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PAPERTECHNOLOGY INTERNATIONAL

THE DEFINITIVE TECHNOLOGY REVIEW FOR THE PULP AND PAPER INDUSTRY

2023

PAPERTECHNOLOGY TV

THE DEFINITIVE VIDEO CHANNEL FOR THE PULP AND PAPER INDUSTRY

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Front Cover: More CTMP from SCA
Ortviken's industrial site, where infrastructure and modern parts from the paper production are reused in the new CTMP facility, to the benefit of both the environment and the economy. A state-of-the-art facility offering the broadest CTMP portfolio in the market, with an unseen opportunity to tailor solutions.
Photographer: Torbjörn Bergkvist

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Foreword

Innovative, naturally

"The White Paper Revolution", people demonstrating with clean sheets of paper after the devastating fire in Urumqi, the capital city of the Xinjiang, PRC, is a recent reminder of the power of paper as a natural substrate for ideas, thoughts, and innovations. Behind every societal change is paper!

Nearly six centuries ago, paper was essential for literacy spreading across the entire population of Europe and soon the rest of the world. That triggered enormous advances in science and, in turn, enabled industrialisation, which functioned because more sophisticated trade was made possible with paper-based packaging. Accounting and finance developed with paper, as well as journalism and media. Digitalisation has come to complement, and compete with paper, but computers would not have evolved without punch cards to start with. Books are still today considered so powerful that the authorities in Russia recently considered it safer to burn more than 50 titles. Paper is innovative and very capable.

We have also been innovative with our processes. Even if the key equipment of a paper mill has not changed so much from the mills supplying to Gutenberg, size, speed, and digitalisation has resulted in amazing technology; I have yet to meet a person who is not impressed by seeing a paper machine in operation. Recycling technology has also evolved hugely in the past decades, to enable utilisation of recycled content in practically everything we produce, wherever it makes sense.

Even in the early days, the industry was practicing Circular Economy, avant la lettre; paper was then made from old textiles, and the expression "from rags to riches" is from the early 19th century, when those selling rags for paper mills could make serious money. We did not forget Circular Economy, but a more sustainable raw material was found in wood. That invention was actually mimicking nature, observing how wasps produce paper-like structures by grinding wood.

Biomimicry, biotechnology, biomanufacturing and recycling most likely will remain core to our industry, as well as working with renewable raw materials. I also trust the traditional pulp, paper and board sectors will continue to grow, as these very products will have a major role to play in making the global sustainability ambition a reality, an innovative, but mature, industry with strong roots.

Often it is easier to see the importance of an innovation only much later. Now smart phones seem essential parts of the global lifestyle, but the first ever text message was sent between two nerds only thirty years ago. In thirty years, we will be living, working and producing in a nearly carbon neutral world. And what today may seem like a nerdy stupid gimmick may by then have grown to a new significance. I like to believe that some of that will take place in our sector.

It is great for Cepi to be working in partnership with Paper Technology International towards that common goal.

Jori Ringman
Director General
Cepi.org

Cepi RENEWABLE RECYCLED RESPONSIBLE EUROPEAN PAPER

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Introduction

Welcome to Paper Technology International 2023

It's hard to imagine that a year has passed since the first edition of Paper Technology International was published, it only seems like yesterday! We sincerely hope that you will find the articles contained in this 2023 edition to be both highly engaging and of real interest and value to your ongoing operation.

Again, many of this year's excellent articles have a focus on sustainability, and our ongoing partnership with Cepi is based on a mutual passion for environmental responsibility, something, we are proud to say, that our industry has embraced more than most.

Our thanks are extended to all the experts that have come together herein to provide such a plethora of knowledge, from all sectors of the industry. Our thanks also go to the amazing team we have here at Paper Technology International, they have worked incredibly hard, and together created a unique online and in-print platform that is growing at incredible speed and engagement.

We are also extremely excited to announce the launch of Paper Technology TV, an exclusive streaming channel totally dedicated to the pulp, paper, tissue, and board industries. Check it out at www.papertechnologytv.com

Global access to the channel will be free of charge to all, from student to CEO, and fully sectionalised (all Search Engine Optimised), so anyone can search for and view what they want, when they want, no advertising, no interruptions, no irrelevant follow-on videos etc. PT TV is an absolute first for this industry sector and we want your content now!

Allow us to wish you a highly successful year ahead; we look forward to catching up with our industry partners and friends, old and new, at the many conferences and shows around the world that are in this year's diary.

Ian Horne
Managing Editor

Colin Smith
Publisher

PASABAN
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Utilizing the unused energy flows inside the paper mills

Pyry Iltanen, Project Manager, BM Green Cooling

INTRODUCTION:

As the energy and material prices are going higher, it makes sense to take a look into the overlooked energy flows inside the building. In the paper mills the heating is not usually the problem, but saving electricity never goes wasted.

One great way to save energy is to use more of the existing energy flows inside the building. This includes hot and cold water, steam and exhaust gases that are not yet used in the process but are given out as waste. In hot side this is widely implemented already, and less heat is wasted, but there are also possibilities in the lower temperatures that do not get so much attention.

In this article I am talking about the water flows inside the paper mills, and how they can be utilized better to lower the energy consumption of the mill. Included are some example calculations and suggestions for the utilization.

BM Green Cooling has over 30 years of experience of cooling in paper mills. During recent years heat recovery and heating has taken a bigger role, as the technic is maturing and the focus in this field is turning more and more to the total system efficiency instead of optimizing separate parts of the process.

What are the overlooked flows?

Overlooked flows are usually found in the lower end of the temperature range in the paper mills, meaning 100°C and under. These can include for example warm process water, affluent water, and cold process water if they are not needed in any particular task.

Cold process water means the fresh water before it is warmed up to be used as process water. With special climate cabinets this water can be used to cool down the e-rooms inside the mill, saving in two places. When the cold water is used in cooling, there is no need for a chiller, and the warmed water can be given back to the process water, so it does not need to be warmed as much, and therefore the heating energy needed is less than before. This means 100% heat recovery and big savings in electrical energy.

Warm water that needs to be cooled down can be used as a heat source for a high temperature heat pump. With a high temperature heat pump up to 90°C temperatures can be reached, allowing a more versatile use.

If there is too much warm process water that is not used for anything and needs to be cooled down, an absorber cooler is a great option. With as low as 70°C water the absorber can provide you with energy efficient cooling.

Absorption chiller uses hot water to replace the electrical energy of the compressor in the chiller. This means that by implementing the warm water flow into the chiller, you are cooling warm water, and you are getting chilled water in exchange, with almost no electrical power. Only electrical power needed in this process is in the automation and in the dry coolers that act as condensation coolers for the absorber chiller.

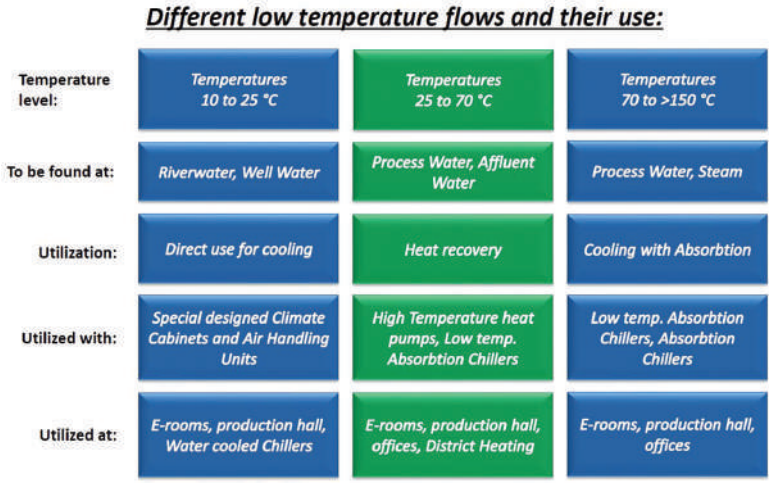


Figure 1: Matrix of the temperatures and uses, "Diagram for the temperatures and usability of the flows".

Why use the energy flows?

Using the overlooked energy flows help to reduce the emissions and decrease the costs and environmental impact of running the mill. This can be achieved by using the existing energy sources more effectively, reducing wasted energy and the energy used.

Taking unused flows and turning them into used flows increases the overall efficiency of the plant, as less energy is used and less energy is given out. Using less of the energy coming from outside and utilizing more energy that was inside the whole time, the overall efficiency of the plant increases. The optimizing process is all about using the least amount of energy while getting the work done.

As affluent water temperatures are getting warmer and the regulations are getting tighter, cooling in the affluent water is needed more often. This can be made for example with high temperature heat pumps, producing warm enough water to be used in heating. With high temperature heat pumps the water can be heated up to 90°C, allowing a more versatile use.

Using the energy flows

In the next part of the article, we are focusing on the flows, dividing them by the temperature levels and suggesting some ways to utilize them.

Cold Water – from 10 to 25°C

Cold water can be usually directly used in cooling of certain areas of paper mills. Either E-rooms or halls, usually the fresh water in Europe is cool enough that the cooling effect can be utilized in certain branches.

With specially engineered climate cabinets the E-rooms can be cooled with fresh water. The Paper Line of climate cabinets by BM Green cooling is specifically designed to be able to use higher water temperatures and still maintain the air temperature on the level that is specified in the ASHRAE norms. The climate cabinets can also be supplied with stainless steel piping if the water quality demands it. Additionally, the stock Paper Line cabinets include the Siemens S7 control unit for easy controlling with the existing Process Control System (PCS) of the mill. Available are also versions without their own control units, so they can be controlled directly by the PCS.

Cold water can also be used in the summer to cool down the hot halls in the mills, like the warehouses, roller halls or packing halls.

After using the cold water in cooling, it is returned to the flow it was taken from. This means that the overall water consumption of the mill is not increased, and we get the additional benefit of 100% heat recovery. As cooling the hall increases the water temperature, this means that the water does not need to be warmed as much later when used in the process.

Figure 2: The Climate Cabinet: "Special Engineered Climate cabinet for the paper industry, with Siemens S7 control unit and A-shape coil to enable high natural cooling share for a year".

Warm Water – from 25 to 55°C

Warm water is for example the affluent water that is going to be given back to the water source. Usually, this water needs to be cooled down before being released back into nature to minimize the environmental impact. The water is however not warm enough to be useful in heating applications.

During recent years we have faced increasing demand for cooling of the affluent water. The regulation is getting tighter, and the environmental questions are getting more important. Affluent water can be cooled down with dry coolers, adiabatic dry coolers or closed cooling towers. What is common in all these solutions is that they are closed systems to prevent the affluent water from vaporizing.

This way the risk for Legionella and problems with steam is prevented.

While cooling the affluent water is possible, it is not the most efficient solution as the heat is dissipated into the surrounding air and wasted. That is why using heat recovery would be the best option for the overall efficiency of the mill.

The affluent water is mostly not warm enough to be used directly in any heating applications, but it can be utilized as a heat source for heat pump. With high temperature heat pump the water temperature can be raised to up to 90°C, which allows versatile use in various applications. In the winter the heated water can also be used in heating the offices or other social parts of the building, or it can be sold for district heating.

Figure 3: Heatpump "High temperature Heat Pump for heat recovery".

Hot water and steam – from 70 to >150°C

If there is hot water that cannot be used in the process and needs to be cooled down, there are options to utilize this water. In winter this could be used in the heating, but on paper mills there is usually too much heat. This means that during the summer there are not many great options to use this water in heating.

One option is an absorber chiller. An absorption chiller uses the hot water to provide chilled water for the cooling applications. In absorption process the heat energy from the hot water replaces the electrical energy needed for the compressor in the traditional chiller solution. This solves the problem of having too much heat in the paper mill and can be used for example to cool the E-rooms in the process.

While previously the absorption could be done with 100 to 90 °C water, the technique has matured and currently it is possible to use as low as 70°C inlet water for the absorption chiller. Possibility for using lower temperatures means that the technique can be used more often on the mills.

Modern absorber chillers can also use gas and steam as a heat source, enabling a very wide range of applications.

Normally the benefits of the absorption system are highest in the summer when there is too much heat on the mill and the need for heating is reduced.

With absorption and adsorption technic the needed electrical energy is drastically reduced. To cool 1.000 kW the absorber needs only 9 kW of electrical energy. Additionally, there is the electricity needed for fans of the condensing unit, and this depends on the

outside temperature. Based on our existing projects the highest consumption here is about 60 kW for cooling capacity of 1.000 kW. The calculated EER (Energy Efficiency Ratio) of this solution for the electrical energy needed here is then 14,5 (1.000 kW/69 kW) in the worst scenario in the summer. Comparing this to the normal EER of chillers which is on the level of 3-4, the efficiency is on another level. We must not forget that absorption solution uses the heat energy for the cooling effect, but if it is possible to use heat which would be otherwise wasted, the efficiency is raised a lot.

Other not so commonly known option is to use a small generator that uses the hot water to produce electricity. While this might not be suitable for most of the mills, it could be the optimal solution for some. By using the hot water in electricity production, the water is cooled down, and the generated electricity can replace the bought electrical energy, therefore saving costs and total energy consumed.

Figure 4: Absorber chiller "Low Temperature Absorber that uses 70°C water as a heat source".

Reducing the electricity consumption in cooling

Reducing the energy consumption in cooling in the high heat load areas such as papermills is also a crucial part of saving energy. For example, the E-rooms require constant cooling when the paper process is running. Yearly this equals to high energy consumption as the heat loads are high and the need for cooling is constant.

Ways to reduce the energy needed include mostly simply taking the most energy intensive part of the cooling out of the equation. This would in most cases be the chiller compressor, whether the cooling is done with DX (Direct Expansion) or water/air cooled chillers.

Freecooling

Reducing of the energy needed for cooling can be done by utilizing free cooling, where the cooling medium is outside air. With purposefully designed climate cabinets for example the E-rooms of paper mills can be cooled with indirect free cooling up to 14°C outside temperatures. This means that during outside temperatures under 14°C no mechanical cooling is needed. For example in Düsseldorf, Germany, the temperature remains under 14°C for 64% of the year.

When mechanical cooling is replaced with free cooling or natural cooling (for example fresh water inside the plant) the savings can be up to 95% in the electrical power consumed. On yearly basis in Düsseldorf this would then mean roughly 60% saving in the electricity consumption in the cooling system compared to a traditional mechanical cooling solution.

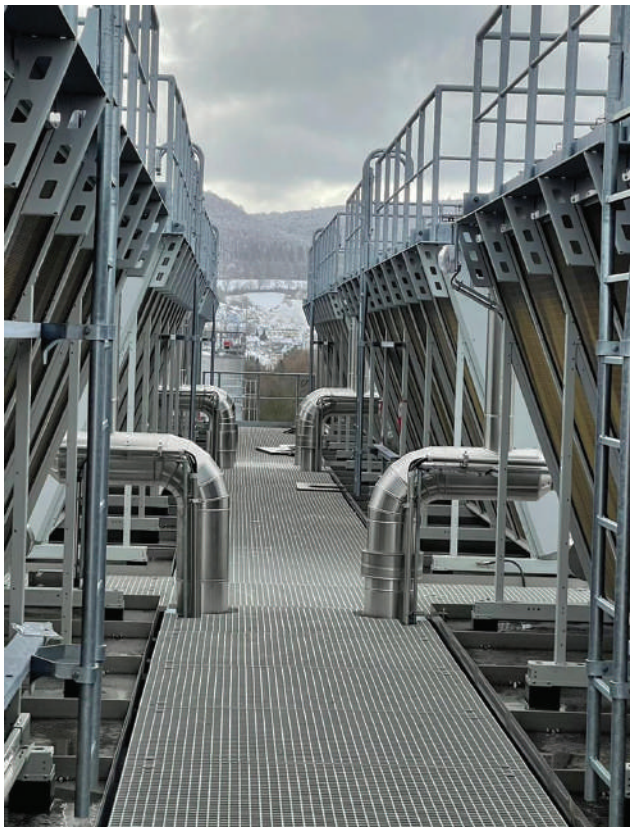


Figure 5: Drycoolers "Drycoolers to provide freecooling up to 14°C Outside temperature".

Natural cooling

If the cooling of the E-rooms can be done with the cold water, the energy efficiency is even higher as we are taking the fans of the dry coolers away from the equation. The only parts that use energy are the pumps, but the pump using is comparable to other liquid-based cooling solutions, whether it is with free cooling or compressor cooling.

CONCLUSION

When considering the energy savings on the paper mill, utilizing the existing energy is a great way to go. Whether the flows are hot or cold or something in between, usually there is a way to use it in a way that saves energy and the environment. Problems can still arise from the material choices and compatibility of the different utilization solutions between each other, and even availability of the said flows during the different times of the year. As the pioneer of natural cooling in the paper mill, on top of engineering of the natural cooling solutions BM Green Cooling also provides study projects for plants to get a better understanding of the usability of the different flows and how to better utilize them inside the paper mill. With the information the customer has a better understanding of the possibilities, the needed investment, special requirements to take into consideration and the savings potential of the solution.

"Energy Hubs" – the paper industry potential as a renewable energy producer

Cepi is the Confederation of European Paper Industries

INTRODUCTION:

A new study commissioned by Cepi to AFRY, a Scandinavian firm supplying engineering and advisory services, shows the untapped further potential for paper mills to function as renewable energy hubs. The pulp and paper industry could increase its on-site renewable electricity and heat production and, through a 'swing capacity effect', sell any excess energy production to the grid, nearby neighbourhoods and other industries.

The European pulp and paper industry is already the largest industrial prosumer of clean energies, with over 60% renewables in its primary energy consumption. Proportionally to its size, it is a major industrial investor into the decarbonisation of its processes, notably via on-site renewable energy generation. It is one of the success stories of the European emission trading scheme (EU ETS), which provides incentives for such investments. The European pulp and paper industry has reduced its CO2 emissions by 34% since 2005 but must meet a very ambitious goal of 62% reduction by 2030.

Advancing the prosumer model

The authors of the study conclude that by 2030 the pulp and paper industry has the potential to increase its renewable on-site electricity and heat production to generate almost 31 TWh. This corresponds to 30% of electricity and almost 6% of heat generated on-site in 2020. But mobilising necessary investments would require predictable EU regulation and expeditious permitting procedures to be put into place.

This new study offers an indication of where some of our industry's next investments could be made. The energy transition in which we are already well engaged is also an occasion for us and for policymakers to rethink what a paper mill is and could be: a renewable energy hub and a biorefinery where substitutes for fossil-intensive materials and products are created.

The study also offers an estimate of the space available in different types of paper mills to install solar panels or wind turbines, in addition to other solutions identified by the authors. The energy production capacities outlined in the new report cannot however be implemented rapidly enough to be a solution to the current energy crisis. But widely shared analysis shows that energy costs in Europe are likely to stay high at least for the foreseeable future, and investments in fossil free energy will eventually offer the industry a chance to adapt to a radically changed energy landscape.

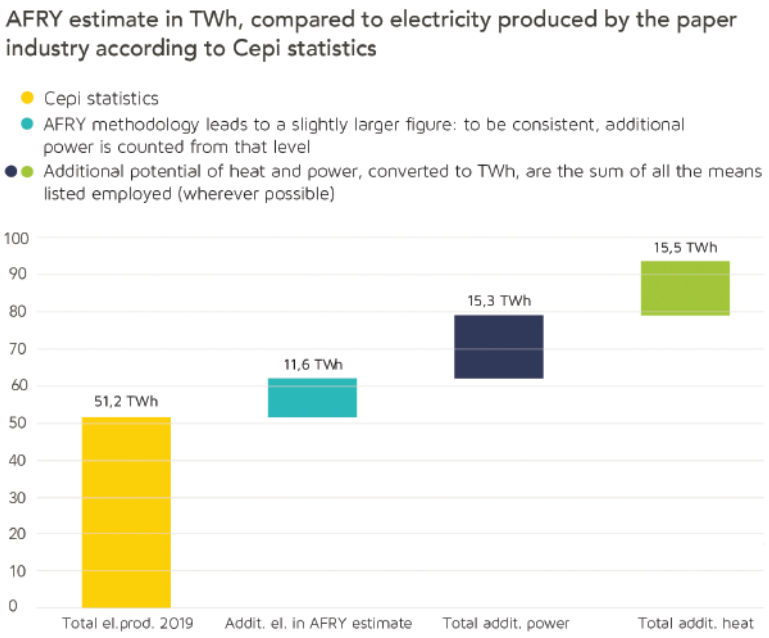


Figure 1: AFRY estimate in TWh, compared to electricity produced by the paper industry according to Cepi statistics.

Swinging between producing energy and material

The study also explored the possibility for the paper industry to reduce its own consumption and increase the share of renewable energy it provides to the grid, nearby neighbourhoods and possibly other industries. The authors estimate that this 'swing capacity' could regularly reach 10% to 20% for an average paper mill.

From a wider perspective, the same effect of optimising between material production and energy generation could also apply to the biomass residues resulting from production. The development of new product applications is already well-advanced. As renewable energy becomes increasingly available and its cost declines in the future, the production of secondary bio-based products and materials is expected to further drive the industry's transformation. New opportunities will present themselves as the industry becomes increasingly energy-efficient and affordable fossil-free energy becomes more available.

The European paper industry could be a global champion and promoter of a new bio-based and circular economy, something for which it is already well–positioned. We have an opportunity for significant, systemic change.

Paper mill sites already produce energy and can be seen as "energy hubs". This means that a paper mill can use all available means that make sense, including e.g. solar and wind power, to optimise renewable energy on-site potential. The AFRY report shows that our industry could increase the amount of generated heat and electricity in many cases. One solution does not fit all sites but becoming less dependent on external energy factors is crucial.

How much more renewable energy could be generated at Cepi mill sites?

The paper industry is very heterogeneous. Some mills produce a large surplus of energy, others consume a large deficit of energy. The AFRY report estimates that across Europe about 31 TWh of additional energy (power and heat) could be produced onsite using a mix of renewable energy sources. This corresponds to:

- Almost 10% of Cepi mills' energy consumption in 2020,
- 30% of electricity produced on-site in 2020,
- Almost 6% of heat generated on-site in 2020,
- About 0.8 % of European overall natural gas use before the 2022 energy crisis.

In reality, this will depend on the mill's individual characteristics such as their own history, shape, layout and equipment. To realise this potential, paper mills would need to make new investments which will not happen overnight.

How the additional potential can be used?

In a business model of "swing" between competing end uses, the additional potential can be used in many ways:

- Space: could be used for additional production capacity or energy production
- Water: could be recirculated, or an energy source
- Gases: are energy for the mill, but could also be sold
- Sludges: could become materials, energy, or sold as is for further treatment
- Lignin: is already an energy source – it can also be valorised as materials and chemicals apart from fuels

In the AFRY report, double counting has been avoided by using typical mills, with size space and other properties, and using its resources efficiently – but only once.

How the additional potential can be realised?

The European policy can support the paper industry in contributing to decrease Europe's dependency on fossil energy. The transition to greater energy on-site production requires a policy framework that:

- Promotes, supports and rewords investments in renewable energy generation on-site,
- Supports new business models which leverage the on-site renewable energy potential,
- Facilitates connecting industrial sites into industrial symbiosis networks,
- Accelerates permitting processes for new renewable energy installations on-site.

Readers can download the Executive Summary for Cepi's Energy Hubs report at https://www.cepi.org.

Cepi is the Confederation of the European paper industry, based in Brussels, Belgium.

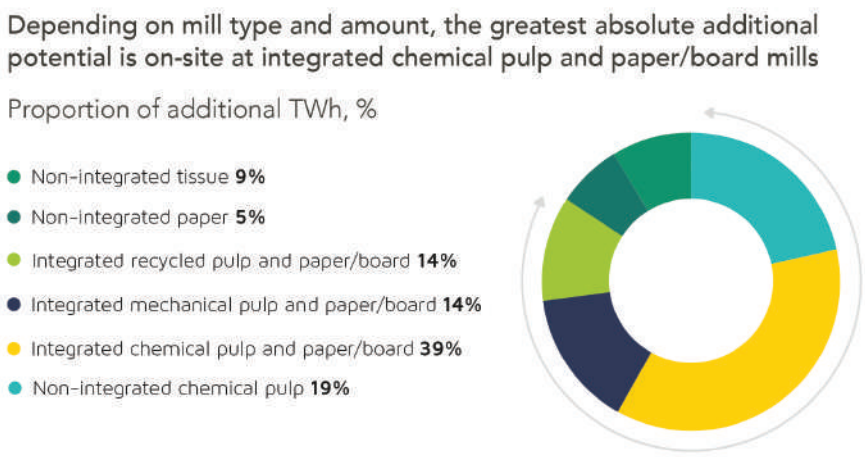


Figure 2: Depending on mill type and amount, the greatest absolute additional potential is on-site at integrated chemical pulp and paper/board mills

Tissue markets overview and trends that will shape the next 5 years

Matt Elhardt, VP of Global Sales, Fisher International

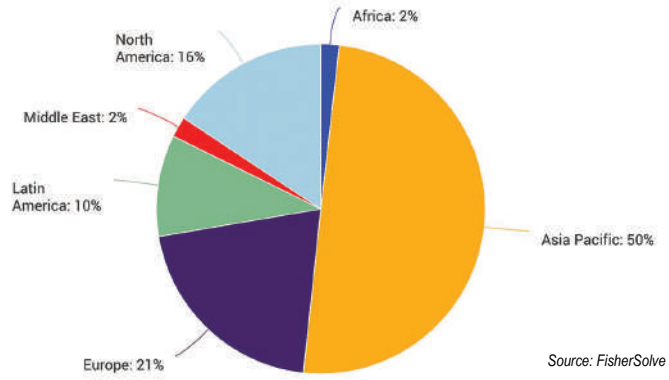
INTRODUCTION:

To say that global geopolitical, trade flows and economic structures are stressed would be an understatement. Over the course of the last two years, a heightened sense of uncertainty has permeated our lives and the markets we depend on, though there are shimmers of light and reasons to be hopeful about the future.

One segment of the pulp & paper industry that continues to rapidly evolve is tissue and towel. There has been some reshuffling and settling since the onset of the pandemic in 2020, and society seems determined to return to normalcy – whatever that may look like. The global tissue sector also looks drastically different than it did in 2019. Before looking at the trajectory of the tissue and towel sector and various factors that could impact it going forward, here are eight interesting facts about the state of the global tissue and towel sector as of 2022.

1: Global tissue is a roughly 60MM st market, which is about 10-15% of the global pulp and paper market. As illustrated in the image below, Asia now accounts for almost half of the world's tissue machine capacity.

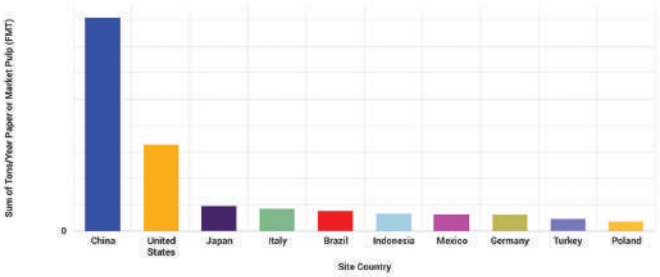
Global tissue production by region



Source: FisherSolve

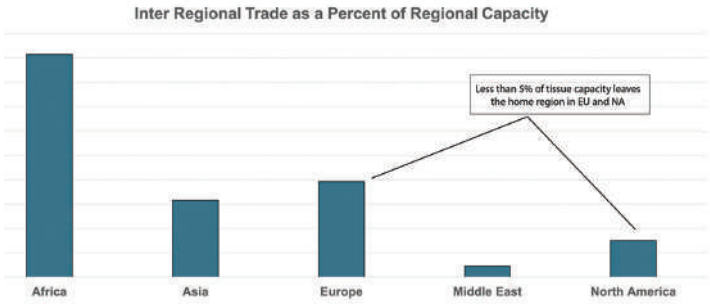
2. Population and urbanization drive tissue production. The graph below illustrates the top tissue producing countries. China's capacity is much larger than the next several countries combined; the United States is also a very important tissue producer, with about half of China's capacity.

Top tissue producing countries



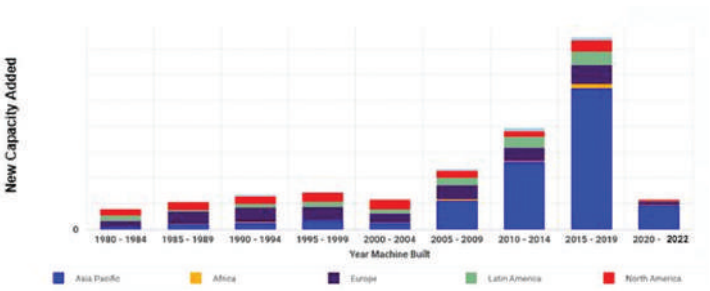
Source: FisherSolve

3. Tissue is a "local" business. This means that most regional tissue production stays close to home (versus other grades such as market pulp and containerboard, which are routinely shipped to far away markets). Over 95% of North American and European tissue production stays in their own markets.



Source: FisherSolve

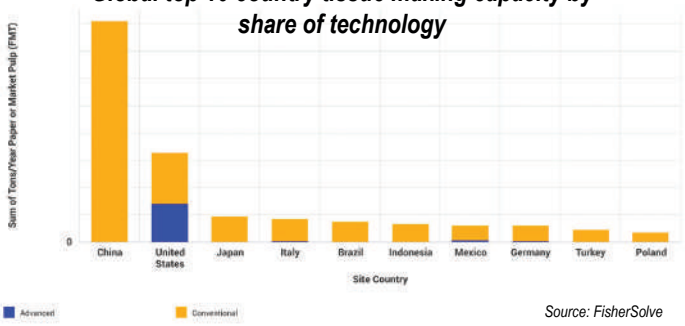
4. New investment in tissue has been driven by Asia, which accounts for 70% of total global new machine capacity since 2010. The chart below illustrates new capacity by machine build year and provides an indication of where capital has been flowing. Asian investments have been mostly in China, which has now resulted in a significant overhang.



Source: FisherSolve

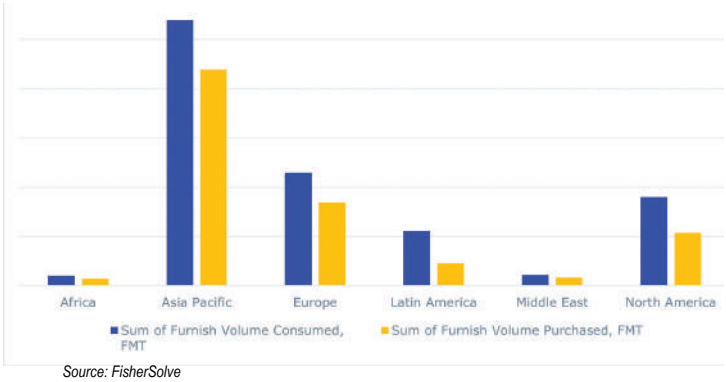
5. The US is unique regarding the high share of advanced technology machines in tissue production – comprising 90% of the world's market for TAD, NTT, etc. This is because US consumers prefer and demand higher-end tissue products that are soft and absorbent.

Global top 10 country tissue making capacity by share of technology



Source: FisherSolve

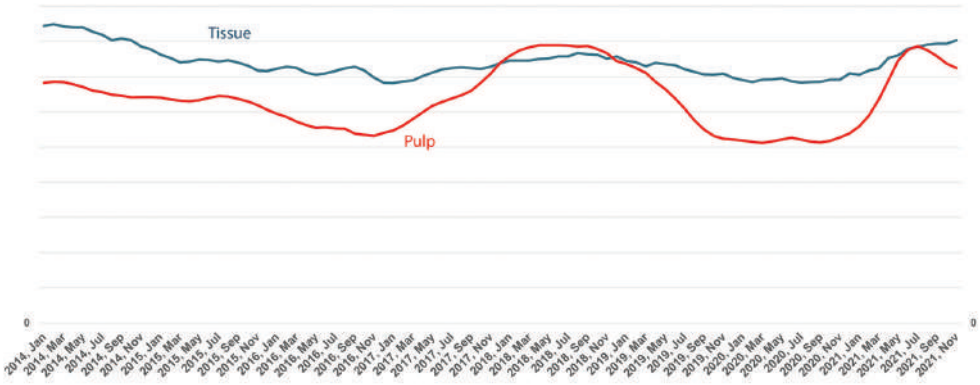
Tissue furnish consumption purchased vs,total



Source: FisherSolve

6. Tissue mills buy market pulp for most of their fiber furnish As illustrated left, about 80% of global tissue is made using purchased pulp. Considering that pulp makes up 60% of parent roll costs for the average global tissue mill, it should be no surprise that it is also the largest single driver of cost on average.

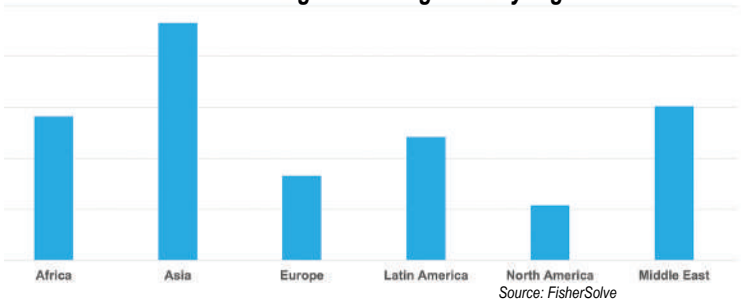
US, Chinese and German tissue and pulp prices USD / ST, Trade-Derived R^2 = 0.6



Source: FisherSolve

7. Globally, tissue prices and pulp prices share turning points. This then leads to another attribute of these types of markets, which is the price correlation. Using FisherSolve's Market Module, we can analyze the calculated trade derived weighted tissue prices for selected regions and acknowledge the correlation coefficient between pulp and tissue prices which is quite high (about 0.6 R2).

2022 - 2030 Tissue annual average demand growth by region.



Source: FisherSolve

8. We expect global tissue demand to grow 1-5% in the coming decade – with the most growth occurring in Asia.

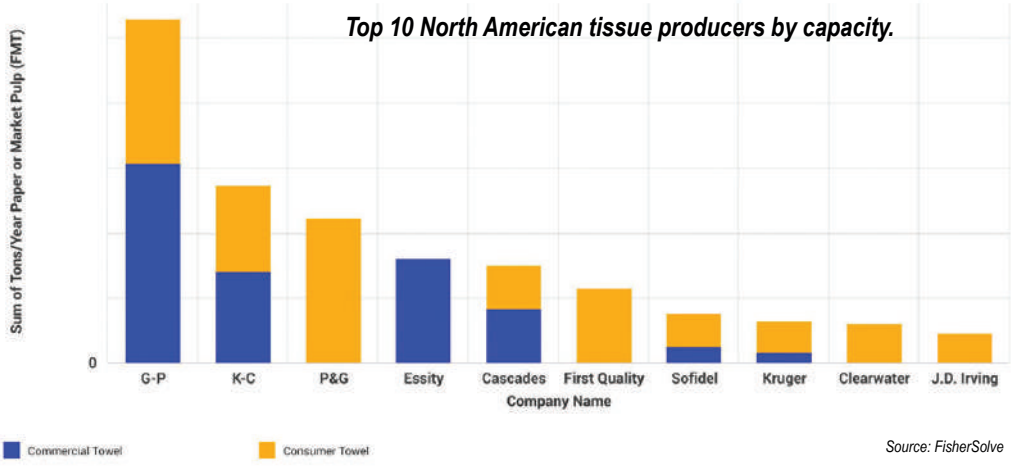
Now, let's narrow it down a bit and look specifically at the North American tissue market and some of the trends that will shape this market in the future.

NA Overview

The current North American tissue market is at about a 10 million short ton value with net imports (excluding the US and Canada) at about 480,000 short tons (st). When looking towards the future, we expect the market to grow by roughly 1% over the next year.

Within the North American tissue segment, roughly one-third of the market is made up of private label share. The image right illustrates the top 10 North American producers by capacity, and it's interesting to note that the top three companies account for about 50% of total capacity.

Top 10 North American tissue producers by capacity.



Source: FisherSolve

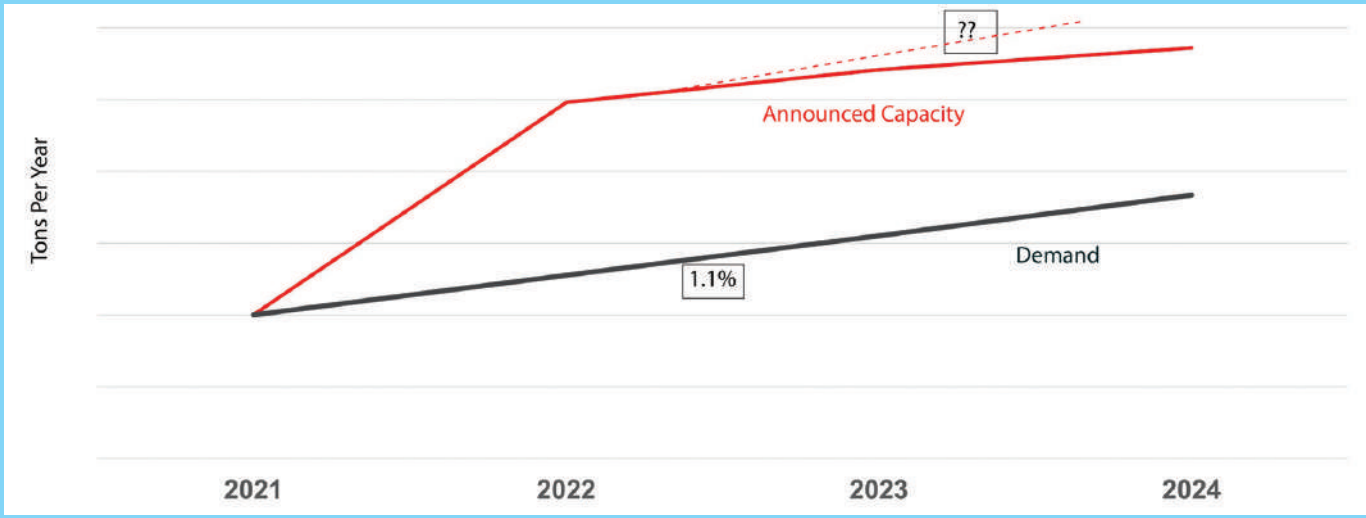
Trends to Watch

Trend prediction is risky business today, as uncertainty may be more pronounced now than it has been in several decades. Between the unexpected global pandemic we experienced over the last two years and the first "major" European land war in 70 years, trend predicting isn't as reliable as it once was. However, the antidote to uncertainty is scenario planning – identifying risks, addressing them and finding the underlying truths that are likely in most scenarios.

In order to scenario plan, we must identify the risks by asking critical questions such as:

• Will capacity (especially in private label) create a bubble? The chart below illustrates North American announced Tissue and Towel capacity and the expected demand. Assuming North America as a whole grows at about 1%, we can compare the expected demand with the announced capacity, and what we see is the likelihood of an expanding gap between capacity and demand as announced capacity is exceeding gross demand. Of course, as the chart below reflects announced capacity, it is altogether possible that we will see additional announcements 2-3 years from now.

North American announced T&T capacity and expected demand.

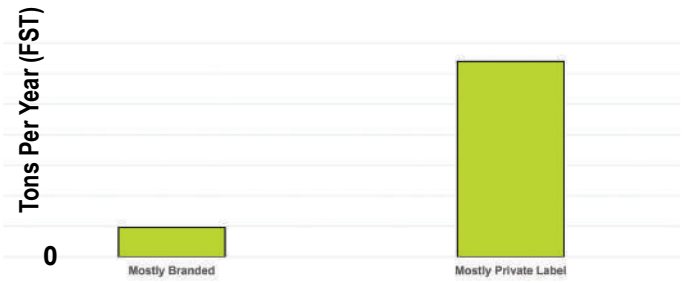


Source: FisherSolve

When we dive deeper and look a bit closer at the details, we can see that a significant amount of new capacity over the 5-year period will come from companies that focus largely on the private label market.

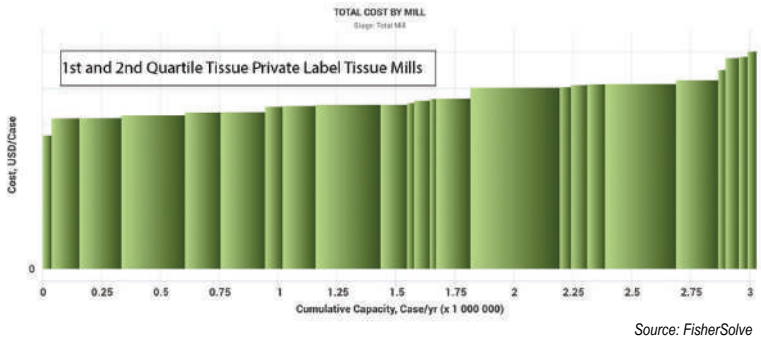
• Will private label market demand grow enough to absorb all of the new capacity? Let's examine three factors that will impact the direction of this growth:

North American tissue capacity change 2021-2025



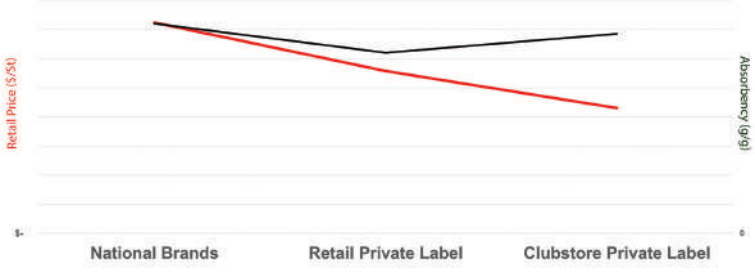
Source: FisherSolve

1. Costs: The chart right illustrates a cost curve (supply curve) at the case level. Using data from FisherSolve, we can adjust for differences in advanced and conventional pressing. When applied, we can see that private labels can be low cost and cost competitive as half of 1st and 2nd quartile consumer advanced non-integrated mills are private label.



Source: FisherSolve

Consumer paper towel shelf priceand absorbancy (NCSU)



2. Quality: When looking at the results from the North Carolina State University (NCSU) published tissue study comparing the shelf price and absorbency of towel, private labels can compete on the shelf in terms of quality compared to national brands. However, the question remains: will towel consumers pay 60-80% more for 10-20% more absorbency?

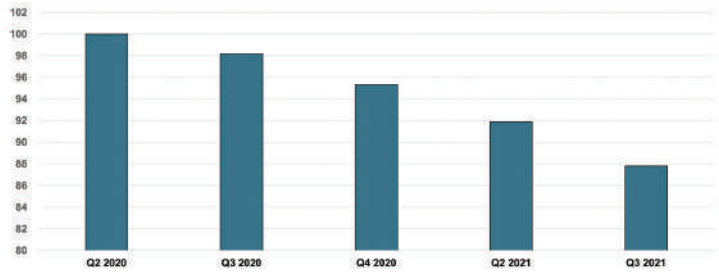
Source: FisherSolve

3. Inflation: Inflation is eroding consumer spending power, which has historically been a tailwind for private label brands. As we can see in the image right, US real wages for all wage earners dropped 12% in 3Q2021 compared to 2Q2020.

However, this is all just a small part of the story. Private label capacity is growing fast and fragmenting – another trend to keep an eye on.

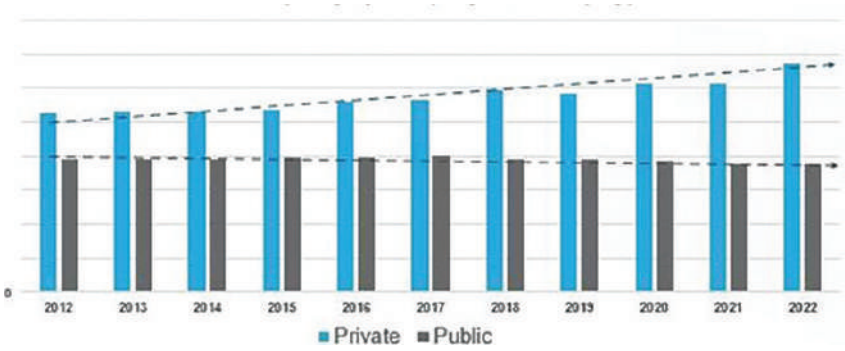
Another important dynamic that is just as critical, and something that is oftentimes overlooked, is the share of private and public ownership. Looking at the decline in public company ownership and what that tells us about capital return expectations has extremely important strategic implications. When investing, public companies tend to want a shorter ROI, whereas private companies don't mind a longer ROI. This is a major factor into why recent, new tissue growth is occurring within private companies.

US Real wages for all wage earners.



Source: FisherSolve

NA. Tissue capacity by company ownership type.



Source: FisherSolve

What Role Does Carbon Play in All of This?

Whether voluntary or mandatory, carbon will increasingly be a cost for producers. We've already seen big brands set net-zero goals which are being backed with big investments and demands that their suppliers help them meet reduction targets. We've also seen carbon legislation in various forms that has been introduced in several regions – creating new opportunities for the industry to take advantage of the significant shift in views on the environment.

The image below illustrates North American tissue greenhouse gas (GHG) emissions by mill, and as we can see, there are significant differences in the amount of carbon emitted between various US tissue producers. Those mills that are emitting the least amount of GHG are advantaged within the industry, whereas those towards the right side of the curve face a serious risk.

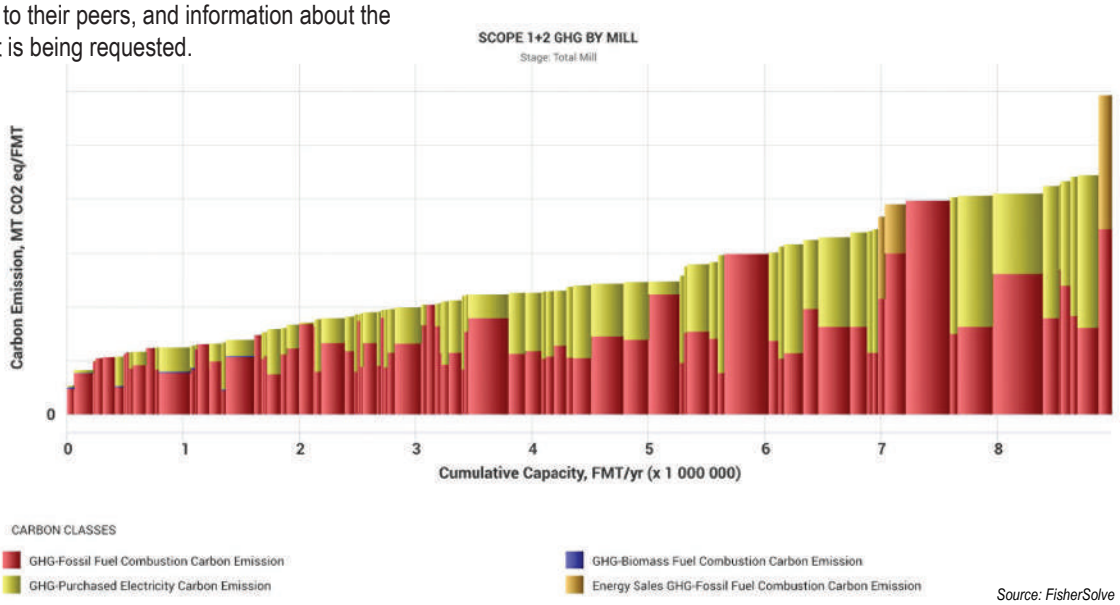
So why is this important?

With the rise of carbon pricing mechanisms, the cost of doing business will ultimately increase for manufacturers located within these high emitting regions. In addition to higher prices, these manufacturers could also potentially lose the business of retailers and companies who are focusing on their own individual carbon footprints, which forces them to evaluate the carbon claims of their own suppliers, transport systems, etc., in order to achieve sustainability goals.

With procurement-level decisions now being made with regard to the sustainability of suppliers, which is critical for the energy-intensive Pulp & Paper industry, carbon impacts of individual mills are being compared to their peers, and information about the upstream carbon footprint is being requested.

Overall, the North American tissue market is very likely to see a cycle of surplus capacity in the coming years, however, pressure will vary by tissue segment and channel. Even though exogenous factors such as Covid-19, the Russia-Ukraine war, and inflation are creating more uncertainty, there are some things we are fairly certain about: low-cost producers in private labels who can compete will gain share; the prospect of reduced consumer spending power will be a tailwind; and carbon costs will become more widespread in the next 5 years, creating a major opportunity for owners who can proactively articulate their story.

Fisher INTERNATIONAL
A ResourceWise Company



Source: FisherSolve

FIBERLEAN ADVERT

Maximum dewatering plus energy savings

Franz Kiefer, Strategic Product Manager Pressing, Heimbach

INTRODUCTION:

Faced with a backdrop of spiralling energy costs paper manufacturers are more than ever confronted with the difficult task of keeping the cost of production as low as possible. The motto is – less energy, more productivity. The implication of this is that paper machines have to be pushed to their performance limits: High machine availability, optimum runnability and maximum possible speed are the focus. A top priority in achieving these goals would normally be to obtain maximum dry content coming out of the press section. This, of course, places high expectations on the performance of press felts. Atromaxx and Atromaxx.Connect from the NewTech product portfolio are well placed to satisfy these expectations.

The concept is based around multi-axial carrier modules providing a structure that is essentially incompressible. On the one hand, this allows a designated void volume to be maintained throughout the lifetime of the felt, whilst on the other hand the open drainage channels are able to handle large volumes of water. The result: exceptionally high dry content!

Thanks to its modular design, Atromaxx is highly versatile in terms of paper grade application as well as speed range and, combined with a suitable non-woven layer , should be suitable for every machine and nip configuration.

Turn off Uhle boxes

Nip dewatering can come into play when machine speeds exceed 600 m/min, making it possible to reduce – or even completely switch off – vacuum in felt suction boxes. When this occurs, the door is opened to huge energy savings. A prerequisite for this would be an individually designed and precisely matched press felt design such as Atromaxx, whereby higher dry content, better runnability and faster start-up can be realised. Numerous references provide compelling confirmation of this.

Unmatched flexibility

The dewatering behaviour of a press felt is significantly influenced by machine speed, pressure pulse and felt saturation level. So, at speeds below 600 m/min nip dewatering is more or less impossible. Even under these conditions, however, Atromaxx can achieve considerable dry content values. This flexible design can come into its own on machines where, depending on paper grade, speed fluctuations necessitate switching between nip and suction box dewatering.

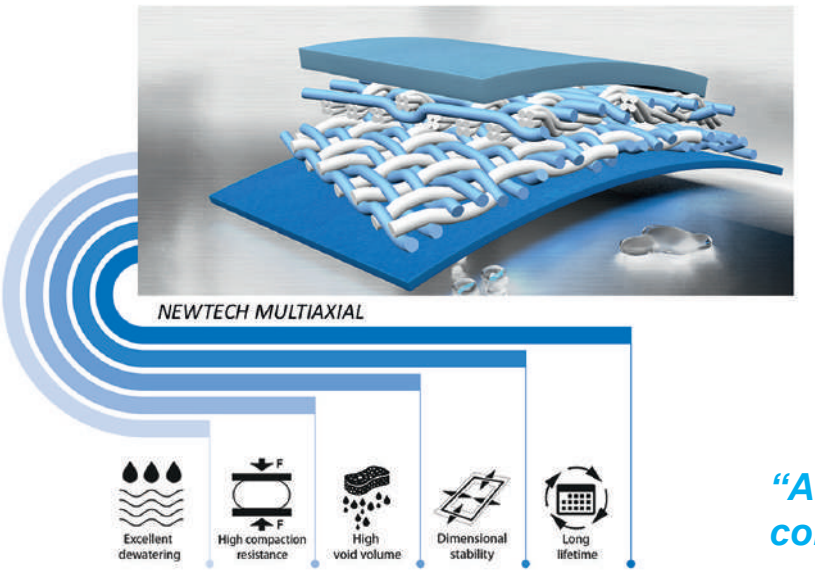
Safe and fast

The outstanding properties of conventional Atromaxx are certainly replicated in the seamed version of the felt. Atromaxx. Connect can be installed quickly and safely while requiring few personnel and brings the additional benefit of drainage values that conventional seamed felts cannot match. High speeds are no problem either, as the seam area and seam itself are designed with this in mind.

The Atromaxx family - Product Features

Multiaxial felt

- **Modular construction: Combination of totally different base properties possible within one felt**
- **Outstanding compaction resistance due to multiaxial structure**
- **Outstanding void volume retention**
- **Absorption of huge amounts of water**
- **Excellent dewatering throughout felt lifetime**
- **High stability**
- **Operation modes for nip and uhle-box dewatering**
- **Applicable for all paper grades**



atromaxx.

"High machine efficiency, optimum runnability and maximum possible speed are the focus."

"A top priority is maximum dry content after the press."

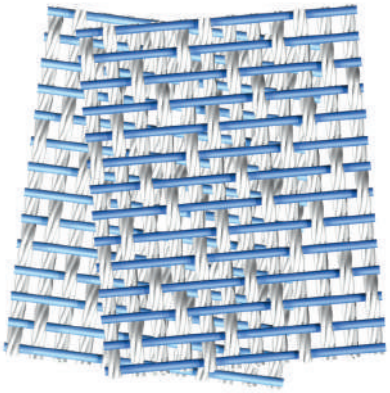


Figure 1: Combination twisted / twisted.

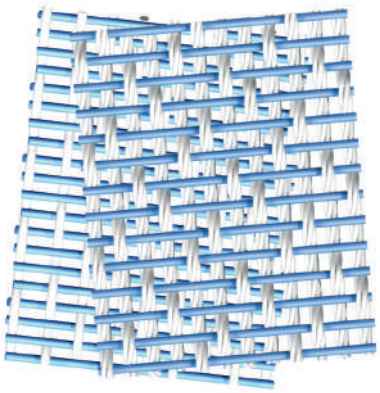


Figure 2: Combination twisted / mono.

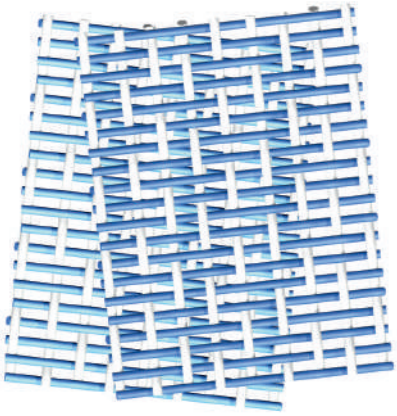
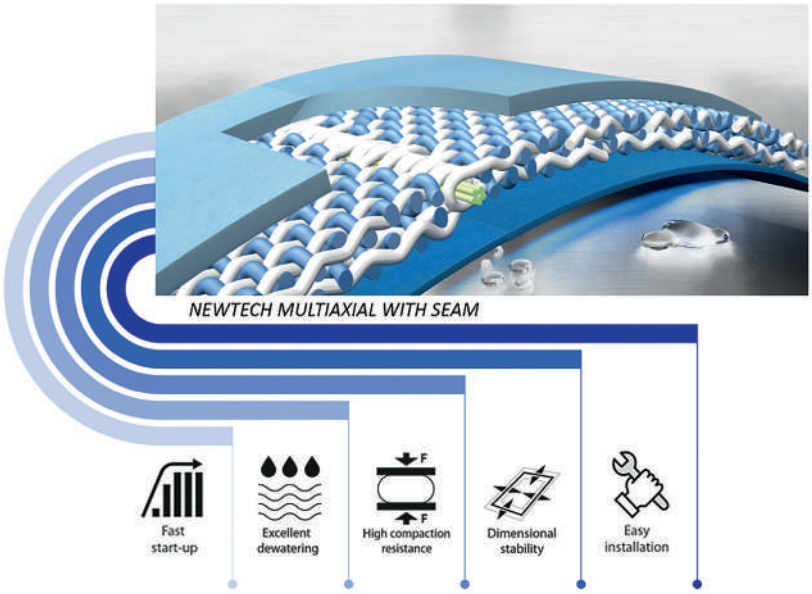


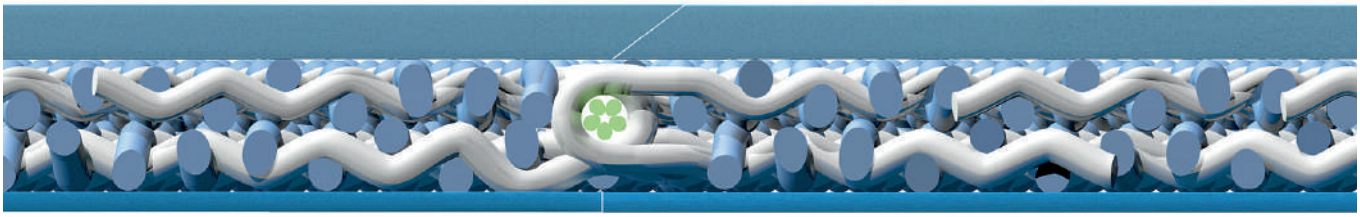
Figure 3: Combination mono / mono.

Atromaxx.Connect – the seamed version offers the same dewatering performance with safe and fast installation.



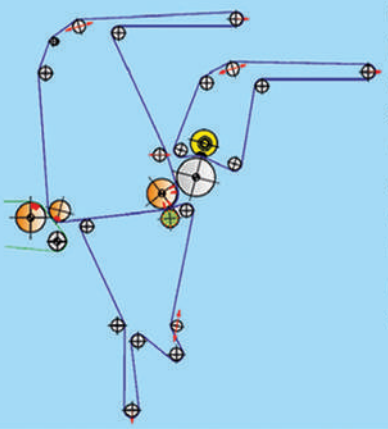
atromaxx. CONNECT

Atromaxx.Connect cross section



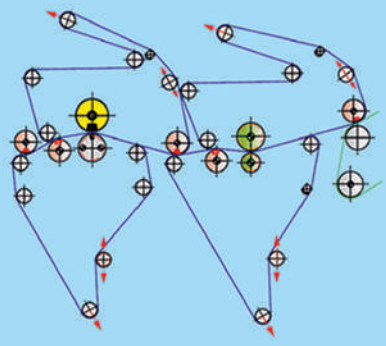
References Atromaxx and Atromaxx.Connect

Reference 1



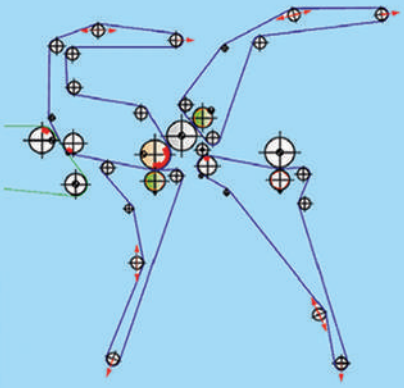
Configuration: Tri-Nip
Speed: 800 m/min
Width: 4,00 m
Paper grade: Special fine paper
Position: Pick-up,
3rd shoe press: Atromaxx
1st press bottom: Atromaxx.Connect
Results: Significant efficiency increase up to 86%. Clear energy savings achieved by switching off felt suction box. Additional advantages: reduced breaks, improved runnability

Reference 2



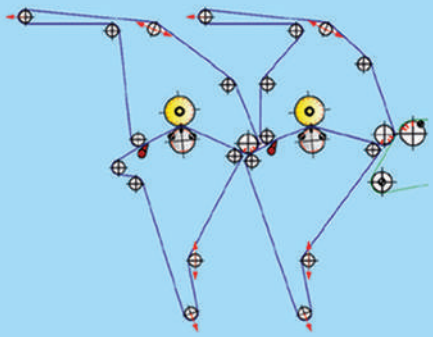
Configuration: Optipress
Speed: 1.200 m/min
Width: 10,50 m
Paper grade: Fluting
Position: 1st press bottom/
2nd press top & bottom: Atromaxx
Results: 56% dryness leaving press section, 16-20% energy saving

Reference 3

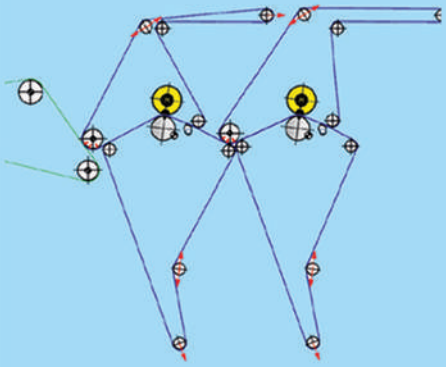


Configuration: Tri-Nip + 4th press
Speed: 950 m/min
Width: 4,50 m
Paper grade: Thermal paper
Position: 4th press: Atromaxx
Results: 50% fewer breaks, more efficient dewatering

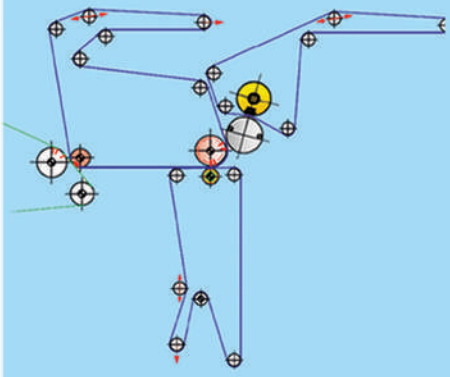
Reference 4



Reference 5

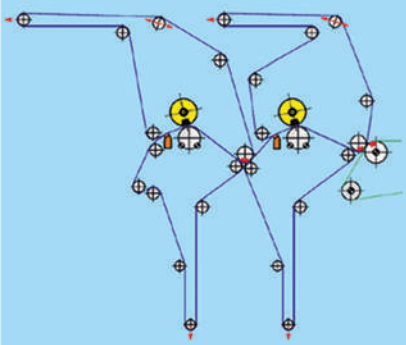


Reference 6



Configuration: Optipress
Speed: 900 m/min
Width: 7,00 m
Paper grade: Folding Box Board
Position: 1st press top/bottom Atromaxx
Results: Improved moisture profiles, production record

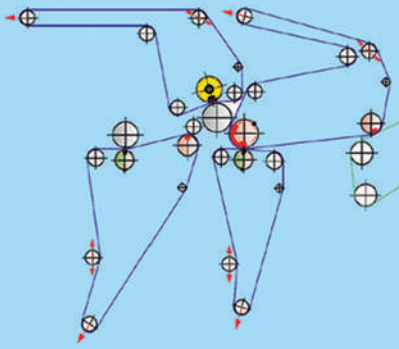
Reference 7



Configuration: Tandem NipcoFlex
Speed: 900 m/min
Width: 7,40 m
Papiersorte: Kraftliner
Position: 2nd press top/bottom: Atromaxx
Results: Very good start-up, longer lifetime compared to competitors

Configuration: Tandem NipcoFlex
Speed: 1.200 m/min
Width: 7,30 m
Paper grade: Fluting
Position: 2nd press: Atromaxx
Results: Faster start-up, improved paper characteristics

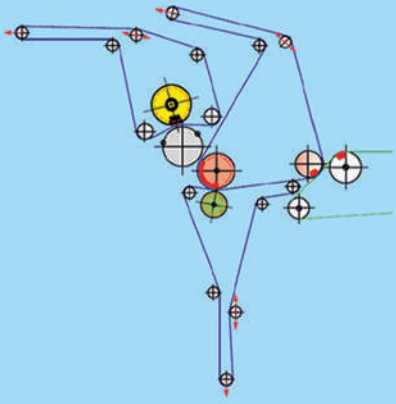
Reference 8



Configuration: Tri-Nip with shoe press + 4th press
Speed: 1900 m/min
Width: 10,50 m
Paper grade: Newsprint
Position: Pick-up: Atromaxx
Results: Fast start-up, good dewatering and runnability throughout felt lifetime

Configuration: Tri-Nip with shoe press
Speed: 1.100 m/min
Width: 5,20 m
Paper grade: Release paper
Position: 1st press: Atromaxx.Connect
Results: Fast seam closing, completely marking-free

Reference 9



Configuration: Tri-Nip with shoe press
Speed: 950 m/min
Width: 5,50 m
Paper grade: Fluting
Position: Pick-up/1st press, 3rd press: Atromaxx.Connect
Results: Perfect performance in all three positions

SULZER
ADVERT

Speciality chemical technologies for high-quality, sustainable and cost-effective chemical pulp production

Ari Rannankari, Pulp Segment Team Leader, BIM Kemi Group

INTRODUCTION:

Pulp production plays a key role in the bioeconomy, the transition and transformation to a fossil-free society and circular economy, producing not only the original bio-based product, but also products replacing fossil-based products. In this respect, pulp production is an enabler of a sustainable future, but can they do it on their own?

Changing global market conditions require pulp producers to manufacture pulp of a higher quality while lowering overall operating costs. Together with variable fibre supplies, sources and qualities, the need to meet regulatory goals and quality improvements at lower capital cost, can create a challenging situation. The pulp and paper industry has improved its environmental record by reducing its pollution of rivers and high water consumption by closing water circuits in pulp and paper mills. Fresh water consumption has been drastically reduced in the last decades especially in Europe, and continues to be reduced as more and more water circuits are closed. This development requires an adaptation of technology, as well as the chemicals used. With these environmental, quality and economical requirements in pulp production constantly increasing, mill and supplier business partnerships are essential.

Specialty chemicals for sustainable and cost-effective pulp production

High quality finished paper and board require high quality fibre. However, the fibre line is only as strong as its weakest link and any problem in the fibre line will impact the final paper. To eliminate weak links and reduce costly bottlenecks in pulp mills many inter-related, and sometimes competing, reactions need to be managed in an efficient way. By understanding the complex chemistry and having access to chemical expertise that can help in analysing and optimising the chemical processes, mills can get big gains and savings - all the way from wood preparation to pulping, while maintaining a sustainable profile.

Figure 1: Optimising chemical processes from wood to pulp.

Specialty chemicals and smart technologies can support in reducing bottlenecks in pulp production, to improve brightness and reduce bleach usage and to keep the mill running efficiently. Cost benefits, removing bottlenecks and production increases can be achieved through very small changes in the system to a complete process change.

You just need to know what to look for and how to do it – the pulp specialists at BIM can provide that expertise. Through their profound knowledge combined with our chemical solutions and analysis tools, they can add real value to the pulp process and help produce pulp according to required needs.

Improving drainage for an efficient pulp washing

The pulp mill's performance is only as good as its washing performance. Inefficient pulp washing can lead to production bottlenecks, reduced quality and increase chemical and production costs. Poor drainage and washing occur when there is much entrained air in the stock. Foaming and high entrained air content are big problems for many pulp and paper manufacturers due to the negative effects they have on the process and the quality of pulp and paper. Air or foam caught in the mat interferes with liquid passing through thus slowing drainage and giving a poorer washing efficiency. The maintenance of vat consistency and vat levels is directly attributed to both the air attached to the fibre and the air in the liquor.

The most successful mills realise that to be viable in this challenging market, you need to break the foam/air cycle. That means finding out what's really impacting washing performance, with the expertise to solve problems at their source and introduce long-term improvements across the entire process.

But what is actually air/foam?

Air is a component which is always present during pulp production and appears as bubbles or foam in the process. Bubble is a small gas particle entrained and dispersed in the fluid. The amount of dissolved air in water increases with pressure and decreases with temperature increase.

Figure 2: Foaming and high entrained air content have negative effects on the process and the quality of pulp and paper.

Foam is formed by many gas pockets surrounded by a thin film of liquid. Foam is created when fluid is mixed with free surface air or when bubbles gets bigger and rise to the fluid surface. Surface-active materials can create foam when they get stabilised.

Foam control and drainage improvement are integral parts of ensuring downstream productivity and cost efficiency. When the process is closed, the level of undesirable substances increases, which leads in turn to foaming and deposit problems.

There is much to be gained by using effective chemical products that deaerate the system and reduce foam formation, such as:

- Reduced air content
- Improved drainage, which gives cleaner pulp, which gives lower COD and chemical savings
- Reduced surface foam
- Elimination of process bottlenecks
- Improved process stability and in some cases increased soap separation
- Increases washing yield, pulp quality and chemical recovery
- decreases bleaching chemical usage, water usage, and energy need.

Advantages of a talc free pulp production

Talc has been widely used for many years in chemical pulp mills with sulphate and sulphite process in order to change physically the surface of aggregated wood pitch particles. This surface change makes the wood pitch particles less likely to attach themselves to metals surfaces in the process which, in turn, lessens the tendency for build-up in the form of deposits. However, one major disadvantage for using talc is its relatively poor retention to the wood pitch particles and fibres as well as its hydrophobicity. To cover for the poor retention talc is dosed at high rates. This overdosage causes in many cases deposit problems, a counter act towards its purpose. In addition, talc is often found with a lot of impurities, such as iron - calcium - and aluminium containing minerals. All of them, not desirable in the pulp process. In recent years, there has also been growing concerns regarding the health risks posed by talc which has led to some paper producers not buying pulp which has been produced using talc.

Talc free pitch control – organic and inorganic

One of the most common challenges pulp producers face is pitch control. As long as people have been making paper from trees, pulp manufacturers have struggled to eliminate pitch. Pitch deposits in open and closed systems often lead to quality problems in both pulp and paper mills. Many times we talk of pitch, but several times it is a blend of organic and inorganic materials.

Pitch is a complex organic colloidal contamination released during the pulp production process and can contain resin acids, fatty acids, triglyceride fats, stearyl esters, sitosterols and other unsaponifiable materials. Pitch can vary in amount, tackiness, and composition, and poses a major challenge for pulp manufacturers, as it can agglomerate and its sticky nature causes production and quality issues. One of the requirements for high product quality is properly functioning pitch control.

Wood types used in pulp and paper production have species-specific compositions of wood extractives, which often cause a variety of process technical and quality related problems. Although the pitch is a minor component of the wood, its effects on the pulp and papermaking process can be quite intense.

In paper making, pitch can cause:

- lowered tensile strength,
- spots and holes in the paper,
- deposits on paper machine parts, wires and felts,
- unwanted foaming and problems with odour and taste.

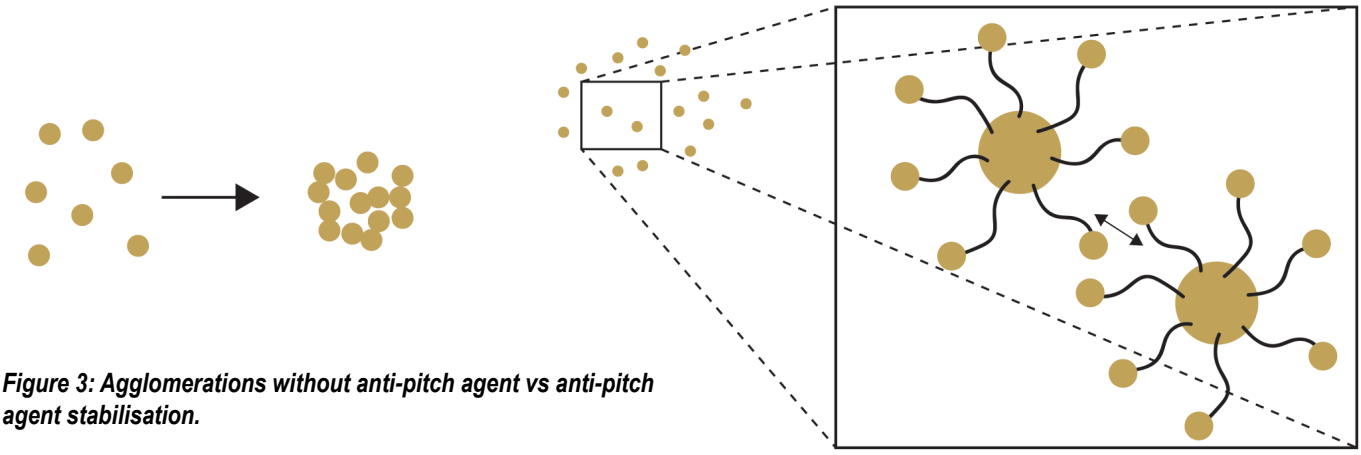


Figure 3: Agglomerations without anti-pitch agent vs anti-pitch agent stabilisation.

Closure of the water loops and the neutral papermaking processes have caused severe pitch issues in recent years. Optimal pitch control without talc can be achieved by continuous use of anti-pitch agents suited for both alkaline and acid conditions.

The benefits of a pitch control are:

Primary:

- Lower extractive content in pulp
- Cleaner process and pulp
- Improved runability

Secondary:

- Talc free pulp production
- Reduced holes and spots in paper
- Increased tensile strength
- Improved smell and taste of paper and board

To achieve optimal results, a thorough working knowledge of the process is essential. This knowledge is then applied to mapping the system in great detail, localising the critical points for pitch deposits. Test samples are then taken and analysed to provide indications for product choice as well as dosage amounts and points.

Different analytical measuring tools, such as BIMPICS, POF-analysis, etc. can help analysing the pitch and choosing the correct dosing position and correct product.

Protecting the fibre for a uniform cooking

In a chemical pulp process all chips are not treated evenly, leading to an uneven cooking with following consequences:

- process variations and uneven quality
- higher alkali concentration needed to reach the target kappa
- increased bleaching chemical consumption due to a wider kappa variation
- higher reject amount due to undercooked chip centres
- decreased yield and pulp mechanical properties

The growing shortage and higher cost of raw materials for pulp production have increased the need to maximise yield during the pulping process. Several modifications to the pulping process have been attempted, such as extended modified continuous cooking and super batch cooking of all which require major capital investments and increase boiler recovery load. Chemical additives are less costly alternatives for a uniform cooking and as replacement of anthraquinone (AQ), since there is a growing concern over the impact of AQ on downstream operations such as evaporator fouling and tall oil production.

Figure 4: Conveyor screw covered with pitch- and talcum deposits.

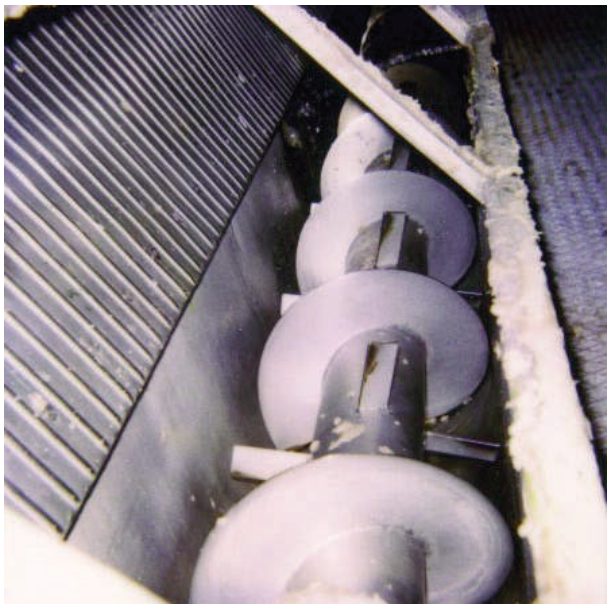


Figure 5: The same conveyor screw treated with pitch control agent.

Chemical additives reduces variations giving several benefits:

- Improved cooking liquor penetration into wood chips for more uniform cooking
- H-factor reduction (alkali / steam / time)
- Extractives load reduction and stabilisation
- Reject amount reduction, gives possibility to increase Kappa target
- Improved pulp physical properties
- Reduced evaporation load
- Yield increase
- Reduced bleaching chemicals consumption
- Improved BSW

To get real benefits and chemical cost payback from chemical additives, a thorough evaluation must be done by a chemical supplier. The dosage can take place in different positions depending on mill conditions and process parameters, amongst others impregnation/digester and the oxygen stage. The fibre protection and cooking aids applications can be combined with other pulp concepts for synergy effects, for example anti pitch agents and fixative to achieve talc-free production.

Inorganic scaling is a growing problem in the pulp industry

Scaling is a growing problem in the pulp and paper industry. There are many reasons for this; increased productivity, demands on higher yields, problems with raw material supply and not least closure of process water loops. Closure of the process water loops will result in an increasing concentration of non-process elements and lead to enhanced risks for precipitation and scaling of compounds with low solubility. This is a pervasive problem where the build-up of scale costs the industry in terms of equipment downtime, quality problems, reduced volume capacity and heat-transfer efficiency, lost production, de-scaling operations costs, and occupational health and safety.

Pulp production uses a high amount of water; roughly 20 – 40 m^3/produced ton. The tendency to reduce fresh water usage leads to higher concentration of salts and scaling problems. When liquor dries solids increase, the concentration of metals as iron, manganese, calcium, copper etc gets higher and higher, until their solubility is exceeded.

Scale, or more accurately inorganic scale, consists of precipitated metal salts. The most common scale in pulp mills is calcium carbonate, typical in heat exchanges, digester and evaporation plants. In acid stages calcium oxalate and barium sulphate are a common scale. The traditional tools for fighting scale are acid cleaning and high pressure water cleaning, two methods which have benefits but there are drawbacks as well. Today, there are much more effective and cost-efficient methods available to control the scale problem. When it comes to elimination of scaling, the most economical way usually is to use highly efficient cleaning methods combined with an effective scale inhibition strategy.

When a scale control programme is implemented, the whole system has to be included. Otherwise, in the modern pulp mills, there is a risk that the scale problem could me moved from one position to another. A comprehensive view of the system combined with knowledge about how the process works is necessary for an effective scale control programme.

Effective cleaning

"It's much easier to keep a clean surface clean than to prevent a dirty surface from getting dirtier". The main problem with mechanical or high pressure water cleaning, is that these methods don't really clean the metal surface, they only appear to. Scaling is a surface-controlled chemical reaction and the precipitating ions attached to crystals already on the metal surface. It is essential to clean the whole surface, even the microscopic crystal growth sites to prevent the new starting points for scaling. Efficient cleaning with a scale cleaning agent dissolves all the scale, even the crystals within the metal pores, and is the best possible start for a scale treatment programme.

Continuous scale inhibition

Two of the methods available which prevent the return of the scale problems are stoichiometric and sub-stoichiometric additives. Stoichiometric additives are basically chelating agents, e.g. EDTA or DTPA. They work very well, but the problem is that at least one chelating molecule per metal ion is needed. Large quantities are required.

Sub-stoichiometric additives work by a combination of different mechanisms, such as crystal distortion, threshold inhibition and dispersing. The scale inhibitor blocks the growth sites of the crystals, increasing the chemical reaction's activation energy. By understanding the scale forming mechanisms, it is possible for chemical supplier to produce and choose the best continuous scale inhibitor in each different situation.

An efficient scale control programme provides:

- Increased production capacity: deposits are avoided in the digesters, in the brown stock wash, in the bleach plant and in the evaporation plant.
- Reduced production loss and decrease energy cost
- Improved process control
- Quality benefits due to more even process control: more stable conditions in the digesters and in the bleach plant give pulp with more stable and better quality.
- Maintained heat exchange: deposits are avoided in heat exchangers and in evaporators.
- Increased runtime between stops.

Avoiding harmful metal reactions to spare fibre properties and reduce chemical consumption

Keeping control of metals and other cations, for example Mn, Fe, Cu and Ca will save a lot of problems and, in the end, money. These substances will cause scaling with decreased production and/or quality issues as a consequence. Especially iron manganese and copper will react with bleaching chemicals, such as hydrogen peroxide, and can destroy the bleaching sequence. By using sustainable solutions for metal chelating and sequestering, the amount of dosed EDTA and DTPA can be reduced or completely removed in cleaning and bleaching applications. This chemistry can also replace $MgSO_4$ in oxygen delignification and peroxide bleaching.

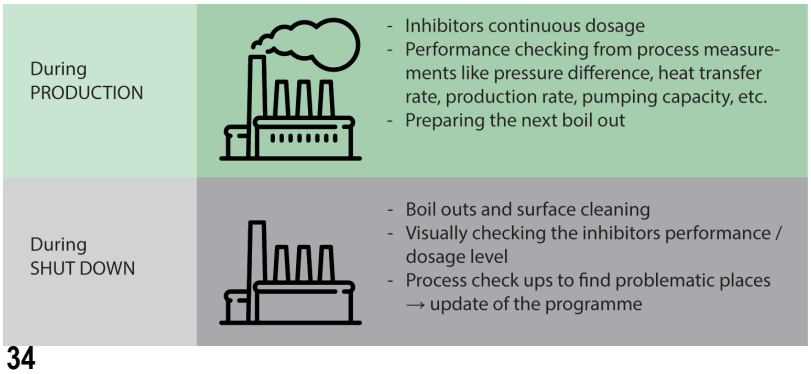


Figure 6: Head box with barium sulphate scale before cleaning.

Figure 7: Same headbox after successful cleaning, barium sulphate scale removed.

Tall oil and soap separation improvement

Resin- and fatty acid blend create problems in brown stock washing area and will increase defoamer and bleaching chemicals consumption. Therefore, it is important to separate soap in the right position and most optimal way. Critical factors for good soap separation are, amongst others

- Temperature
- Dry content
- Separation time and process construction
- Residual alkali
- Salt content

Even if all process parameters are optimised, some of the soap will still be dissolved in the black liquor. This will cause fouling in the evaporation area. By adding chemistry to the mixing liquor going into the separation tanks, the equilibrium will be changed and more soap will be subjected to separation. This will lower the risk for fouling and decrease the load on the recovery boiler. If there are no other bottle necks white liquor production can be increased significantly.

Working together for a more sustainable future

We all have a responsibility to commit to a positive and greener future and the pulp and paper industry has an opportunity to make a real impact. Together, pulp producers and chemical suppliers can contribute to make life on earth more sustainable, healthy and inspiring by focusing on creating more value from fewer resources and use the world's limited resources more efficiently.

In switching to a more sustainable pulp production, you should be able to expect close support and consultancy from application specialists at your chemical partner. This support should range from identifying the specialty chemical applications needed to process setup and optimisation.

At BIM, we are aware of the chemical industry's role in the history of modern eco-movement. We also have insight in the huge potential we as a supplier of chemicals within the pulp and paper industry have of being an enabler of a sustainable future, e.g. to enhance our customers' energy, water and fibre efficiency. We believe that our knowledge and experience should be used as a driving force in the continuous development within the pulp and paper industry. Our expertise is founded on a number of core competences and technologies, which lead to the development of green specialty chemical-based concepts, technology and service for the pulp and paper industry's products and processes.

By working in close cooperation, we believe that producers and chemical suppliers can play a central part in making every day-life more comfortable, healthy and inspiring. But it's not enough to merely talk about this aim; we must actively work to achieve it. And we must do it now.

CONCLUSION

BIM is a family-owned, entrepreneurial chemical company supplying the pulp- and paper industry since 1973. With a customer-focused research and product development, we develop innovative specialty chemical concepts designed to improve products and processes in a cost-effective and sustainable way. We focus on creating more value from fewer resources to use the world's limited resources more efficiently.

BIM provide services and concepts all over the world through a global network of experts, production units and R&D facilities. Our local operations include Sweden, Norway, Finland, England, Germany, Poland, Belgium, Czech Republic, Portugal, Spain, France, South Africa and dedicated agents and distributors in most other pulp and papermaking countries.

BIM in brief

Pulp and paper focus

Founded in 1973 by Peter Wållberg with approx. 220 employees worldwide

Certified according to ISO 9001 and ISO 14001

Member of the UN Global Compact

Gold rated by Ecovadis

Associated with the Responsible Care Program

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FiberLean MFC — A proven, sustainable path to new grades at low CapEx and cost savings

Martin Koepenick, Senior Marketing Strategist, Innova International Corporation

INTRODUCTION:

Your brown linerboard can become White Top without a rebuild. Or you can lightweight at equal strength. You have greater flexibility with virgin fiber, lower-quality recycled furnish, as well as minerals and other additives, With your own scalable MFC onsite module from FiberLean — and the know-how of applications specialists — you have a runway for innovations and a revolutionary cost-saving tool. Best of all, MFC, (micro-fibrillated cellulose,) is a natural, sustainable advantage with the same DNA as the fiber resources you already use.

Never has the paper and board making industry been more in the spotlight as a sustainable path to productive manufacturing, focusing on gaining the full potential from managed and urban forests and reducing waste through a well-established recycling infrastructure.

FiberLean® MFC (micro-fibrillated cellulose) products and know-how are ideal for accelerating raw material reduction and flexibility and opening the way for new grades. What makes FiberLean MFC onsite, scalable modules a game-changer is the ability to deliver ongoing savings and value-added gains for producers—providing proven economic and ecological advances onsite and with ease.

The portfolio of FiberLean products now includes pure MFC, MFC composites with minerals, and recovered fiber formulations. All FiberLean MFC offerings are easy to incorporate into your current practices at your mill location.

Figure 1: FiberLean MFC onsite scalable modules center around robust grinding technology. High-throughput continuous operation--Low maintenance costs and high uptime (>95% plant availability)--Chemical-free process--Highly-automated modular plant design with online monitoring.

Figure 2: Without a rebuild or coater installation, your brown linerboard can become White Top thanks to FiberLean FloT, diversifying your portfolio into white, printable box manufacturing markets.

Brown linerboard to first-class White Top with FiberLean on Top (FloT)

According to Enrico de Landerset, CEO of FiberLean Technologies, Ltd., “It’s not been possible to make White Top without a massive rebuild until the development of FiberLean on Top (FloT). Customers can break into markets with newly invented grades at lower cost, assuring higher profitability. Highly printable surfaces for digital printing is another benefit.”

In addition to the FloT for White Top and FloT Jet applicators at the wet end, FiberLean offers a wide range of surface ad barrier options not previously possible—all aimed at sustainability targets.

Not all MFC is equal

MFC commercial power is about mastery of cellulosic fibrils based on intense R & D and inventions—always building on nature. With more than 650 patents for FiberLean MFC and customers on three continents, scientists and application specialists have developed hundreds of recipes to help customers realize optimization gains and savings. It's important to note that robust, proprietary "grinding technology with finesse" provides consistently high performance.

Small footprint; massive results

Small enough to jog around in three minutes, onsite FiberLean MFC Modules at paper mills have fast payback.

Adds de Landerset, "Our MFC modules require little change in processes and are easily scalable. Depending on the mill's output, they typically feature two to five grinders, our core equipment capability."

As Danny Ingle, FiberLean COO, says, "More than simply offering products and equipment, our applications teams are a valuable deliverable. As a solutions provider, we realize the importance of having low-maintenance, flexible, and complete offerings. We help customers evolve, always focused on well-planned trials that lead to continuous improvement. We understand the challenges of adapting formulations to succeed on high-speed paper machines."

MFC products and know-how reduce chemicals, water, and energy consumption. Efficiency and creative developments happen partly because of close observation by applications experts on a real-time basis, both onsite and remotely. As for substitution, you can be more flexible with hardwood, softwood, and recycled fiber resources.

Continues Ingle, "You can reduce starch and reduce or eliminate man-made raw materials that are not environmentally friendly."

Growing with customers

Biomaterials are inherently about sustainable solutions. FiberLean scientists and applications specialists understand this value for industrial customers.

Concludes de Landerset, "Everything the FiberLean team invents is with a clear purpose, driven by customer needs."

Over the next five years, FiberLean projects business with 25-50 customers and EUR5-10 million in sales for each MFC module onsite. Complimentary channels, such as a merchant model, will also provide smaller quantities of FiberLean MFC from company facilities and potential joint ventures.

The FiberLean MFC, micro-fibrillated cellulose portfolio of products, MFC scalable modules, and applications know-how, all build on the networking concepts of nature—and inventive ingenuity, to create entirely new solutions for paper and boardmakers.

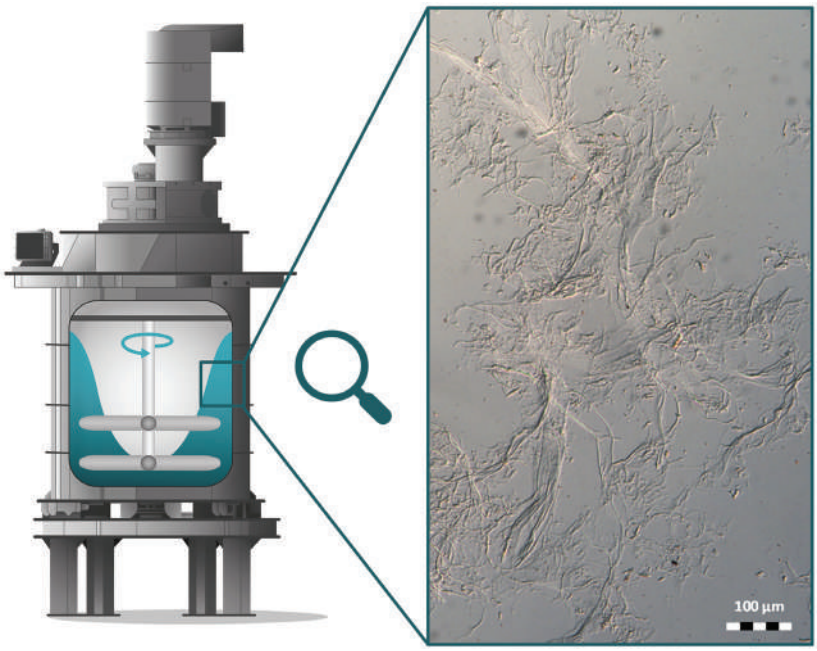

Figure 3: The unique FiberLean grinding process creates interconnecting fiber. Networks are highly fibrillated for strength and high performance.

"FiberLean MFC modules are easy to install and easy to run. Very quickly, they support equal or greater performance of existing grades and serve as a runway to create entirely new ones".

Figure 4: Proven across many paper and packaging grades, FiberLean MFC saves 20 to 80EUR/ton in raw material cost reductions and efficiency gains. FiberLean MFC formulations are also ideal for supporting new grade development.

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How to save energy up to 30–70% in paper machine vacuum system?

Anna-Riina Ahonen, Marketing Manager, Runtech Systems

INTRODUCTION:

Today, every mill is looking for ways to save energy – not only to cut down costs but also to reduce its carbon footprint. We at Runtech Systems are happy to share with you some tips how to do it.

Say yes to lower energy consumption and costs

Using vacuum in various paper machine positions is expensive. In fact, vacuum is one of the top three energy consumers in a paper mill. By using vacuum only in the most critical positions, you can fully benefit from a more efficient nip dewatering strategy and save energy. And by measuring the water flow online accurately enables you to optimize vacuum levels and not overdo them.

Heat recovery provides another excellent way to save energy. Using recovered heat instead of primary energy sources, for example, to warm up shower waters or dryer hoods allows you to expect major cost savings.

By optimizing your papermaking process, you can save energy up to 30-70% in vacuum system as well as improve runnability and paper quality.

Ensure optimal operation of your vacuum system

There is vast potential for energy savings in vacuum systems, as many paper machines suffer from poor energy efficiency. Some machines would benefit from a complete system rebuild. But in other cases, the required modifications can be relatively small compared to the savings gained. One often overlooked factor lowering efficiency can be the lack of maintenance.

The benefits of regular and correctly timed vacuum system maintenance are obvious. When properly maintained, the operational efficiency of the vacuum system is kept at an optimum level, and unexpected shutdowns are avoided. It is important to also service the auxiliary equipment.

The cost of energy used by a vacuum system over its lifetime exceeds its purchase price many times over. This means that working at the optimum settings of a vacuum system is one of the most important economic factors in mill operation. If left untouched over long periods, the availability and efficiency of a system will decrease, and operating costs will inevitably increase.

By maintaining your vacuum system, you can keep efficiency at an optimal level and secure the stable operation of your papermaking line.

Switch to an EP Turbo Blower

Did you know that the EP Turbo Blower is at least 15-30% more efficient than a new liquid ring pump (LRP)? And as a LRP wears down, this difference grows. In typical rebuild projects, 40-60% energy savings have been achieved.

Process optimization and lower energy consumption start with the EP Turbo Blower. This completely water-free vacuum solution offers significant heat recovery potential for paper, board and tissue machines. Mills have reported that vacuum system optimization with variable speed and capacity turbo blowers have saved them up to 2,000 kW.

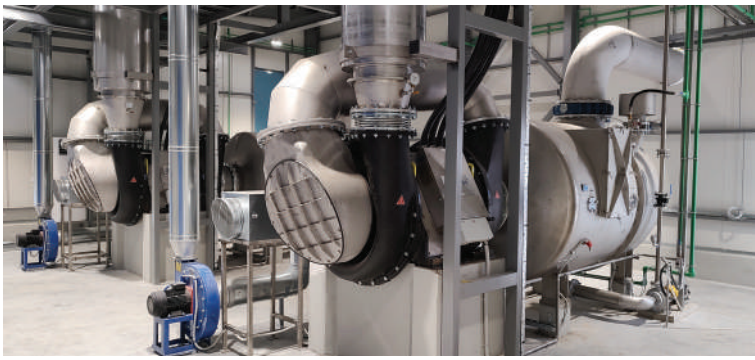

Figure 1: RunEco EP Turbo Blowers are modern blowers with integrated high-speed motor controlled by a frequency converter: rotation speed and vacuum level can be adjusted according to the process requirements.

A typical Runtech RunEco vacuum system consists of several smaller size turbo blowers giving clear design and operational advantages over the competition. In addition, as the only company in the world we also offer liquid ring pump technology to form a combination of both technologies – a hybrid system. With this portfolio, we can always find a perfect fit for our customers' demands, needs and budget.

Quite often a situation has been observed where a single, or a few low air flow consumers (devices) are operating at high vacuum levels, such as a high vac box or a press suction roll high vacuum zone, while the rest use a considerably lower vacuum level. This leads to a situation where the most economical option is to continue the use of the existing LRP. Fully rebuilding a system with blower technology is not always the most efficient solution, especially if this means that different vacuum levels need to be combined in one blower. It is proven that a well maintained LRP operating at low speed to produce high vacuum level can perform at a good efficiency level outperforming systems where a large single blower experiences considerable expansion losses.

For example (see picture 2), a paper machine often has multiple vacuum consumers and vacuum levels. By combining all these together to a single large unit you inherently introduce losses and lower your system's efficiency. As is evident in this case, only one consumer can operate at the blower vacuum and all the others need throttling control that lead to significant energy losses. In addition, as air is a compressible medium which changes volume significantly with the surrounding pressure, a single large unit will experience expansion losses.

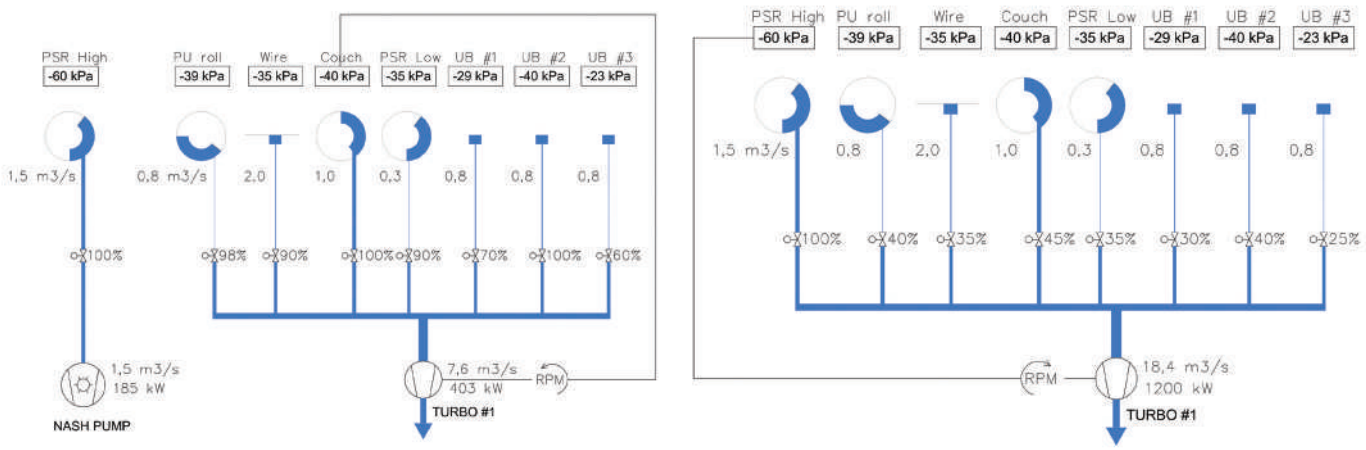

Figure 2a & 2b: Combining all vacuum consumers with different vacuum levels to one unit can destroy system efficiency due to expansion/throttling losses.

Old system	kW	New system	kW	Savings
LRP x 9		LRP x 1		
		EP400-700-D1		
		EP500-700-S x 2		
Total	2,150	Total	1,150	**1000 kW**
				47%

Old system	kW	New system	kW	Savings
LRP x 14		LRP x 1		
Blower		EP600-T1		
		EP600-HF1		
Total	2,150	Total	700-800	**≥ 1,350 kW**
				≥ 67%

Figure 3a & 3b: In these rebuild cases, existing liquid ring pump or pumps are compared to a hybrid system to find an optimal balance between investment and operating costs. A containerboard machine achieved even higher energy savings than expected. The start-up was very smooth and provided instant savings with a flexible vacuum system that provided good vacuum control to the mill. In addition, water savings were significant. On a fine paper machine, eight liquid ring pumps were replaced with three EP Turbo Blowers, and an LRP remained to provide vacuum for high vacuum consumers. The rebuild provided energy savings of 1,000 kW, dropping the specific energy consumption to 24 kWh/t, with Turbo Blower exhaust air also saving one ton of steam per hour. In addition, a cooling water tower was stopped, bringing the mill substantial water savings.

The airflow from a lower vacuum level (higher abs. p) expands over the valve to a higher vacuum level (lower abs. p) at the blower/header and thus the actual airflow seen by the equipment can be doubled or even tripled. An often seen vacuum level difference of e.g. 20 kPa (-60 kPa vs. -40 kPa) between two consumers at the machine can lead to a 100% increase in the air volume through expansion and thus naturally lead to a large increase in the blower's energy consumption.

To improve efficiency, vacuum connections, vacuum levels and system operation need to be surveyed thoroughly for each case. Based on customer needs and targets, as well investment payback, in some cases, given the results of this audit, the decision to go forward with a hybrid vacuum system gives the biggest bang for the buck.

However, to save energy maximally up to 30-70% takes more than just switching over from LRP's to turbo blowers. You need other optimization measures, too. Read on to find out what they are.

Measure water flow to optimize vacuum levels

To save energy, it is essential to use the optimal vacuum level in the forming and press sections. Often paper mills use too high vacuum levels because they do not know the accurate water flow.

The primary function of a wire- and press section in a paper machine is to remove water from the paper sheet. In order to understand the effectiveness of individual elements (such as save-all pans and suction boxes) of a wire- and press section, the dewatering rate must be measured. Without this, critical air flow (i.e. vacuum level) review and consequent optimization cannot be successfully carried out. Water removed from the paper sheet contains air, and is often subject to foaming. Traditional magnetic liquid flow meters demand a homogenous flow and will not be able to provide accurate data. Runtech's Ecoflow dewatering meters are designed to measure water flow across a mechanical restriction and are not sensitive to entrained air or foaming. These devices are used both under vacuum (in a separator drop leg) and in atmospheric conditions.

EcoFlow dewatering measurement system optimizes dewatering and vacuum levels in the forming and press sections. EcoFlow provides maximized sheet dryness after the press section, improved machine runnability and maximum energy efficiency, while providing papermakers with accurate real-time feedback about the dewatering performance along the paper machine.

Go for nip dewatering

EcoFlows are designed to work with doctoring to gain maximum energy efficiency. Dewatering and doctoring are not only related to energy consumption, but they also have big effect on whole machine runnability, efficiency and profitability, as well as the paper profiles. A well-designed and operated dewatering and doctoring system is one of the key issues to a well-performing and energy-efficient machine. A lot a paper machines have them but they are not effective and do not have the adjustability that is needed to optimize them effectively. In order to get the full benefits from

increased dewatering, an online dewatering monitoring, efficient water discharge and rewet prevention are necessary. Runtech Ecoflow, save-alls and double doctors can perfectly match these needs.

There are some additional ways to ensure optimal vacuum levels and thus save energy. By using nip dewatering instead of uhle box dewatering, you get better profiles and improve dewatering without vacuum.

Here are some things to pay attention to:

- Felt moisture ratio has to be high enough.
- You need to have right type of felts.
- Roll covers need to have grooves instead of blind drillings.
- Well-functioning save-alls and doctors are a must to prevent rewetting. A doctor rebuild can reduce the need for vacuum by up to 50%.
- AirBlades are suitable for lower machine speeds.

Optimized doctoring and dewatering improve process performance and dryness after press, lowering the need for steam (1% dryness means 4% steam savings). This, in turn, results in electrical and steam energy savings.

Recover and reuse exhaust heat

The EP Turbo blower produces approximately from 5 to 20 m^3 of exhaust heat per second. By recovering this 100–180°C heat, you will be able to lower steam consumption at your paper machine. Recovered exhaust heat can be used, for example, to warm up shower waters or dryer hoods.

Since steam is one of the most expensive components in papermaking, heat recovery will lead to significant cost savings. Reusing exhaust heat boosts sustainability, too. Replacing primary energy sources by heat recovery reduces your carbon footprint as in many places steam is produced by combusting fossil fuels that cause CO_2 emissions.

Figure 4: EcoFlow is the only reliable and accurate online dewatering measurement system for water that contains lot of air. When you measure the water flow accurately, you can adjust the vacuum optimally and reach high energy efficiency.

Figure 5: A well-designed and operated dewatering and doctoring system is one of the key issues to a well-performing and energy-efficient machine.

Figure 6: Heat recovery, as an important part of the RunEco solution, cuts down papermaking energy costs radically because the system reuses heat to replace primary energy sources.

Take a look at these energy savings

- Uhle box vacuum: 15 kW/meter
- Drive power (uhle box friction): 7 kW/meter
- Increase in dryness (after press) 1-2% equals to 4-8% less steam
- At least 25%, typically 40- 60% electrical savings compared to LRP system
- Heat recovery energy savings rate: 80-200% of turbo system total power demand
- Water and cooling tower cost savings: 100,000 EUR/ year
- Easy and fast maintenance of turbo blowers. Bearing exchange during felt change (8h). All maintenance can be done on site.

On average 2MW LRP system produces 3,500 tons of CO2 annually. With Runtech turbo rebuild you will also save 30-70% of these emissions.

Discover the potential of your machine

Vacuum demand varies for different paper grades, felts and machine speeds, therefore, a tailor-made solution with flexible and variable capacity can balance the supply and demand, resulting in optimized dewatering and minimized power consumption. Vacuum levels are measured at the vacuum pumps and blowers to identify problem areas. The dewatering elements such as flat boxes, save-all pans and uhle boxes are reviewed. Specialists study pressure and bleed losses to analyze the energy consumption and evaluate if the vacuum levels are too high.

With the experience of thousands of audits and dewatering studies at paper mills, we are able to benchmark the effectiveness of existing vacuum systems, dewatering equipment, suction elements, fabrics and felts.

Today, over 950 Turbo Blowers have been sold globally. This experience and expertise allows us to work with our customers, help them get the most out of their papermaking process and vacuum systems – and ensure they achieve both their operational and process goals.

Engineered Solutions for Pulp and Paper Industry

Offering the industry's most comprehensive equipment portfolio for paper machine dewatering and vacuum systems, coupled with our extensive papermaking know-how, Ingersoll Rand businesses Runtech and Nash provide optimal solutions for all paper mills, from service and rebuilds to completely new papermaking lines.

Runtech's offering includes save-alls, doctoring, forming and dryer section cleaning systems. Our EcoFlow dewatering measurement system significantly improves dewatering, doctoring and cleaning processes, enabling increased dryness after the press section. Runtech also offers runnability optimization as well as ropeless tail threading.

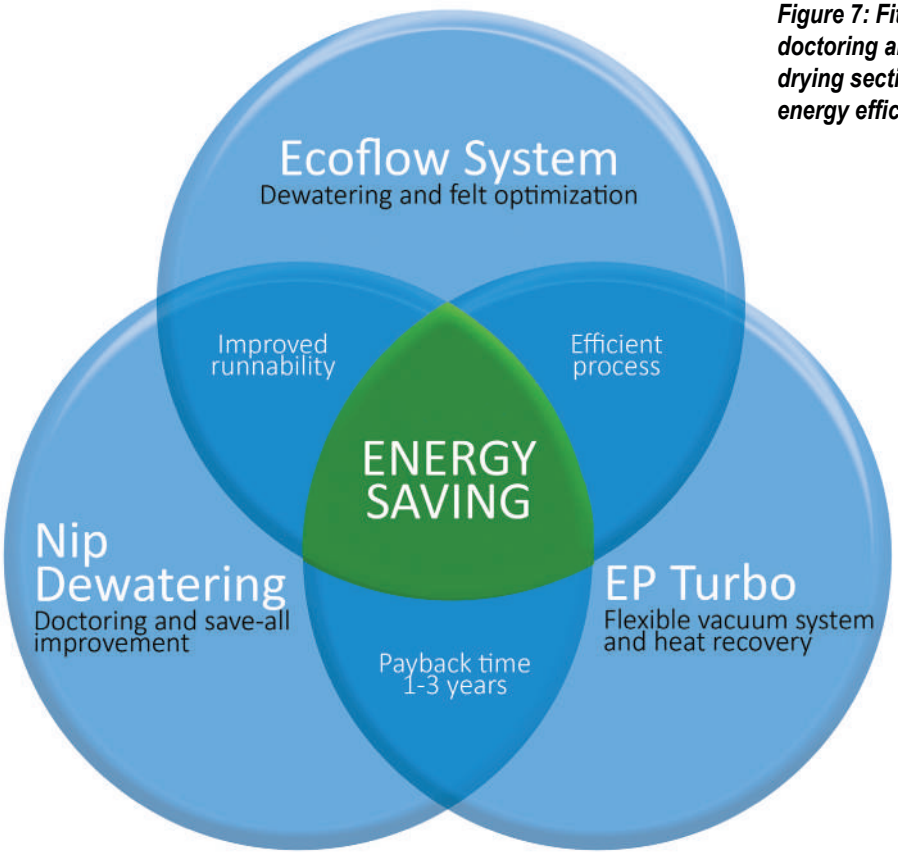

Figure 7: Fit-for-purpose vacuum system and efficient doctoring and dewatering solutions for forming and drying sections are the fundamental base for the good energy efficiency and low cost paper production.

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Ackumen™ MCA-i™ – The safer, smarter monochloramine offering

Ryan Eberhardt – Platform Launch Specialist, Buckman
Edita Garlaite – Global Market Manager, Packaging, Buckman
Paul Quinn – MCA Global Brand Manager (Retired), Buckman
Janet Woodward – Senior Technical Consultant, Global MCA, Buckman

INTRODUCTION:

From super cruise control that allows hands-free driving of a vehicle to smart watches that tell us how much sleep we get, monitor our health statistics and track our exercise, we are becoming more connected every day. So is chemistry! With this evolution Buckman is stepping up the mill visibility of our monochloramine chemical systems with cloud connection and actionable insights responding to the ever-changing mill processes.

Monochloramine Overview

Monochloramines (MCA) are formed in situ by mixing the monochloramine precursor (MCAP) with industrial grade sodium hypochlorite in water. The general chemical equation is:

$$NH_3 + NaOCl \rightarrow NH_2Cl + NaOH$$

This reaction must occur at the proper pH (>7) and at the proper molar ratio of MCAP to sodium hypochlorite. If the sodium hypochlorite is overfed, the reaction is pushed to the formation of dichloramines.

$$NaOCl + NH_2Cl \rightarrow NHCl_2 + NaOH$$

Monochloramines are considered weak oxidizers when compared to the other oxidizers used in the paper manufacturing process such as chlorine dioxide, hypochlorous acid, hypobromous acid, and peracetic acid. Because they are considered to be a "combined" form of chlorine, monochloramines react to a much less degree or not at all with other wet-end additives such as dyes, optical brighteners, starch, retention aids, and sizing agents. They are highly specific to the microbial contamination in a process. Because of these attributes, MCA chemistry has become one of the major oxidant biocides used in the paper industry.

Taking Your MCA Program to the Next Level

Reducing freshwater usage, increased use of and rising contamination in recycled furnish and greater reliance on anaerobic digesters for effluent treatment can mean adding more chemistries to supplement final product specifications and effluent efficiency. This can lead to increased process variability, unscheduled shutdowns, lower quality product and additional costs. In response to these challenges, Buckman offers a new monochloramine program called Ackumen™ MCA-i™, a breakthrough chemical-digital solution that uses artificial intelligence with actionable insights that automatically and promptly stabilize your process.

MCA-i™ combines Buckman's best-in-class monochloramine chemistry with state-of-the-art sensing technology, cloud-based data analytics, 24/7 expert monitoring and analysis, and accurate predictive modeling to take the work – and the guesswork – out of you managing your paper machine microbicide programs and their impact on your effluent system. One significant feature of the MCA-i unit is a hypochlorite sensor which measures the activity of the sodium hypochlorite. It is well known that sodium hypochlorite's stability is greatly impacted by storage temperature, storage time and exposure to sunlight. As noted above, to produce a stable MCA molecule, the sodium hypochlorite and MCAP must be mixed in water at a precise molar ratio. The hypo sensor measures the sodium hypochlorite concentration continuously, adjusting the sodium hypochlorite flow rate to maintain that precise molar ratio.

MCA-i is Buckman's newest MCA generator that utilizes data to produce actionable insights. It is capable of monitoring multiple sensor data, combining them with mill process data to automatically adjust your treatment program. Your microbiological control program is pro-actively managed. The generator adds significant safety features, including Buckman's patented reaction temperature technology. Its improvements in automation and technology allow usage reductions of not only the microbial control chemistries; you will also benefit from better system/process performance, leading to significant savings in functional chemistry, improved machine runnability and improved final product quality. As mill personnel, you can view key operational parameters of the unit and Key Performance Indicators (KPIs) from your computer or smart phone.

To prevent disruptions to your process, the MCA-i unit will alert the Buckman representative of routine maintenance and potential problems with the unit or the treatment program. The unit can "learn" to change dosage rates as your process experiences changes or system upsets, such as high freshwater usage at start-up or increased broke usage after a break. This learned insight can lead to better control and chemical cost savings to you.

MCA-i connects to the cloud and allows Buckman's Remote Services Innovation (RSI) lab and global subject matter experts to remotely monitor the unit and hundreds of process parameters – nearly 1000 data points – and notifies the Buckman representative of significant changes to mill processes, such as increased biocide demand. It works with edge computing and cloud storage to securely collect and store data, which can then be used to develop historical patterns. This allows the quick detection of process anomalies. Benchmarking data with context can be used to help you plan continuous improvement projects or your new machine/mill. Critical to achieving the best-in-class performance is linking the "what, where, when and how".

Case History

MCA-i technology has allowed for significant performance increases. Recently, MCA-i was benchmarked against Buckman's previous generation MCA equipment on a paper machine in North America.

Phase 1 - Trial

Phase 1 of this evaluation was to compare the performance of MCA-i with the older generator, a Gen 4. In order to accomplish this, application points and dosing strategies were not changed during this phase. A primary goal was to maintain a similar MCA residual at the headbox while maintaining KPIs such as machine runnability. Manual testing included both total chlorine and MCA residuals and adenosine triphosphate (ATP) analysis to measure microbial contamination. Data collected via digital platforms (Buckman OnSite® for the Gen 4 and Ackumen™ for MCA-i) included application flow rates, pump flow rates from water, MCAP and sodium hypochlorite, and pH. The hypochlorite concentration was also monitored by the MCA-i unit.

Results of Phase 1 are shown in Figures 1-2 and summarized in Table 1. With MCA-i, slightly higher headbox MCA residuals (13.3%) were easily maintained (Figure 1) while a reduction in both the MCAP (12.0%) and sodium hypochlorite (14.7%) chemical usages was achieved (Figure 2). With regards to controlling microbial activity, headbox ATP remained well below the customer's upper limit of 500 relative light units (rlu) (Figure 3). The outliers (above 100 rlu) occurred after an unscheduled down and correlate to lower headbox MCA residuals (Figure 1) during the same time period.

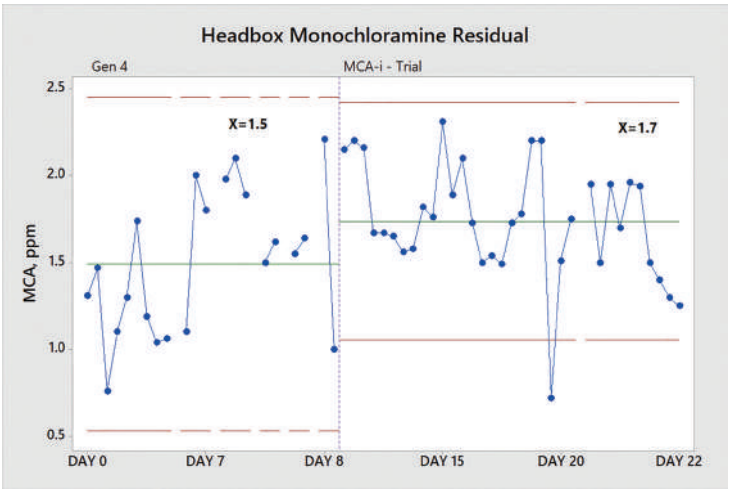
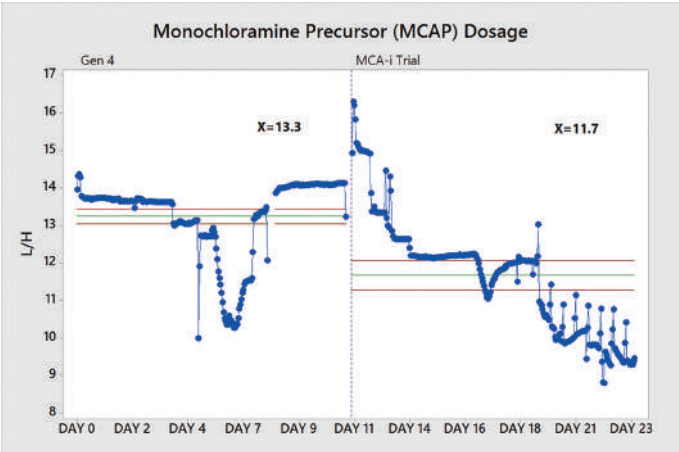


Figure 1: Phase 1 Trial Evaluation of Headbox MCA Residual. When comparing the performance of MCA-i with the Gen 4, slightly higher MCA residuals (13.3%) were achieved.

Table 1. Summary of key findings from Phase 1 Trial Evaluation

	Gen 4	MCA-i	Difference	% Change
Headbox MCA Residual (ppm)	1.5	1.7	+0.20	13.3
MCAP Flow Rate, LPH	13.3	11.7	-1.6	-12.0
Sodium Hypochlorite Flow Rate, LPH	33.4	28.5	-4.9	-14.7



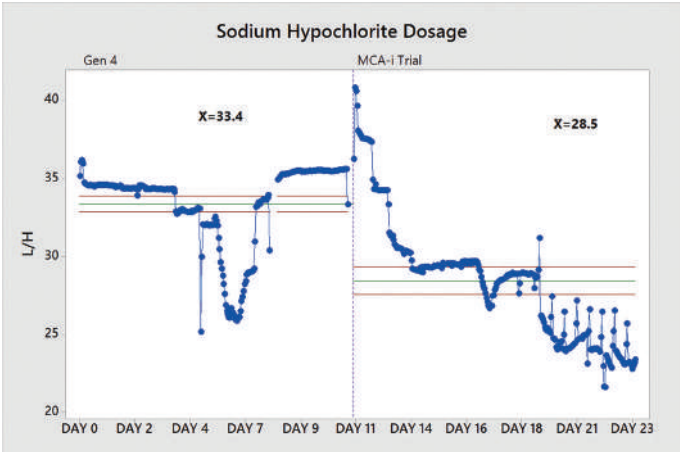
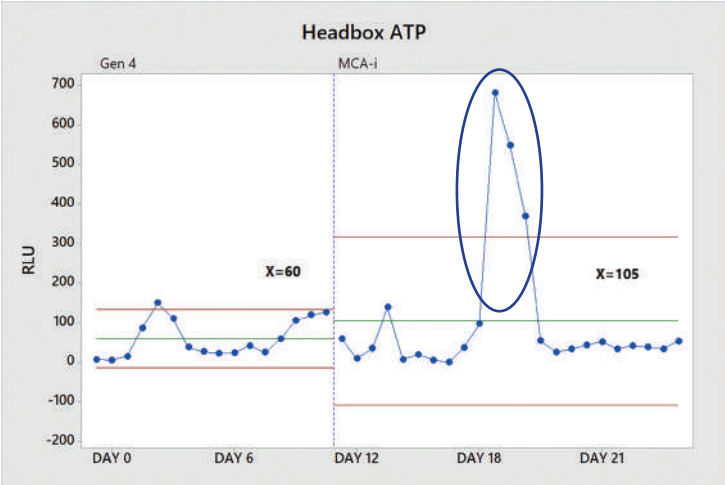


Figure 2: Phase 1 Trial Evaluation of MCAP and Sodium Hypochlorite Dosage Rates. For the MCA-i trial, both chemical flow rates were reduced while maintaining a slightly higher headbox MCA residual (Figure 1) as compared with the Gen 4.



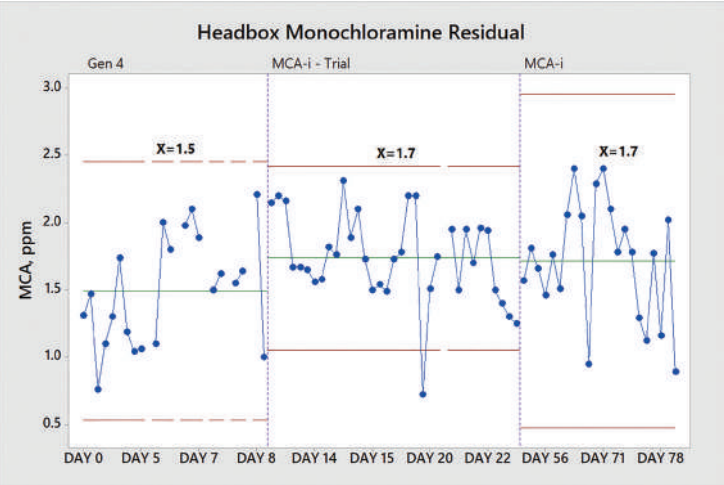
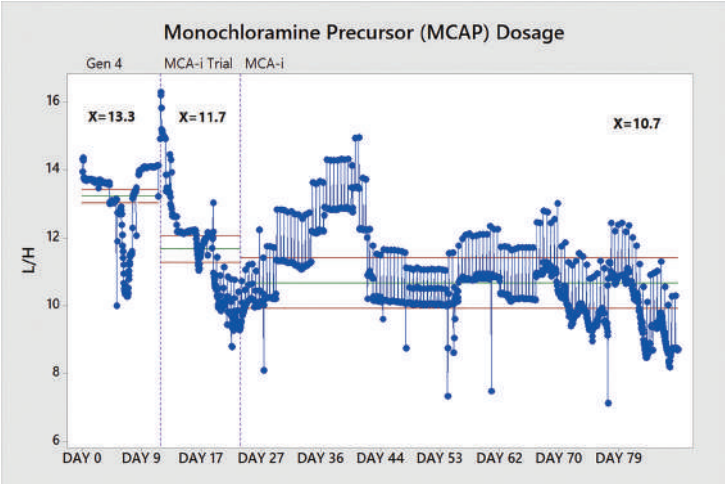


Figure 3: Phase 1 Trial Evaluation of Microbial Control via ATP Analysis. With the Gen 4 unit, ATP numbers were well below the customer's upper limit of 500 rlu. MCA-i produced similar results. The three outliers (encircled) occurred after an unplanned down and correlate to slightly lower MCA headbox residuals during the same time period (Figure 1).

Figure 4: Phase 2 Trial Conversion Evaluation of Headbox MCA Residual. The headbox residuals were maintained during the conversion.



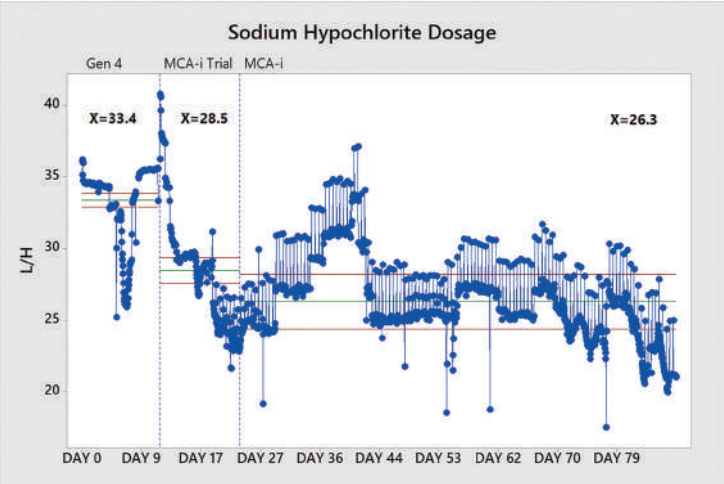


Figure 5: Phase 2 Trial Conversion Evaluation of MCAP and Sodium Hypochlorite Dosage Rates. Both chemical dosage rates were reduced further while the MCA headbox residuals noted in the trial phase were maintained (Figure 4).

Phase 2 – Trial Conversion

For phase 2, the biocide program was further optimized utilizing MCA-i's features. Results are shown above in Figures 3-4. The MCA headbox residuals were maintained at 1.7 ppm (Figure 4) while the flow rates of both MCAP and sodium hypochlorite were further reduced (Figure 5).

The speed of response with MCA-i provided a more consistent biocide dosing, less variation in monochloramine residual and reduced variability throughout the process, resulting in a higher level of efficacy and a reduction in chemical usage. Features of the MCA-i unit that contributed to these results include the hypochlorite sensor and the use of PID (proportional–integral–derivative) flow control valves. In the past, the sodium hypochlorite activity was tested manually and then the MCAP : sodium hypochlorite molar ratio was also adjusted manually. Because the sodium hypochlorite activity was monitored continuously, MCA-i was able to automatically adjust the MCAP : sodium hypochlorite ratio to the proper molar ratio. Figure 6 shows an example of the change in sodium hypochlorite activity over a 24-hour period. As a new delivery was transferred to the run tank, the sodium hypochlorite concentration increased from 8.5% to 12.5%. MCA-i automatically adjusted the chemical ratios to continue to produce a stable MCA solution. This ensured that the sodium hypochlorite was not being overfed, which would have led to the formation of dichloramines. The addition of PID flow control valves eliminated drifts which can occur with the use of manual flow valves. A comparison of the water booster pump variation over a 12-hour period between the Gen 4 unit and MCA-i is shown in Figure 7. With the PID flow control valves in MCA-i, the flow variation was reduced by 75%. This translates to having the right amount of MCA chemistry in the process at the right time.

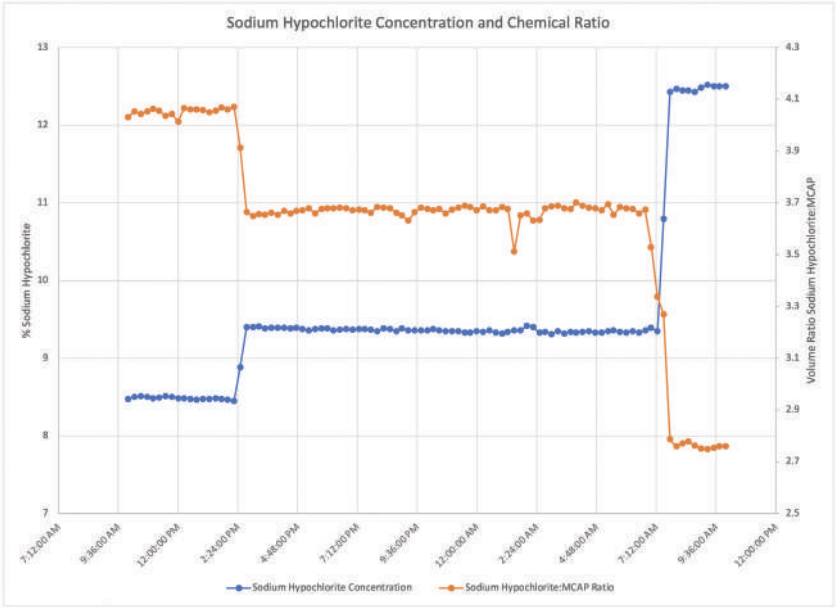


Figure 6: Phase 2 Trial Conversion Evaluation of Hypochlorite Sensor. The sodium hypochlorite activity over a 24-hour period is shown. As a new delivery was transferred to the run tank, the concentration increased from 8.5% to 12.5% and the MCA-i unit automatically adjusted the MCAP : sodium hypochlorite ratio to maintain a stable MCA solution.

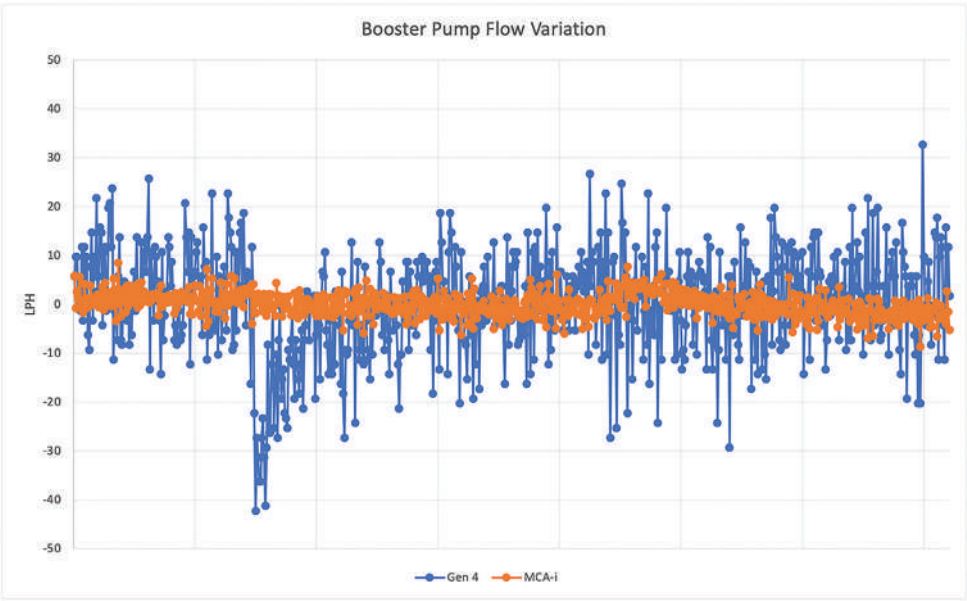


Figure 6: Phase 2 Trial Conversion Evaluation of the PID Flow Control Valves. The water booster pump variation over a 12-hour period was compared between the Gen 4 unit and MCA-i. The flow variation was reduced by 75% due to the use of the PID flow control valves in MCA-i.

Phase 3- Continued Optimization

The next phase in optimizing the customer's biocide program is utilizing the variety of control modes that MCA-i offers. One step is to combine the machine production data with a total chlorine probe at the headbox for tighter control of the program. This and other control modes will continue to ensure that the right amount of chemistry is used at the right time.

CONCLUSION

The Gen 4 dosing unit at this customer site produced a good, stable MCA solution that provided more than adequate biological control to the process. To take this MCA program to the next level, Buckman was allowed to trial MCA-i. Data from the initial trial and conversion to MCA-i have shown that the MCA residuals were maintained and thus biological control maintained while both the MCAP and sodium hypochlorite dosage rates were reduced. Several of the key features of MCA-i, e.g., hypochlorite sensor for chemical ratio control and PID control flow, provided the customer with significant chemical savings.

VALMET
ADVERT

OraCrepe™ Next: next-generation creping

Sara Giunchi, Communications & Marketing, Oradoc

INTRODUCTION:

In order for 'flexibility' to be synonymous with 'reliability' it is necessary that a Yankee doctoring system fully meets the needs of the production process, which, by its very nature, is influenced by a series of variable parameters.

High product quality and production variability (always taking into account the different process conditions) are the peculiar characteristics of the modern tissue market, which requires high-level performing machines.

The choice between a rigid or flexible doctoring system, therefore, is carefully considered on the basis of the characteristics of the machine and the type of production (production speed, paper width, paper weight) and it is not necessarily definitive.

That's what the Oradoc and WEPA case history is all about: a change of strategy that led to a tangible improvement in production level, as well as leading to the development of a new product now available in the range of doctoring solutions provided by Oradoc.

With hundreds of flexible Yankee blade holders (branded as "OraCrepe™") installed all over the world, Oradoc can certainly boast a consolidated experience both in terms of highly customized design and assistance during installation and maintenance.

But what makes a company competitive in the market and in line with the times is its ability to keep pace with customers' production needs, welcoming their requests just to turn them into solutions that are innovative from a technological point of view as well as reliable and performing.

This is how OraCrepe™ becomes OraCrepe™ Next.

Maurizio Tomei, Sales & Customer Service Manager of Oradoc, summarizes the genesis of this venture as follows: "The project was born from the combination of two main aspects: from one side the will of Oradoc R&D department to develop a new flexible doctoring system for the Yankee cylinder, on the other side the need of Fosso Ralletta WEPA plant to replace the existing PM16 creping system - a rigid and obsolete solution - with a flexible Oradoc one."

"We had already adopted standard OraCrepe™ flexible solution in 2005 on PM17 - explains Stefano Chiocca, Production Manager at Fosso Ralletta plant - and we had been able to obtain significant improvements in the production process. We know and we have appreciated Oradoc expertise for many years, as Oradoc doctoring systems are installed in our factories both in Italy and abroad".

Figure 1: OraCrepe Next.

"PM16 is a double wire machine that can produce premium quality toilet paper. Two years ago we decided to change the set-up of the machine for production needs, so that's the reason why we decided to replace the old rigid doctor with a new flexible one, as we already did on PM17" explains Saverio Grimaldi, Production Manager at Fosso Ralletta plant.

The devised technical solution stems from the consolidated experience that Oradoc has gained over the years on OraCrepe™ blade holders for the Yankee area, adding however some technical improvements aimed at increasing and optimizing the system in terms of performance, reliability and maintainability.

"The R&D project had as its starting point the technical characteristic that distinguishes the flexible blade holder: self-profiling, i.e. the ability to automatically adapt its shape and that of the blade to the Yankee crown profile - underlines Andrea Orlandini, Oradoc Operations Manager - With this in mind, the design of the blade holder and the various components were also reconsidered, with the aim of increasing their performance both in terms of operation and maintenance. "

"An innovative, independent system for controlling the blade load on the edges, a compact and robust design and a different pressure system complete the new flexible OraCrepe™ Next blade holder" explains Lorenzo Romei, Oradoc project engineer, who followed this product from the start "We highlighted the OraCrepe™ features that could be improved. As a result, the new blade holder design is more stiff and compact, and its independent elements allow for easier maintenance. The new pressure kit features high-quality hose and sleeve spark-proof material, while the new hose support enables easier replacement and consequent reduction in shutdown time."

To assess the performance of the new OraCrepe™ Next, WEPA also decided to install the OraTec™ FX-20 system to monitor the creping process in a continuous way, with sensors integrated inside the doctor beam, a solution already adopted in other plants of the group.

"Two years after installation, we can certainly say that OraCrepe™ Next has proven to live up to our expectations, solving some problems of paper passage and difficult maintenance that we encountered with the previous rigid system" underlines Stefano Chiocca "No start-up problems and great reliability in following tests, easier ordinary maintenance and excellent quality of the finished product…..we are very satisfied".

The very strict validation process identified 5 KPIs, which were constantly monitored over time: blade load, blade lifetime, softness grade, coating and fibres' build-up issue, all of which improved significantly or disappeared, as in the case of fibres' build-up.

"In projects of this level it is important to be able to collaborate with the right partner to build a business you can be proud of. We had the opportunity to share this project with WEPA, who agreed to host the pilot installation of OraCrepe™ Next in their Fosso Ralletta plant. A special thanks goes to WEPA Italy and to all the technical team that was involved in this project "concludes Tomei.

"No start-up problems and great reliability in following tests, easier ordinary maintenance and excellent quality of the finished product… we are very satisfied".

Figure 2: Overview of OraCrepe Next installation.

A defect is more than just bits and bytes

How camera inspection systems have become indispensable for quality control and efficiency

Christian Eikmeyer, Product Manager Business Unit Paper, ISRA VISION

INTRODUCTION:

In paper and tissue production, web breaks and substrate defects present significant challenges in all types of paper or tissue machines, converting and layering operations. Reducing breaks and surface defects is an important objective, given the increasing speed and operating complexities of present production environments.

Therefore, using cameras inside paper machines is nothing new. For decades, they were used for plain and isolated defect detection. However, machine vision is no longer isolated but has evolved to be an ecosystem. As technology evolves, the amount of information available grows and grows. What sets a good system apart these days is what the ecosystem around the cameras does with the huge amount of data they can collect and how you communicate with other downstream or upstream processes. The right information to improve operations is what's important and what makes machine vision indispensable to papermakers.

ISRA's systems allow a mill to handle data, correlate data by using ISRA´s Paper Quality Management System and interface between ISRA's systems and the mill's quality control system. Another benefit is the potential to make predictive maintenance based on what data is collected and what can happen next.

It´s all about grading and classification

Everything today is about grading and detecting defects as soon as possible. ISRA's inspection system cameras can achieve a resolution of 0.25 mm on a 2,000-m/min machine. Thus, the systems can pick up the tiniest of defects not visible to the naked eye.

The degradation of the secondary fiber quality has led to decreased yield and quality which you can see in the increase in the number of defects, for example, dirt count

A web inspection system will help determine the quality. But communicating that information to the producer requires a good defect classification system. It´s key to define the nature of the defect: streak, impurities, oil drops. Defects are automatically classified according to the papermaker's specifications and,

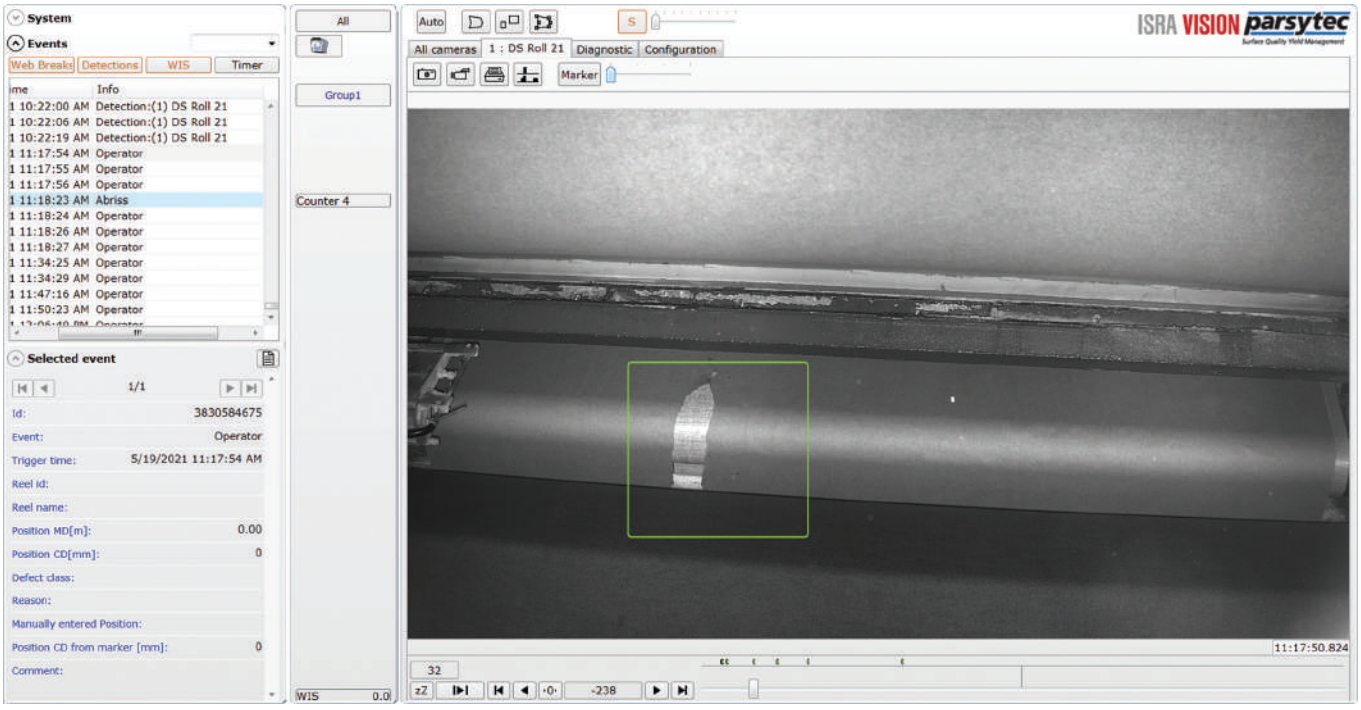


Figure 1a: The Web Break Monitoring detected a defect that will lead to a web break.

depending on the defect type, size or frequency, actions can be initiated if desired. For example, defects at the edge of the web are evaluated differently, as they are more critical, than defects in the middle of the web. This reliable classification of all defects found by the web inspection system is mandatory not only to deliver surface quality information but as well to gain information concerning the production process stability.

In the past and even in the present in rudimentary Inspection Systems, the Classification is only based on decision rules also known as rule-based classification or box classification. With this approach, the user defines the rules for classification manually.

The next level is called image-based classification method-today's standard for most classification approaches used in modern web inspection systems. Here, the user does not need to define rules any more, but is defining defect classes and teaching those classes with defect samples. The classifier would then define a feature set for the classification which would distinguish the defects in the best way.

With the growing demand regarding surface quality, more data is needed to find process relevant defects. This makes the classification more complex, time consuming and error prone needing more advanced classification methods.

Therefore, ISRA is now providing an AI-based classification approach based on deep-learning and multi-layer neural networks, making classification more reliable and less time consuming for the user. The Inspection system does recognize different defects completely on its own, without any defect training or rule generation by a user. ISRA´s system defines defect classes based on the defect appearance. The only work left is naming the defect classes. Even if the detection run is still extracting features, the classification system uses optimized multi-parallel layer neural networks to distinguish defects and asign them to groups (classes). Processing resources to define the right set of selected features to distinguish classes from each other are now allocated to the AI algorithms. This way the classification of defects is much more precise; reliable and quicker.

Benefits to the production line

PAPER MASTER 4.0 - ISRA's latest iteration of the inspection management platform – is the first browser-based platform for surface analysis to access the data of the ISRA system from anywhere, whether it be directly at the production line, in a meeting room, or on the road, by simply using mobile devices such as a tablets or smartphones.

Another new feature is sync code marking based on laser technology. This mark, done on the paper machine, can be detected on the winder, which then specifies the position in the web. For example, if there is an edge crack or other defect, the laser mark coding tells the winder control to slow down to avoid a web break. If a reel is going from a rewinder to a coater, it can be stopped; the defect patched and then sent on to the coater. Today, about 25 installations with the laser marking technology benefit from the technology where defects can be assigned by location on the sheet in the next production stage, regardless of paper losses incurred in the process.

With the Reel Release module ISRA also offers a solution for winders that can give an exact quality report for each roll cut. This setup can also tie in other data to ISRA´s software (e.g., moisture measurement), so a producer can decide whether or not the end product is saleable to a specific customer.

An additional new development is the introduction of color cameras. They provide significantly more information about the defect. For example, color cameras can distinguish between oil and water drips on the web. For recycled mills, it can also identify bacteria to identify whether a mill's deinking system is working well or not.

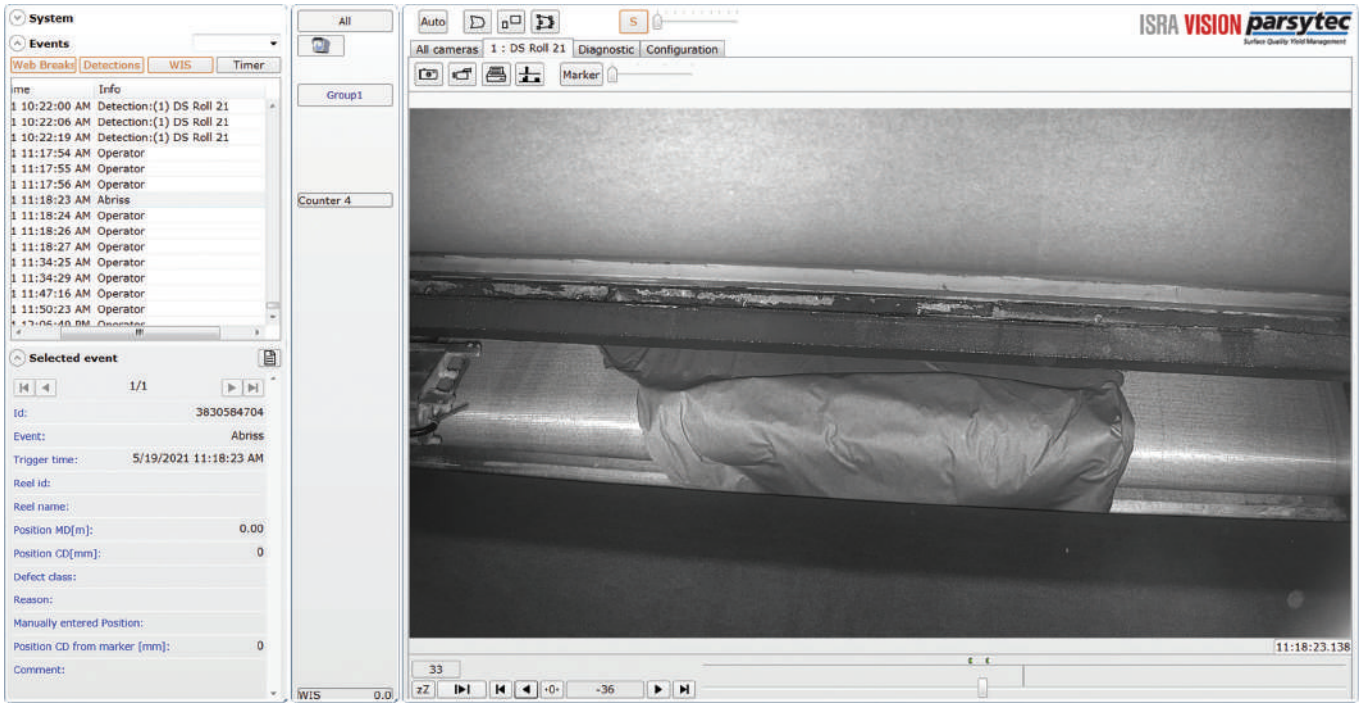


Figure 1b: With no actions taken, the web break has ultimately developed.

In addition to PAPER MASTER, EPROMI production analytics can display a huge amount of data that the mill can use for condition monitoring or predictive maintenance. The information is easy to access, either in the mill or remotely. It can also be used to collect and coordinate data from all kinds of quality control systems from any type of paper machine and/or mill.

Every system is unique

ISRA VISION´s product portfolio caters all paper grades from the lightest tissue to heavy board and has grown following the industry's conversion from graphic grades. With machine conversions, particularly from graphic to board grades, there is a need to ensure the legacy web inspection system meets the new needs of the client. The number of cameras, the implementation of web break monitoring and web inspection is fully customizable to suit the individual mill´s or production line needs.

There are specialized systems offered for specialty machines that are custom designed depending on space and configuration. How the producer does final surface treatment also has an influence on the kind of optical set-up it needs. For example, coating on high-end broke will need a high-resolution system and the correct camera angle for the installation is essential.

The greatest savings potential results from the reduction of the number of web breaks. Even a 20% reduction saves an enormous amount or increases the output of a paper machine.

We all know how important it is to avoid downtime, especially in the low-margin paper industry. In addition to this obvious cost saving, however, paper manufacturers can also significantly reduce the costs that arise from customer complaints. The use of PAPER MASTER and the associated software tools ensure-that only perfect paper rolls will be shipped to customers to eliminate complaints.

By using ISRA VISION's PAPER MASTER Platform, papermakers will be able to optimize their entire production process by reliable process efficiency and quality control.

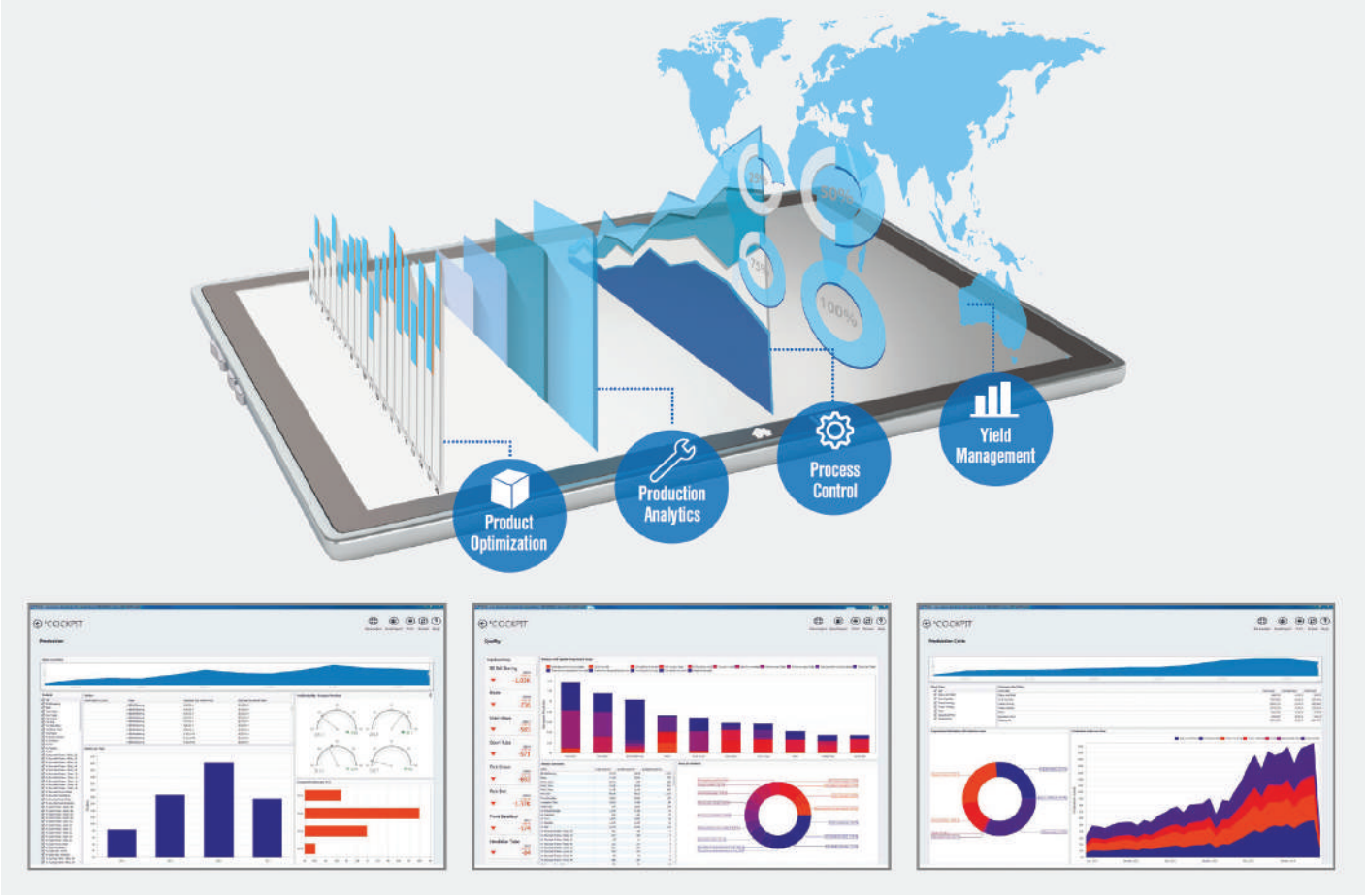


Figure 2: ISRA´s Paper Quality System makes hidden facts visible and ultimately helps to save time, improve processes and save costs.

SIEMENS
ADVERT

More CTMP from SCA

Martin Kubu, Strategic Director, Opticom,
Photographer: Torbjörn Bergkvist

INTRODUCTION:

"We're up and running with our brand new CTMP facility - on-time and on budget. Equipped with the latest technology - not only providing unique opportunities for customized solutions but also an even broader technical portfolio. We already have a profitable business, a solid, growing customer base and we see growth in packaging and tissue, but also in new areas such as moulding, where we foresee a high future demand. Replacing fossil plastics with certified fibre-based solutions will certainly be an interesting area, so with the broadest CTMP portfolio in the market, we're now taking a significant leap forward", states a proud **Stefan Sjöström**, Director of Global Sales, CTMP.

Figure 1: Ortviken's industrial site, where infrastructure and modern parts from the paper production are reused in the new CTMP facility, to the benefit of both the environment and the economy.

The biggest challenge, apart from the fact that we had a global pandemic to deal with during the project, affecting not only us but also our contractors and naturally logistics, was to tear down large parts of the closed paper mill at Ortviken and build a new bleached CTMP (Chemi Thermo Mechanical Pulp) facility at the same time. "Simply squeezing a new process into an existing costume", is how Anders Granström, Mill Manager at SCA's new state-of-the-art CTMP facility puts it.

Ortviken's Industrial site

The industrial activity at Ortviken began as early as the middle of the 19th century. During the 20th century, Ortviken developed into a modern industry and in 1958 two paper machines were put into operation. At its peak, the factory had a production capacity of approximately 900,000 tons of publication paper, but in February 2021, production ended and the last paper machine was closed.

However, SCA had already decided to move the CTMP production from Östrand to Ortviken and invest SEK 1.45 billion in a new facility, thus significantly reducing the investment cost per ton, largely thanks to a well-developed infrastructure and modern parts already in place. This included key functions such as wastewater treatment, steam supply, electricity, and compressed air. Add to that the strategic location of the site, meaning that SCA can offer logistics solutions worldwide, although Europe will continue to be the main market for CTMP.

"At the very least, we can also leverage solid and unique expertise in mechanical pulp that exists both in Ortviken and Östrand. Although our new facility uses cutting edge technology and is highly automated, CTMP production still requires experienced operators who constantly monitor and really understand the process - and we have that competence", says Anders.

Figure 2: Anders Granström, Mill Manager Ortviken Pulp Mill and Maria Nordgren, Product Manager CTMP, in front of the baling line.

Figure 3: Wood chip silos and input of sawmill chips.

The CTMP expansion

"Significant focus has been placed on the design of the facility, above all to create capabilities for an impressively broad product portfolio. This incorporates the ability to use different fibre raw materials and for developing the pulp properties over several refining stages", continues Anders.

"The wood handling department from the old mill is fully repurposed, but in order to efficiently handle different types of wood the number of chip silos has increased from one to three. Normally they would contain spruce chips, birch chips and sawmill chips, but different types of wood can be run in campaigns. An extended chip wash has been constructed to reduce odour and taste issues in the finished product. Within the pulp mill, the primary and secondary refiner and screening are reused, but now supplemented with a chip bin, impregnation, and preheater, as well as three low consistency refiners. Steam separation after primary refining is made using a perivapor. The disc filter has been rebuilt to handle the pulp's dewatering for the different qualities", explains Anders.

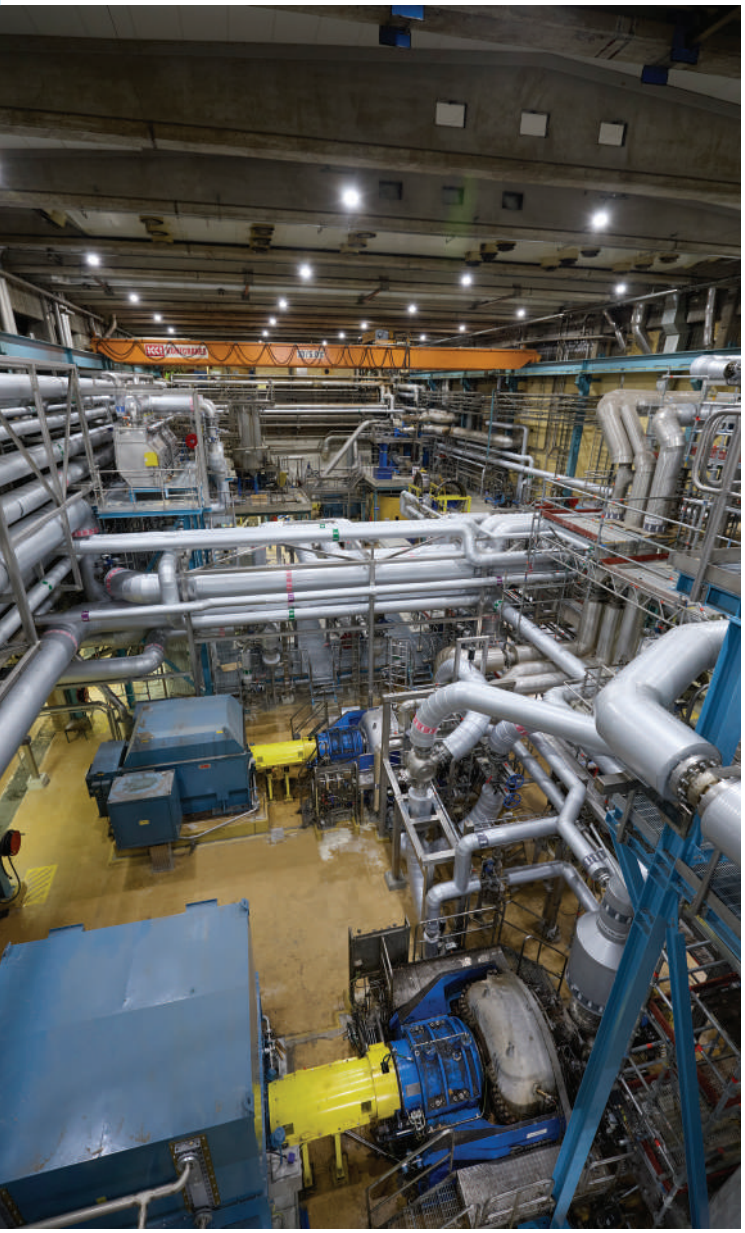


Figure 4: Primary and secondary refiners.

To produce birch CTMP, a new cleaning stage has been installed, cleaning birch pulp from black spots as well as the separation of stone cells. And the bleach plant has been rebuilt to facilitate two-stage bleaching, MC (medium consistency, approx. 8%), followed by HC (High Consistency, approx. 40%), with NaOH (sodium hydroxide), H2O2 (hydrogen peroxide) and NaSiO2 (sodium silicate) as active bleaching chemicals. A new building has been erected which houses dewatering, two twin roll presses, two flash dryers and baling, as well as a wrapping facility. The facility is designed for a capacity of 300,000 tons a year, meaning that production will more than triple from today's 90,000 tons.

"Everything is proceeding according to plan, and we are now working on qualifying existing products. As products are approved in terms of quality, production is moved from Östrand to Ortviken (Östrand will be shut down when everything is ready). Thanks to our formidable experience, we are also developing new products, and with our new state-of-the-art facility, plus the unique access we have to different types of certified wood and the R&D resources we have, we are certainly well equipped to develop completely new solutions. Above all, and what has been so much appreciated and successful so far, is that we can continue to develop these solutions together with our customers", says Stefan Sjöström, Director of Global Sales.

Figure 5: Stefan Sjöström, Director of Global Sales, CTMP.

Quality

Ortviken's facility is unique from a quality online measurement perspective, where the aim is to do online quality classification of all pulp products, (something that is not done at many mills), explains Maria Nordgren, Production manager, CTMP. Including, for example, equipment from Pulp Eye and BTG, we have several online measurement points along the process, (CSF (Canadian standard freeness), shives, mean fibre length, brightness, spots and pH). We also use models to predict paper properties, such as bulk and strength, explains Maria.

"Our technical capabilities, access to different types of wood, and know-how mean that we now offer solutions to a much wider target group than before. For example, two-stage refining and the screening stage will enable a freeness range between CSF 350-750 ml as well as low shive contents. In addition, we will now be able to offer above 83 % ISO in brightness (enabled by the two-stage bleaching process). Add to that our in-house developed HT technology, providing outstanding possibilities of bulk, both for spruce and birch", says Sara Qvist, Product Manager, CTMP.

Figure 6: Sara Qvist, Product Manager, CTMP

Figure 7: The three low consistency refiners.

HT is an in-house developed technique using higher temperatures and pressure levels, which softens the lignin, allowing the fibres to be separated more easily in the refiner. The result is a pulp with greatly increased bulk levels and low shives content, perfect for board customers with high demand for bending stiffness.

"Furthermore, the extended chip wash minimizes odour and taste issues, enabling us to offer products that are approved for food contact, i.e., meeting the high requirements in food applications that applies to different segments and markets. With that said, all our capabilities combined will now make us relevant for a much broader market, which is ideal" concludes Sara.

Figure 8: A newly erected building which houses dewatering, two twin roll presses, two flash dryers and baling, as well as a wrapping facility.

Technical challenges

Some compromises in the layout have been made, given the fact that the facility is partly built in old premises. The new plant has a lower redundancy rate because there are more single machines in several positions. Availability of such equipment, as well as preventive maintenance, becomes even more important. The disc filter needs to be able to handle a wide range of products and will not have the same productivity across all grades.

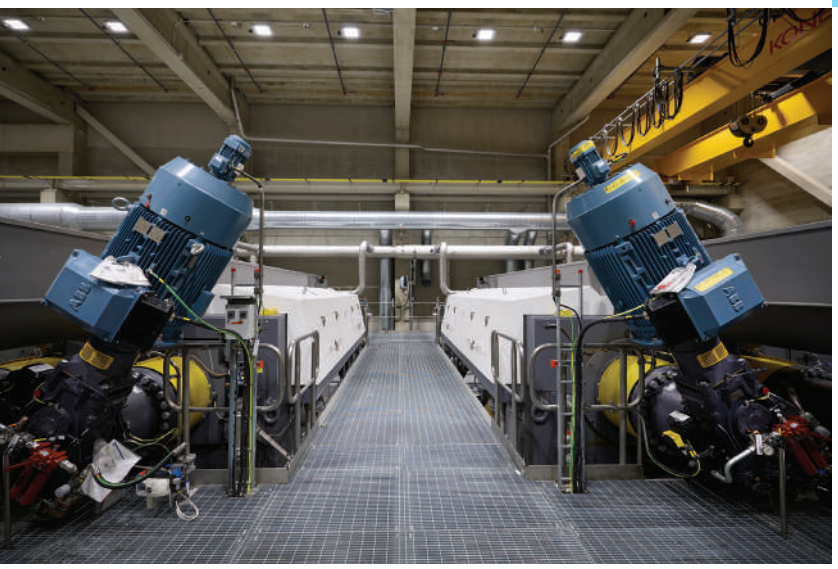


Figure 9: Twin roll presses.

The implementation time was an impressive 22 months (largely thanks to access of local expertise, as many contractors were from nearby areas). “To construct a new plant in a facility that is being shut down was naturally a challenge; as well as maintaining competence in a transition period, and generally conducting project activities during the covid pandemic, the invasion of Ukraine has of course also brought extra challenges”, summarizes Anders.

Energy

“At Ortviken there are five biofuel boilers, where internally generated bark, bio sludge from the wastewater plant, bark from other SCA units, and wood pellets are burned; there is also a turbine with an output of 16 MW. In the manufacture of bleached CTMP pulp, steam is also produced which is reused”, explains Maria. “The flash dryers have been equipped with a new solution, to preheat air to the dryers with a heat exchanger for increased energy efficiency; waste heat from the CTMP facility is used for water heating for other activities at the Ortviken site. SCA also leases premises at Ortviken to the company Renewcell (textile recycling). Furthermore, Ortviken supplies district heating to Sundsvall´s municipality, corresponding to the heating of 10,000 households”, continues Maria.

Safety

Health and safety are fundamental to SCA’s operations. SCA has a zero-accident vision, and safety in the workplace is highly prioritized. “Double block and bleed” have been installed, meaning that two valves are used to ensure that it is possible to drain completely in all stages during maintenance work. In addition, light beams are installed, which means that the baling line is completely secured if someone gets too close.

Suppliers

The main supplier during the project has been Valmet (refiners, dewatering equipment, drying, baling and wrapping), as well as process simulation for the training of operators.

Other suppliers have been Andritz, delivering disc filters, and ABB, delivering motors, control systems, and quality monitoring during the entire process.

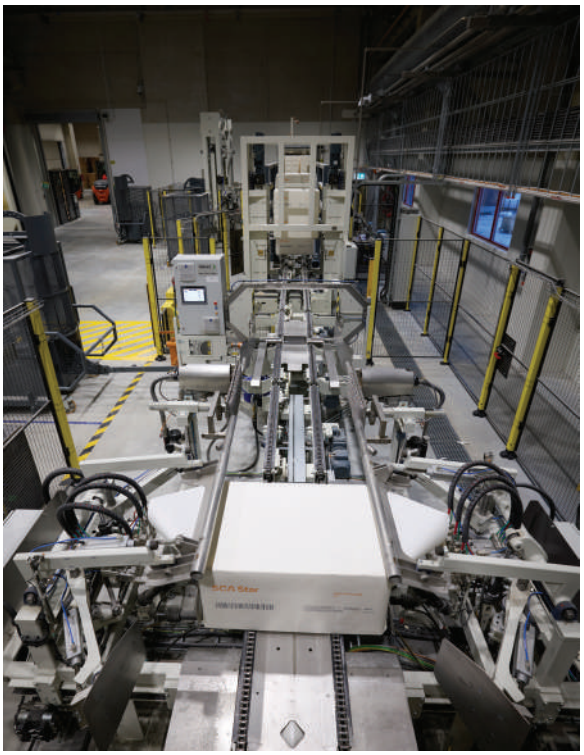


Figure 10: Baling line.

Figure 11: Inside control room.

SCA More – the new CTMP portfolio

So, to summarise, Stefan concludes: “We are now taking a bold leap forward: Offering the broadest CTMP portfolio in the market, with an unseen opportunity to tailor solutions.

With unique access to well-managed FSC and PEFC-certified forests, together with a proprietary supply of fossil-free green energy, we can deliver outstanding environmental performance. In our processes, we always make use of the entire tree from our forests and have unlimited access to versatile raw materials, such as birch. As a knowledgeable and committed partner, we’re determined to improve our customers’ performance, making more for less and thus helping our partners do even better business. Which is why we named our new CTMP portfolio SCA More!”.

PROJET ADVERT

How is the tissue industry coping in today's volatile world?

Pulp, Paper & Fibre, Tietoevry Industry
Arto Huuhilo, Product Owner
Jarmo Ropponen, Head of Sales and Marketing

INTRODUCTION:

Together with Fisher International, I-Plan, and Valmet Automation, Tietoevry conducted a global market study among the tissue industry in June–October 2022. The purpose of the study was to find new ways and areas to improve and focus on efficiency; enable cross-border thinking and end-to-end value creation through digitalization; and support a sustainable industry future. The 36 respondent tissue producer corporations came from 22 countries on four continents, with more than one in four respondents at C level, and nearly a third representing manufacturing or operations.

Principal trends: profitability and sustainability

Not surprisingly, profitability and sustainability rose to the top of the list of important development and improvement areas. Sustainability was mentioned by two-thirds of respondents, with profitability trailing only slightly at over 60 per cent. Taking a closer look at their constituent parts, a more nuanced picture appears.

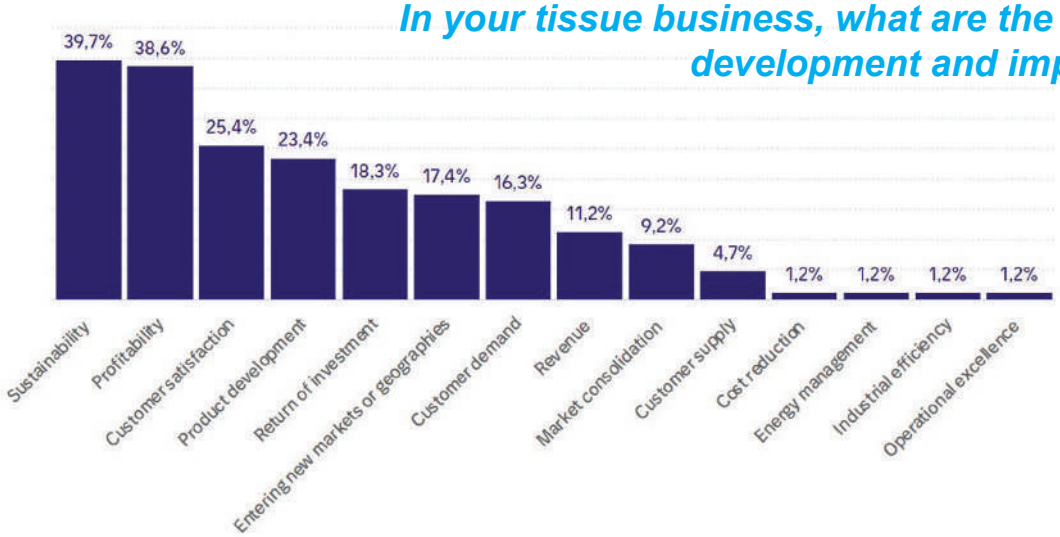
Sustainability includes shortening the supply chain and managing it more efficiently both upstream and downstream. Data collection, tracking and tracing, setting the right Key Performance Indicators, and appropriate reporting are key issues.

Sustainability also has a profitability aspect – while there is a cost to efficient management, better efficiencies create savings. This applies to both the supply and logistics chain, and mill and production operations. Therefore, there is quite a lot of overlap in sustainability and profitability.

Profitability in itself is dependent on many other issues as well. Many companies feel they are not making the best use of the data available from their processes. Demand planning and sales forecasting are perceived as lacking in more than 50 per cent of respondent companies, as is the efficiency of inventory planning. Improvements in mill automation and predictive maintenance also play an important role.

"We have a target to replace all raw materials that are fossil based by 2030."

In your tissue business, what are the most important development and improvement areas?



Profitability largely hinges on efficiency, both in production and business processes. No wonder many respondents place a lot of importance on reliable Manufacturing Execution Systems (MES). The presence of a top-class MES is seen as boosting improvements not only in production, but also in operations, maintenance, and business planning.

Besides energy prices, raw material availability and cost are having a significant effect on profitability. The tissue industry is a low-margin business where cost fluctuation has an immediate impact on profitability.

Tissue manufacturers are in raw material competition with other industries, notably the containerboard and cardboard industries, which due to higher sales margins are in a better position to buy at higher price levels. This creates a profitability pinch also from the supply side.

Tissue mills struggle most with energy and raw materials

In contrast with the enterprise level, at mill level, energy and raw materials were seen as the biggest and most imminent problems in the industry. Regarding energy, skyrocketing prices were the main source of concern, while raw material sourcing suffered not only from rising prices but also from declining availability. The combined effect of the rising cost of doing business and the importance of managing the supply chain more efficiently leads companies to seek tighter closeness to their markets.

How are we performing on urgent issues?

It is interesting to see how tissue companies see themselves performing in some of their key areas of concern.

Sustainability gets the most mentions as the most important improvement area, but a gap analysis reveals that companies nevertheless seem satisfied with their present performance. In fact, they slightly exceed their own expectations between urgency and perceived performance. In contrast, profitability performance is seen as clearly worse, by far topping the list of the gravity of shortcomings. Companies are also dissatisfied with their performance on energy efficiency at a rate of twice those of demand planning and forecasting, and digitalization and making good use of data.

One way of interpreting this is that respondents approach issues alternately from a profitability and a sustainability angle.

A somewhat striking finding is that around a third of companies see themselves as sustainability forerunners, while one in five are not paying much attention. The rest consider themselves as following trends with more moderate investment.

Interestingly, **product quality** is an area where most companies exceed their own expectations. Respondents are also satisfied with their present level of customer service.

Nearly six in ten respondents consider organization, processes, and know-how to be their most important areas of improvement investment.

Digitalization a key success enabler in a turbulent market

The tissue industry is undergoing perhaps one of its biggest business environment changes in history. There is war in Europe. We are just recovering from the Covid pandemic that at a stroke upended all business plans. Cost pressures are mounting, and both the demographics of the target markets and end-customer behaviours are changing. We are seeing a real litmus test of success for the entire industry.

Digitalization has undeniable importance in such circumstances. Companies can clearly see the helpfulness of digitalization in both the hard and the soft side of the business – machine monitoring, optimization and maintenance, as well as demand forecasting and helping react to rapid market changes.

When asked about their key focus areas in digitalization and applying new technologies within the next 12 months, nearly nine out of ten respondents mentioned production.

A basic requirement for realizing the benefits of digitalization is to have a reliable MES in tissue mills. As a development area, implementing or improving the MES solution is considered important by one-third of respondents.

The following areas, in order of importance, are maintenance, energy, supply chain management, and Sales & Operations Planning (S&OP). Quality issues and sales are areas where digitalization is seen to be of least help.

Market maturity seems to play a role in how the issue of digital improvements is approached. Less mature markets seem to focus on production efficiencies, while more mature geographies emphasize a more bird's-eye view by looking for better usage of data in overall decision-making.

Artificial intelligence (AI) is a hot topic in today's digital world, and the technology is being adopted by tissue industry forerunners as well. From a list of corporate-wide functional areas, production and manufacturing seem to use the technology most, with 40 per cent of respondents naming those areas. Interestingly, "none" was the next most common answer, indicating that nearly a third of respondent companies are not using AI in any of their business or production functions.

There seems to be high demand for creating a reliable digital trail of operations to determine the correct KPIs for keeping abreast of actual production and product quality performance.

" In my view, sustainability is included in material and energy efficiency – so if you want to improve your material and energy efficiency you are at the same time improving your sustainability."

The most room for improvement is in people, with equipment and systems a close second

Initiatives grouped under the heading **"People"** – meaning organization, processes and know-how – is by far the highest focus area to improve.

Depending on the respondent's location, workforce issues also came into play – scarcity of workers and their low skill level played a role.

Knowledge sharing and collaboration are crucial to increasing efficiency at mill level, together with efficient use of data, and realizing the benefits of digitalization.

Machinery and Equipment, Process Automation and Systems investments are largely on the same significance level. Interestingly, development needs in systems, such as MES, ERP and S&OP, process automation and data & AI are seen as more important than investments in tissue or converting machinery.

Companies expect to invest in energy efficiency in the coming years. Remembering the probable overlap between profitability and sustainability, most of the respondents are planning capital investment in reducing plant emissions, and on-site investments in green energy, such as their own solar panels or wind turbines.

The most crucial investments relate to new equipment to reduce energy in production, on-site green energy sources and on-site power and steam generation equipment. Smart energy tracking and automation are high on the agenda, too.

A closer look at Sales & Operations Planning

Sales & Operations planning is an interesting area, which merits a closer look.

Different kinds of optimization and planning work are at the centre of S&OP in order to respond to the uncertainties caused by an unpredictable and volatile market situation. By role, CEOs and Manufacturing and Operations have different priorities when it comes to developing S&OP.

Manufacturing and Operations, rather understandably, look at the issue from a narrower point of view. Their main concern is optimizing demand and supply balance. CEOs, for their part, emphasize a more overall approach – automated sales forecasting and understanding customer demand fluctuation.

CEOs and the shop floor see things differently

An interesting finding is that in some important areas, top management and line management have clear differences of opinion. We already mentioned Sales & Operational Planning, the goal of which differs significantly between CEOs and Manufacturing and Operations respondents. Another such difference is development priorities. Reflecting the development areas the respondents chose earlier in the questionnaire, it seems that the most important focus is on "**people**", that is, organization, processes, and know-how.

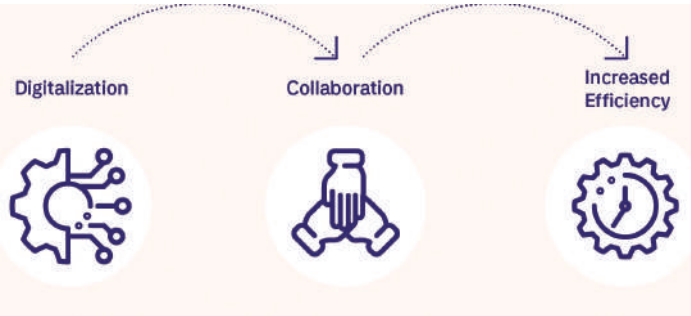
However, there is a significant difference in what CEOs prioritize. Perhaps somewhat surprisingly, their number one priority is MES, which is a key enabler of building a truly data-driven company.

TIPS for Tissue for a profitable tissue business

TIPS is Tietoevry's ERP (Enterprise Resource Planning) and MES (Manufacturing Execution System) which is specifically designed for the industry sector comprised of pulp, paper, fibre, packaging and tissue. It allows the successful planning, selling, execution and operation of production and warehousing. With the resulting efficiencies and high-quality level, companies can meet customer requirements in full and on time while maintaining business profitability.

TIPS contains automation interfaces, as well as integration to local and corporate-level data storage repositories. TIPS automation integrates to automatic warehouses, AGVs, tissue roll producing machines and converting lines. Large amounts of process data including quality profiles are collected, stored, and used for quality control and process optimization. Data can be used for both on-premise analytics and AI, as well as delivered to a cloud for machine learning and similar purposes such as digital twins.

The latest addition to the TIPS solution family is TIPS OMS (Operations Management System), which is a great example of breaking through corporate silos through knowledge sharing and collaboration. OMS significantly increases efficiency in the mill production environment through real-time data, dashboard visibility into production, and seamless communication between mill teams.



"The tissue industry has been without major innovations for many years, both in new products and in new process and management technologies. So, I understand that the sector deserves a true turnaround in all aspects."

Download the white paper for a more thorough analysis

A white paper digging deeper into the issues the tissue industry is facing today is available for download on Tietoevry's website at **www.tietoevry.com/tipstissue.**

You can find more information on the TIPS for Tissue solution for a profitable tissue business on the same website – or better still, come visit us in hall 8A, booth 51E at Tissue World in Duesseldorf, March 28-30, 2023.

TOSCOTEC
ADVERT

Continuous cleaning of forming wires, press felts and dryer fabrics

Or: How to lower water and power consumption and increase production efficiency and output in Paper Machines at the same time.

Claus Robberts, Founder and Owner of ProJet b.v.

INTRODUCTION:

In a paper machine, there are 3 main stages or sections of the manufacturing process, all having their specific task to obtain the desired paper properties:

- Forming Section: formation of the sheet (strength, thickness, etc)
- Press Section: surface properties (printability, etc)
- Dryer Section: dryness at the end of the production process

Each section has one or more conveyors to support the paper sheet while it's being manufactured; Wires in the Forming Section, Felts in the Press Section and Fabrics in the Dryer Section. The conveyors are generally referred to as "Paper Machine Clothing" or PMC.

The benefits of consistently clean machine clothing

Clean PMC, with consistently high permeability and dewatering capabilities, delivers important productivity and performance advantages. Consistently clean Forming Wires give better dewatering in the Wire Section which leads substantial improvement in dryness level when the sheet leaves the Forming Section, into the Press Section. Forming Wires loose dewatering ability when contamination builds up over time during production. Cleaner Press Felts assure improved sheet surface, better dewatering and therefore higher dryness levels when the sheet enters the Dryer Section, so less drying energy is required there. Clean Dryer Fabrics with high permeability or porosity provide highest drying capacity so less steam consumption is required. At the same time, much less contamination will be deposited on dryer cans, doctor blades, and felt rolls.

More and more contamination (fillers, broke, pitch, stickies, etc.) can be found on PMC caused by an increasing use of secondary fibers, recycling of coated broke, increasing use of sheet fillers, an increased use of recycled mill water supplies, and the increased use of process chemicals.

Advantages of Continuous PMC Cleaning

ProJet is a globally operating company with over 30 years experience in designing, manufacturing and supplying innovative High Pressure Cleaning systems for paper machines. Over 1,500 ProJet cleaning systems are successfully installed and running in paper manufacturing processes worldwide. The ProJet system consumes very little water, compressed air, and very little electrical energy; all much less than conventional cleaning showers. This innovative cleaning system is being applied successfully to very low basis weight paper product as well has heavy weight paper board applications. Applying a ProJet Cleaning Solution guarantees consistently clean PMC from beginning to end of the usable life, while using a minimum of utility resources. Consistently clean PMC delivers the following significant manufacturing advantages:

- Conventional HP showers can be switched off leading to enormous water consumption and power consumption savings.
- No shutdowns will be required for manual or chemical PMC cleaning. This will provide increased manufacturing productivity and profitability.
- Maintaining consistently high PMC permeability and dewatering capabilities increases dryness and quality of the sheet, leading to less reject and higher profitability.
- Better CD sheet moisture profiles will be maintained.
- Sheet curling, caused by uneven moisture profile, will be eliminated.
- PMC life will be substantially improved.

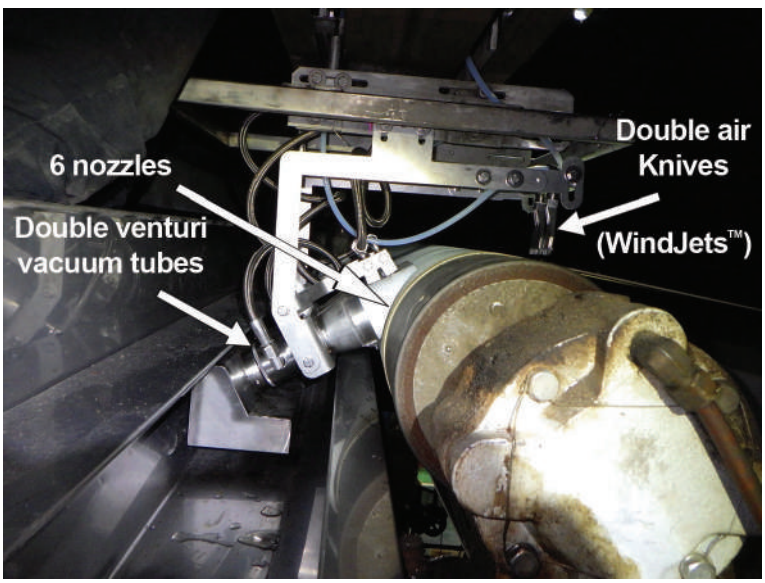


Figure 1a & 1b: Clean a dirty dryer fabric within 12-24 hours and then maintain this cleanliness 24 / 7.

Figure 2: Power Cleaner 2.0 on Bottom Fabric.

Power Cleaner

ProJet's Power Cleaner systems all use a highly reliable traversing beam with a single oscillating cleaning head with multiple nozzles and high pressure water, all designed for the specific position in the machine. The cleaning head is equipped with vacuum and air knives leading to the following features and benefits:

- The vacuum and debris discharge system allows the Power Cleaner to operate completely mist free, opposed to conventional showers, leading to a much cleaner machine and work environment.
- Debris and contaminants are discharged, away from the manufacturing process, eliminating the risk for re-contamination.
- The head can be sent to particular trouble zones, providing targeted and more efficient cleaning than conventional showers.
- The head can parked outside the paper machine, allowing for nozzle changes during the production process

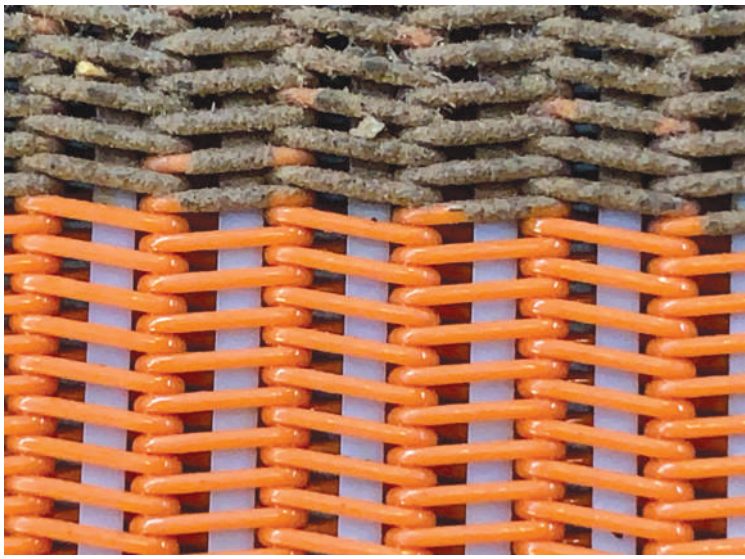


Figure 3: ProJet clean.

ROI calculator

ProJet understands that each client application is unique. For that reason, ProJet developed an automated ROI-calculator that will be applied to each application and produced paper grade.

By contacting

info@projetinc.us or

info@pro-jet.nl ProJet

ProJet will perform a no-charge ROI calculation of any Forming Wire, Press Felt or Dryer Fabric application. After inputting the process parameters provided by customers, they will be provided with a ROI-Analysis of each specific application and investment justification.

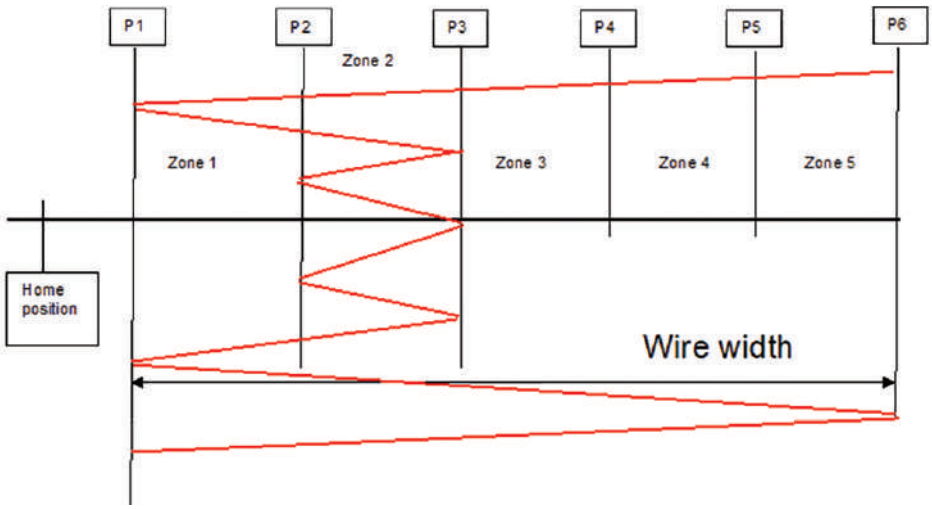


Figure 4: Strip- & Zone cleaning.

Problem solved: Engineers take on challenge of failing equipment at paper mill

Tony Pallone, Deublin Company

INTRODUCTION:

An important aspect of engineering is the application of math and science to solve real-world problems. Case studies illustrate the role of engineering in analyzing, identifying and solving operational problems in a production environment.

An example can be found in the case of a large paper mill in the southeastern United States incurring increased maintenance cost and time spent servicing the machine's aging steam system, which had been installed in the mid 90's. The mill's primary pain point was to address high levels of water in its oil lubrication system which reduced equipment life and increased downtime. There was also the danger of unforeseen equipment failure. The company's specifications made an allowance for water levels in the oil lube system up to 0.03%, but samples showed levels as high as 0.26%.

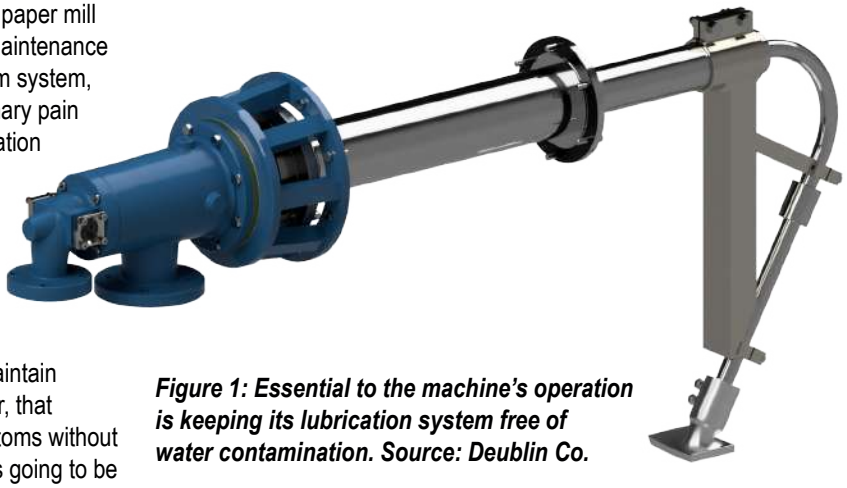


Figure 1: Essential to the machine's operation is keeping its lubrication system free of water contamination. Source: Deublin Co.

The mill's current solution was to deploy and maintain costly dehydrators to reduce the excess water. However, that solution was merely a Band-Aid, treating only the symptoms without addressing the root cause. The problem, moreover, was going to be progressively worse over time, as the mill was routinely experiencing bearing failures. Meanwhile, the temporary solution represented an exorbitant expenditure for the company.

Engineers at Deublin Company, an American manufacturer of rotary unions and steam joints, had an alternative idea. By examining the problem and analyzing its root cause, they were able to devise a solution to help reduce the machine's overall operating costs, improve dryer efficiency and even present an opportunity for modernizing the machine's existing steam joints.

Investigating the problem

The papermaking process involves combining pulp made from cellulose fibers with water, then placing it onto a machine to form it, dry it and ultimately produce rolls of paper. There are separate sections within the machine for each of these tasks. Each section makes use of rolling elements with bearings that need to be kept lubricated, either with circulating oil or grease. Essential to the machine's operation is keeping its lubrication system free of water contamination.

This can be especially challenging in the machine's dryer section, where critical drying takes place in the paper making process. This is achieved, in part, by drying cylinders heated by steam supplied through steam joints, as shown in Figure 1.

At this particular paper mill, the steam joints were at least 20 years old, and each contained a carbon steel journal insulating sleeve. When functioning normally, these sleeves would create air cavities to provide thermal insulation from convective heat transfer of steam. Boundary air and the sleeve material would protect the inner bearing from thermal stress; this protection is particularly important for machines operating with higher steam pressures, such as those used to produce brown-grade paper. When properly sealed, the sleeves would also prevent water contamination of the circulating oil.

As an insulating material, carbon steel is susceptible to "steam cuts" — small pits on the surface of the material, as shown in Figure 2, that diminish seal integrity. Steam cuts are caused by exposure to high-pressure, high-temperature steam over time. Considering the age of the equipment and the composition of the material, Deublin engineers correctly reasoned that the excess water in the mill's oil lubrication system was the result of leakage in the steam joints.

Devising a solution

Although the mill had arrived at an intermediate fix — removing excess water using dehydrators — it was not a sustainable solution for the long term. The dehydrators were being rented at a cost exceeding the value of the failing steam joints, the condition of which would only grow worse over time.

Deublin engineers decided to integrate a new material into the steam joints: stainless steel. Compared to carbon steel, which had been used by the original equipment manufacturer (OEM) for the composition of the steam joint insulating sleeves, the benefits of stainless steel can be seen in the next column.

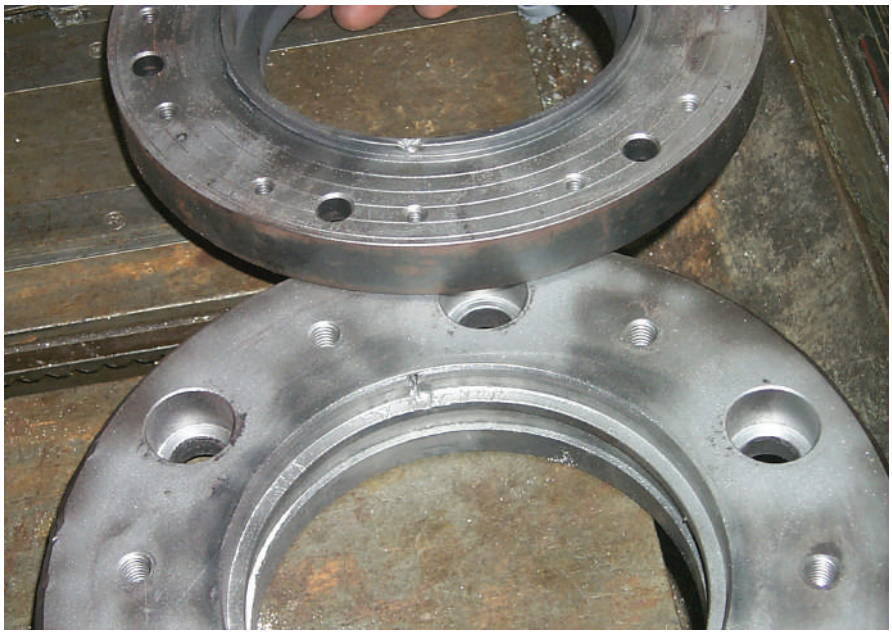


Figure 2: Steam cuts are small pits caused by exposure to high-pressure, high-temperature steam. Source: Deublin Co.

stainless steel

- Better insulation at the temperatures in dryer sections
- Lower thermal conductivity (approximately 30% of carbon steel conductivity)
- Increased material hardness
- Greater resistance to corrosion and steam cuts

It is not accurate to state that carbon steel should have no place in the composition of steam joint journals. Compared to stainless steel, the material's lower coefficient of thermal expansion is ideal for protecting equipment during transient conditions such as startup, shutdown and changes in pressure.

This is where true engineering ingenuity came into play. As shown in Figure 3, Deublin devised a custom solution that incorporated the essential properties of both materials — one that incorporated carbon steel to allow for thermal expansion, without compromising the advantages offered by stainless steel. A carbon steel journal flange was used to make contact with the dryer, while a stainless-steel insert was positioned inside the flange. This brought the differing thermal expansion rates of the two materials into sync, producing the same level of thermal expansion between the flange and journal.

Considering the potential impact of stainless-steel thermal expansion on seal integrity, Deublin also positioned static sealing elements in the external counter flange, around the diameter of the stainless-steel sleeve. Each element was chosen for their resilience to high temperatures. These included a Slyd-Ring, an Aflas O-ring and a Teflon C-ring inside a stainless-steel insert applied by interference in the adapting flange. A weep hole in the external adapting flange was incorporated for leak detection and identification in case of a static seal breach.

Building a system

Deublin's approach looked beyond the immediate concern of protecting the machine's bearings, toward building a whole system with long-term viability. Its custom-designed insulating sleeve is just one element designed to reduce water contamination and extend system life.

Another feature of the system design is an isolation tube that allows for the passage of steam without contact with the mechanical seal. The space between the inside diameter of the insulating sleeve and the outside diameter of the isolation tube is filled with saturated steam from inside the dryer. The seal surfaces are exposed only to saturated steam and not dry superheated steam. Due to the high level of water content, saturated steam serves as a thin film of lubrication between the two rotating seals, extending seal life.

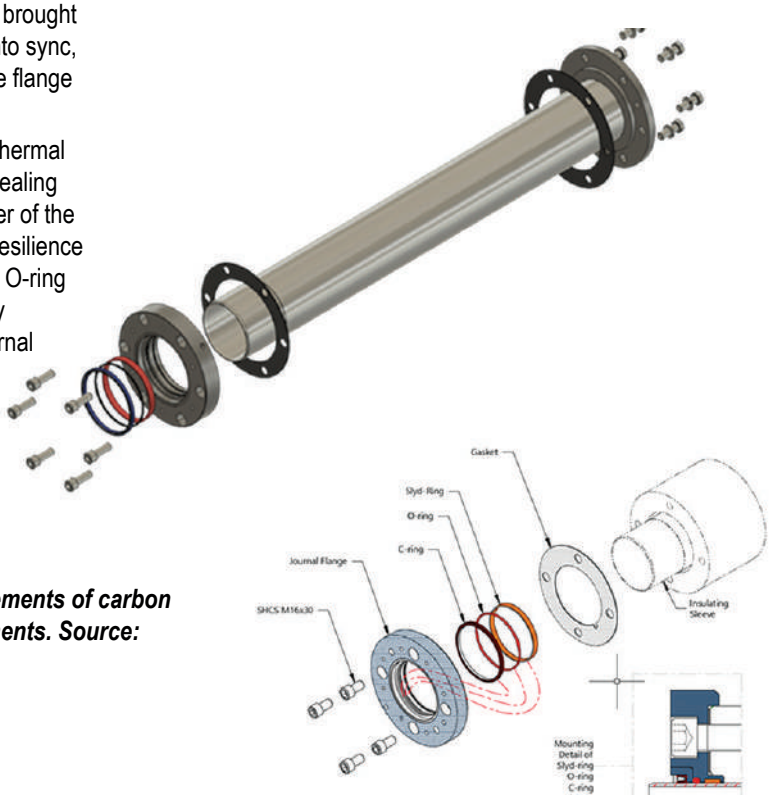


Figure 3: This innovative insulating sleeve employs elements of carbon steel and stainless steel, along with static sealing elements. Source: Deublin Co.

Deublin engineers also took a "proof of concept" approach to ensure their solution would be effective before deploying it throughout the whole system. By starting with a small section of the machine, Deublin engineers were able to demonstrate a measurable result at minimal cost.

They were able to reuse bell and housing components from existing joints to save on metal costs, effectively upgrading the plant's equipment without major expense. See Figure 4 for competitor comparison of the effectiveness of Deublin joints at temperature insulation.

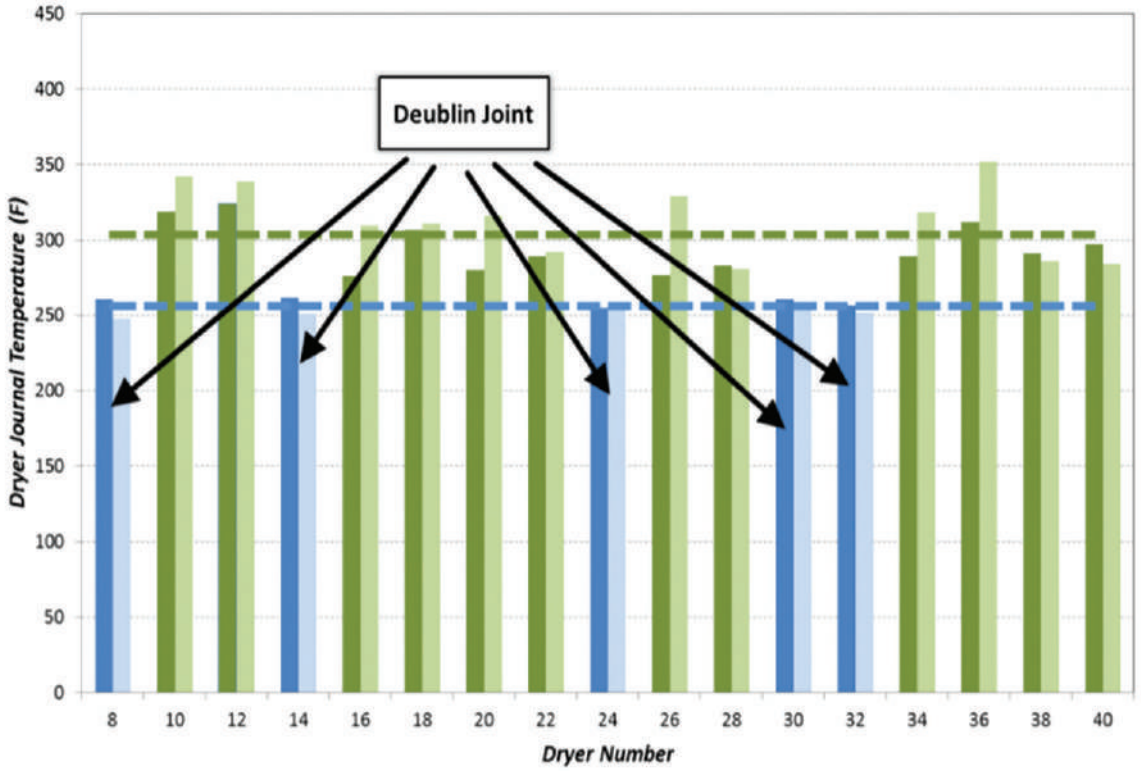


Figure 4: Deublin joints are effective at keeping temperatures at lower levels than those of a competitor (shown in green). Source: Deublin Co.

End results

Once the custom-designed solution was in place, the effectiveness of the Deublin approach could immediately be seen. Testing showed an immediate reduction in water contamination. The mill was able to discontinue dehydrator rental shortly after installation, which took place during an annual outage. Here's a look at the progress in one of the machine's tanks:

- Pre-installation measurements:
- 0.05% water at 493.5 ppm, 2/21/2019
- 0.26% water at 2559.6 ppm, 2/28/2019
- Installation during annual outage, 5/9/2019 to 5/10/2019
- 11 kits installed, five for condensate removal systems and six for steam inlet systems, each including seal conversion, journal flanges, insulating sleeves and siphon conversion
- Post-installation measurements:
- 0.15% water at 484.3 ppm, 5/22/2019 (1st dryer section)
- 0.18% water at 484.3 ppm, 5/22/2019 (2nd dryer section)
- No water detected, 5/22/2019 (3rd and 4th dryer sections)
- 0.03% water at 281.1 ppm, 5/29/2019
- Rental dehydrator removed, 5/31/2019
- No water detected

In terms of expenses saved by Deublin solution, the overall cost metrics indicate that the project paid for itself within the first year of operation.

Engineering answers

The case of the paper mill is just one illustration of how engineering know-how can be used to arrive at solutions that go beyond "quick fixes" that often create more problems than they solve.

Although dehydrator rental offered an intermediary fix, it was both a costly and ultimately unsustainable solution. Deublin engineers looked deeper into the problem, incorporating their knowledge of material properties and their perspective on the whole system. This allowed them to devise an answer that not only solved existing problems in the short term, but also built long-term sustainability into the equation.

To learn more about Deublin's approach, visit their website www.deublin.com.

SCA
ADVERT

Addressing industrial cybersecurity risks affecting the industry

OTORIO & ANDRITZ partner to safeguard production operations
Daniel Bren, Co-Founder and CEO, OTORIO

INTRODUCTION:

The pulp and paper industry continues its rapid digital transformation. This makes pulp and paper manufacturers' industrial networks more connected, more productive — and, unfortunately, more exposed to cybersecurity risks. Safeguarding IT and operational technologies (OT) is critical to ensuring business continuity and resilient operations at the heart of pulp and paper manufacturing.

As industry leader ANDRITZ's OT cybersecurity partner, OTORIO knows how crucial safety, uninterrupted energy supplies, plant operations, and reliable utilities are to the pulp and paper manufacturing processes. The sophisticated industrial machines crafted by ANDRITZ rely on multiple technologies, data sources, automation, and digitalization, as well as procedures to optimize process performance.

Manufacturers worldwide have been hit with real-world industrial cybersecurity attacks that halt industrial operations, lead to ransomware demands, harm business continuity, and affect shareholder value. The pulp and paper industry is no exception. Over the past two years, cyber attacks impacted the manufacturing operations of at least three different paper and packaging companies in North America and Europe.

Whether they deal with recycling OCC, packaging board, and mixed waste, securing production lines, drying processes, or power and boiler generation, OTORIO's industrial-native cybersecurity solutions enable pulp and paper manufacturers to minimize digital and cyber risks to their industrial operations. Our solutions prioritize risk mitigation, add business context, and allow plants to manage multi-site OT, IT, and IIoT networked environments from one central dashboard.

Why the industry faces cybersecurity vulnerabilities

Whether producing paper, boards, or tissue, the various stages of pulp and paper production and the technologies that support it increase a manufacturer's digital attack surface. Producing panelboard, for example, involves heavy industrial machinery and automated, networked technologies for raw wood processing, preparation, cleaning, and pressurized refining. If a cyber attack impacts even one stage of the process, this can have a domino effect on related processes, potentially disrupting or halting operations until the security breach is resolved.

OTORIO is proud to fully integrate our OT cybersecurity solutions into ANDRITZ's safe automation and digitalization smart manufacturing portfolio. Our solutions enable a pulp and paper manufacturer's OT and IT teams to proactively reduce cyber risks and vulnerabilities affecting the security and safety of manufacturing procedures, business continuity, and ongoing operations. We provide plants and production floors with key functions like enhanced visibility of all your digital assets across your manufacturing network (whatever their location). Your teams get contextualized risk management with easy-to-use mitigation playbooks and significantly more resilient industrial operations.

Critical infrastructure

It is also imperative for pulp and paper manufacturers to protect their internal critical infrastructure assets in their mills and plants from cyber threats and vulnerabilities. Many stages of production and processing create opportunities to recover, conserve, and reuse resources that might otherwise go to waste (e.g., wood fiber, water, and energy). Water is essential to the pulp and paper manufacturing process. Manufacturers use it in many stages of production: wood preparation, pulping, pulp washing, bleaching, and coating. Recovery boilers allow for the extraction, recovery, and reuse of byproducts like black liquor as energy during other stages of production. For example, boiler generators serve two functions: supplying steam for paper production and generating power for manufacturing operations.

"ANDRITZ's pulp and paper industry clients benefit from OTORIO's industrial-native OT cybersecurity solutions. By proactively reducing digital risks and vulnerabilities in their multi-step manufacturing processes, they help maintain secure, resilient operations for our clients' paper, board, and tissue production."

- Tatu Liimatainen, Head of OT Cybersecurity, ANDRITZ

ANDRITZ's steam recovery systems enable the efficient capture and reuse of surplus steam energy, reducing a manufacturing plant's fuel and boiler feed water consumption. Industrial burner solutions also supply pulp and paper mills with energy by repurposing industrial waste and biofuels to generate energy and reduce CO2 emissions. Industrial machinery in pulp and paper plants that support energy production, capture, or reuse can also affect worker safety if malicious actors breach OT or IT systems controlling their operation.

Safeguarding and having visibility into your IT and OT assets is vital. Without effective OT security, malicious cyber actors are more likely to breach security configurations in industrial assets like boiler generators, steam recovery systems, and fuel systems. Such breaches can impact worker safety, day-to-day operations, regulatory compliance, and more.

Preventing cyber risks from third parties

Your pulp and paper business uses third-party software solutions and works with contractors who might be a source of accidental or malicious cyber incidents. Contractors help service your heavy machinery, integrate new equipment and processes, and interface with power, utility, and energy systems on which your organization depends.

Contractors are often unaware of cyber risks and can introduce vulnerability into your networks. An effective OT security risk management solution will identify such threats and help you implement safety practices to prevent them from being exploited.

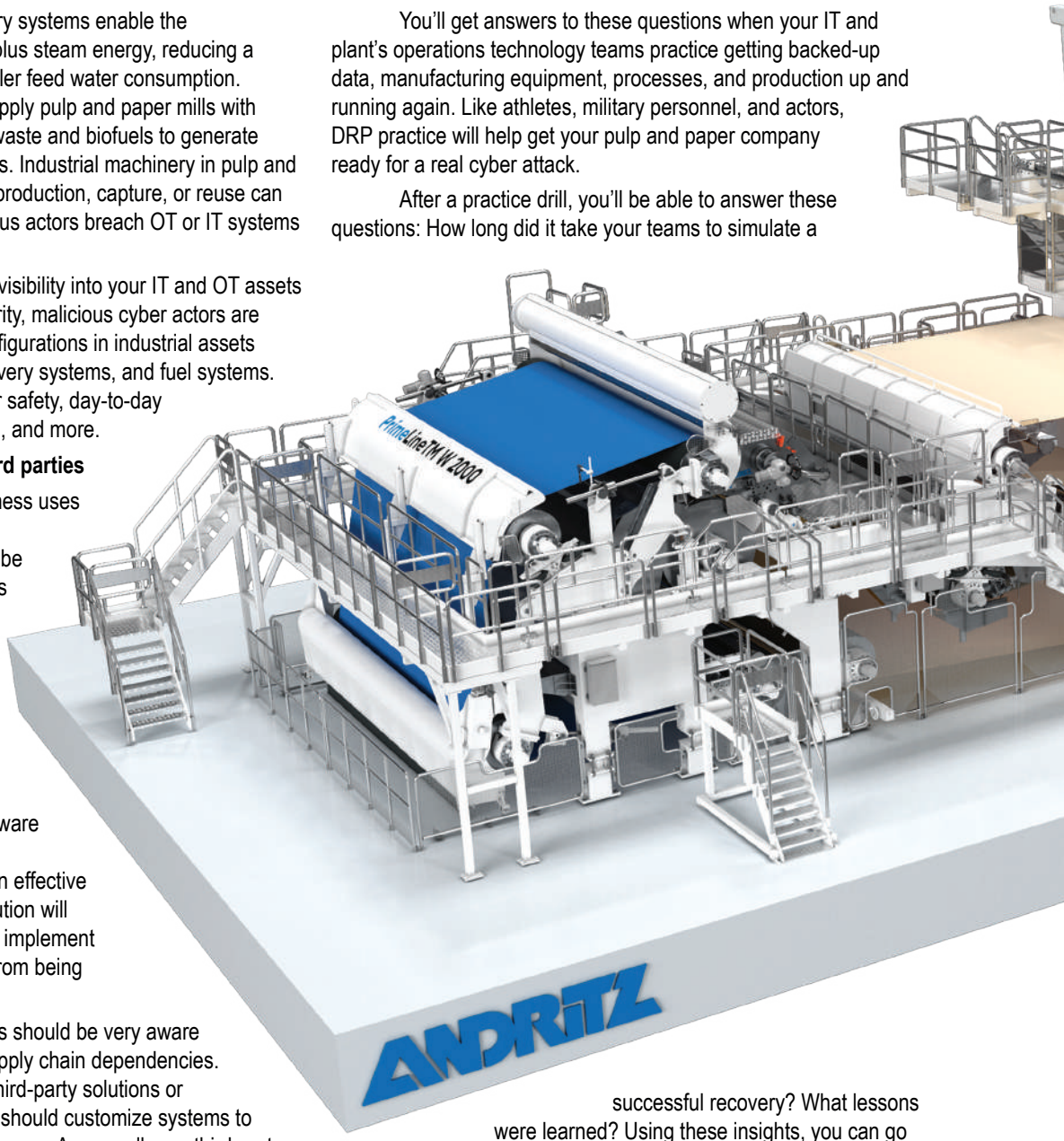
Pulp and paper companies should be very aware of potential risks introduced by supply chain dependencies. In cases where products rely on third-party solutions or services to operate, the company should customize systems to minimize their use and risk of exposure. Assess all your third-party products and providers associated with your business operations with a comprehensive due diligence program.

Practice makes perfect: Disaster recovery exercises

Every pulp and paper manufacturer needs to have a disaster recovery plan (DRP) and a backup plan in place. The most effective way to recover from an industrial cyber attack is to practice your DRP and backup plans often.

You'll get answers to these questions when your IT and plant's operations technology teams practice getting backed-up data, manufacturing equipment, processes, and production up and running again. Like athletes, military personnel, and actors, DRP practice will help get your pulp and paper company ready for a real cyber attack.

After a practice drill, you'll be able to answer these questions: How long did it take your teams to simulate a successful recovery? What lessons were learned? Using these insights, you can go back and repeat your DRP.

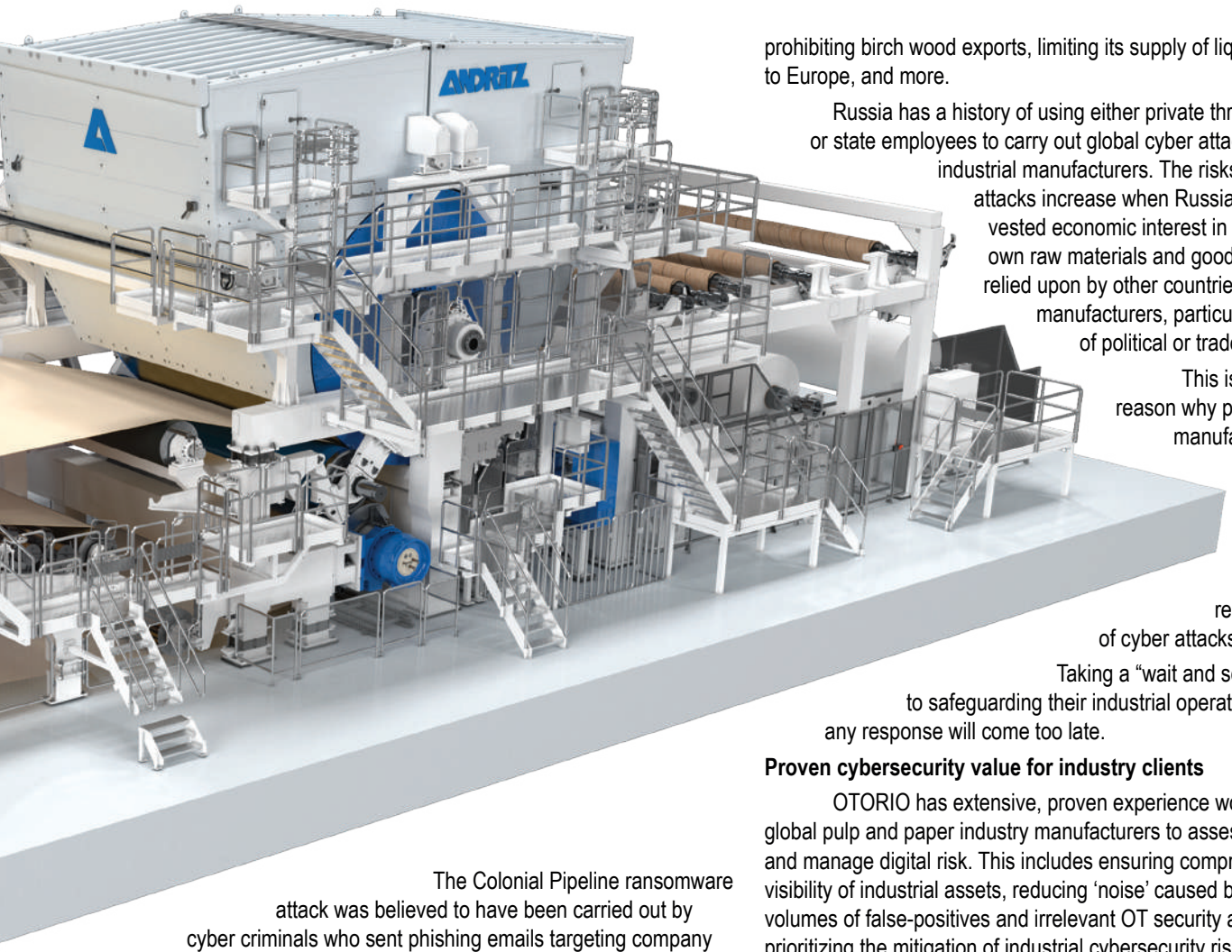


Why employee cyber hygiene is important

It is imperative that every pulp and paper company require its employees to practice basic cyber hygiene. At a minimum, this means workers should a) use multi-factor authentication (MFA) for remote access to the company's network, b) control user-access management, and c) use reliable anti-virus and firewall solutions.

Hackers frequently try to gain access to a company's IT and OT networks via -'phishing'- campaigns that target employees' corporate email and social media accounts. These attack strategies often ask employees to 'confirm' their account login details, including their passwords. If an employee shares such secure credentials, this may give malicious actors access to the employee's account and provide remote access to the company's internal network, databases, industrial operations, and machinery.

- ***Do your IT and OT teams regularly back up network data and secure these backups?***
- ***Do you know how often backups are done and where your data is stored (e.g., locally, offsite, or in multiple locations)?***
- ***Does your company hold regularly-scheduled disaster recovery exercises every quarter?***
- ***When a zero-hour or zero-day attack happens, will your DRP actually work?***



The Colonial Pipeline ransomware attack was believed to have been carried out by cyber criminals who sent phishing emails targeting company employees. Employees who shared their credentials reportedly allowed hackers to exploit remotely accessible accounts, systems, and more.

That is why employee cyber awareness training is essential. Pulp and paper manufacturers should train all employees in security awareness subjects related to their role and develop a security awareness training plan. Topics on which to educate employees during this training include the company's information security policy, IT and OT access, best practices, and access to relevant machines and systems by authorized users only.

Financially-motivated ransomware attacks

Many cyber attacks can result in ransomware demands. Pulp and paper manufacturing is a multi-billion dollar global industry. The recent pandemic increased demand for corrugated cardboard and pulp production. From toilet paper and package shipments to paper goods for food deliveries, CIPA (the European association representing the paper industry) noted this trend in its 2021 annual statistics.

Criminal ransomware gangs try to find and exploit any OT and IT security vulnerabilities that industrial manufacturers have. We know of at least three real-world cyber attacks against pulp and paper manufacturers. Two of these attacks in North America resulted in ransomware demands.

Geopolitical risks impact manufacturing operations security

Like other industries, geopolitical conflicts can increase OT and IT security risks for pulp and paper manufacturers. After Russia invaded Ukraine, sanctions imposed on Russia by the US and EU affected supply chain security for raw materials like Russian birch trees. Until recently, these trees' pulp was relied on to soften toilet paper tissue. Russia responded to these sanctions, in part, by prohibiting birch wood exports, limiting its supply of liquid natural gas to Europe, and more.

Russia has a history of using either private threat actors or state employees to carry out global cyber attacks against industrial manufacturers. The risks of such attacks increase when Russia has a vested economic interest in trading its own raw materials and goods that are relied upon by other countries and foreign manufacturers, particularly in cases of political or trade disputes.

This is an important reason why pulp and paper manufacturers should proactively enhance their IT and OT security postures to reduce the risk of cyber attacks.

Taking a "wait and see" approach to safeguarding their industrial operations means any response will come too late.

Proven cybersecurity value for industry clients

OTORIO has extensive, proven experience working with global pulp and paper industry manufacturers to assess, monitor, and manage digital risk. This includes ensuring comprehensive visibility of industrial assets, reducing 'noise' caused by high volumes of false-positives and irrelevant OT security alerts, prioritizing the mitigation of industrial cybersecurity risks based on their context and potential impact on your business.

We have experience reducing ransomware risks and helping companies fight phishing attempts that target thousands of employees at hundreds of worldwide locations. Our work leads to improving customers' security controls to ensure their OT, IT, and IIoT network environments are resilient against future attacks.

OTORIO has deep experience performing vulnerability and penetration testing ('pen testing') for pulp and paper manufacturers. This allows you to see how outside attackers would view your company's IT and operational technology (OT) networks. These valuable tests and analyses enable us to find potential attack scenarios and help you proactively reduce vulnerabilities. We have years of experience helping industry manufacturers prioritize and contextualize risks that can have the greatest impact on their businesses.

OTORIO and ANDRITZ help safeguard your operations

ANDRITZ helps its global pulp and paper customers minimize digital and cyber risks through its partnership with industry-leading OT security provider OTORIO. Founded by leading OT cybersecurity experts, OTORIO's portfolio of industrial-native cybersecurity solutions ensures continuous digital risk management and compliance. These solutions are now fully integrated into the ANDRITZ Automation & Digitalization portfolio, providing customers with safer machines and a significantly more resilient infrastructure

In a multi-generational, constantly changing threat environment, customized OT cybersecurity measures are an imperative part of the automation development process. That is why ANDRITZ embeds OTORIO's innovative solutions in its market-leading solutions and services, ensuring that every pulp and paper machine meets the highest cybersecurity standards.

The advanced services are delivered in the safest way, ensuring the customer's continuous efficient and effective production, along with proprietary commercial data security.

In today's rapidly evolving industrial operations environment, protection against cybersecurity risks and compliance with industrial security standards is expected upon every machine delivery and commissioning. ANDRITZ ensures that each machine it delivers is secure, regulatory compliant, and meets the customer's contractual requirements for continuous, safe production.

With OTORIO's spOT Lifecycle solution, ANDRITZ can also also provide post-delivery Security-as-a-Service over the machine's entire lifecycle on the customer's premises. spOT Lifecycle periodically checks configurations and vulnerabilities during ANDRITZ service calls (whether remotely or on-site), and performs "virtual querying" of the machine's fingerprint for new, publicly-known vulnerabilities. This solution provides clear, practical recommendations on how to remediate compliance and security gaps and harden against ransomware attacks.

The result is a detailed report on compliance confirmation that delivers accurate, in-depth security verifications of the delivered machines. spOT Lifecycle enables ANDRITZ to remediate each vulnerability, security gap, and compliance deviation prior to a machine's delivery, and include details on any mitigation steps taken in the issued report. The information is also used to ensure that new deliveries are secure by design.

ANDRITZ's Automation & Digitalization embeds OTORIO cybersecurity into the automation lifecycle of new and existing machines for safe, resilient, and efficient operations. The company's Security-as-a-Service offering ensures that each machine it delivers is secure, regulatory compliant, and meets contractual requirements. Every customer is assured that ANDRITZ deliveries provide continuous, safe production throughout their entire lifecycle.

Real-world cyber attacks on industry manufacturers

In February 2021, Atlanta-based corrugated packing manufacturer WestRock experienced a ransomware attack. A month later, the company informed shareholders that the attack had affected WestRock's production operations, causing a loss of approximately 125,000 tons in containerboard and paperboard production.

In February 2020, a malware attack on Paper Excellence Canada impacted the company's IT systems and forced it to temporarily shut down operations at three of its nine production facilities. Hackers installed malware on the pulp and paper manufacturer's IT system software that sent essential data to production mills, telling manufacturing operations machines about required criteria like paper quantities and dimensions. The manufacturer's Canadian operations had to be temporarily halted until the attack could be resolved.

In January 2022, the Swiss-based CPH group experienced a cyber attack on its IT systems that caused it to temporarily suspend pulp and paper manufacturing operations at plants in Perlen, Switzerland and Mülheim, Germany. Approximately two weeks after the attack, the company announced that "all IT systems of the CPH Group worldwide were checked and restored from the backup systems together with external cyber specialists."

For secure remote access to operational assets, ANDRITZ Automation & Digitalization utilizes OTORIO's remOT to deliver secure, simple, and fully governed remote access to the operational environment.

ANDRITZ applies remOT zero trust security architecture as a service in clients' industrial environments in compliance with IEC standards for single sign-on controlled access to operational assets. Alternatively, clients can easily manage remote connections for all their third-party vendors by using remOT.

Summary

Industrial cybersecurity risks and ransomware demands affecting pulp and paper manufacturers' production are an unfortunate reality. Companies must proactively assess, manage, and mitigate OT security risks to protect business continuity and maintain resilient operations.

OTORIO and ANDRITZ bring their extensive experience and industrial-native cybersecurity expertise to help you assess, monitor, and manage industrial risks. From helping to ensure safe pulp and paper manufacturing operations to reducing risks and vulnerabilities that can impact your production, worker safety, critical infrastructure, and regulatory compliance, our proven OT security solutions and services can enhance your cybersecurity posture and help safeguard your industrial production.

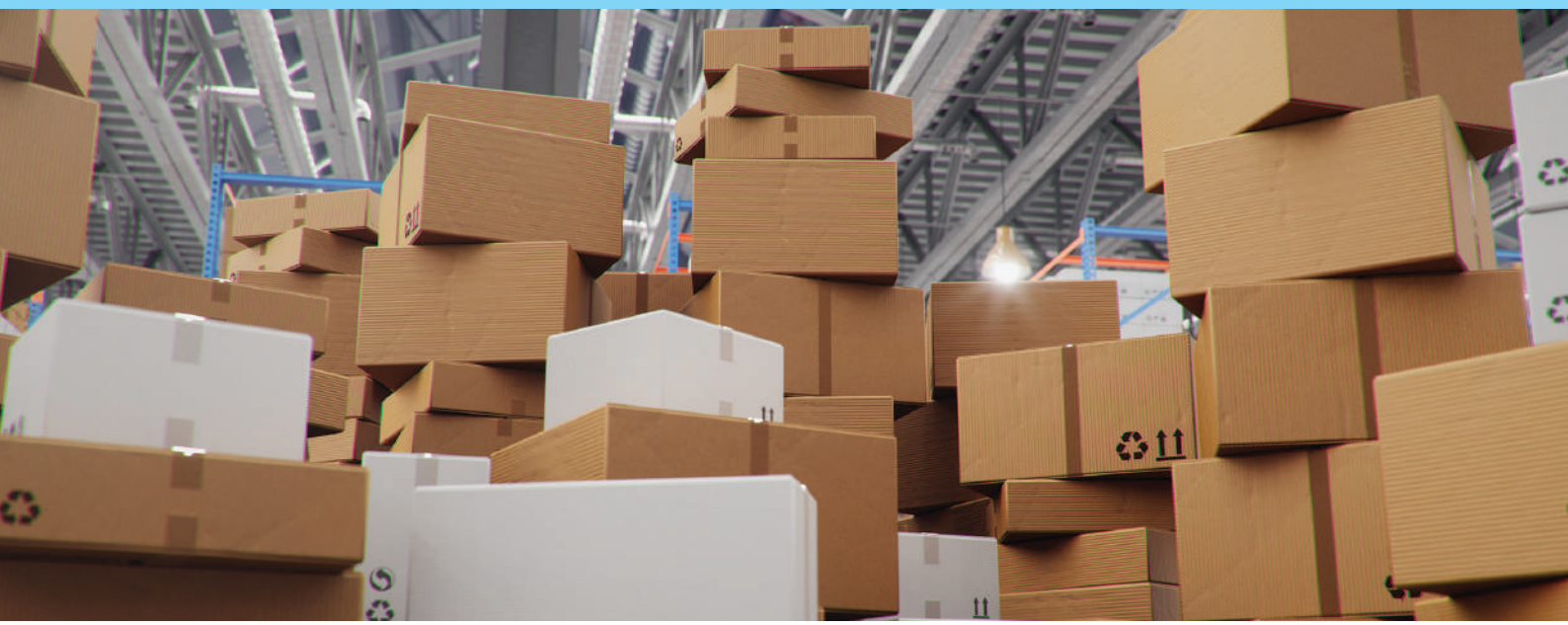
Daniel Bren, Co-Founder and CEO, OTORIO

Omya Calcium Carbonate is Pushing Boundaries in Packaging Board

Edgar Habich, Global Business Development Manager Paper & Board, Omya

INTRODUCTION:

As consumer behavior shifts in how goods are purchased and consumed, product packaging must change to match the new behaviors. Due to the global COVID-19 pandemic, we have seen an acceleration in some buying behaviors toward e-commerce where people who may have been reluctant in the past to shop anonymously online are now fully embracing this new approach.



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Another aspect of the ongoing shift in consumer behavior is the increasing awareness to adopt more sustainable and environmentally friendly lifestyles. The three golden “R’s” for packaging - Reduce, Reuse, Recycle - have gained importance as notions of sustainability continue to touch everybody on planet Earth. However, even when consumers are behaving as environmentally friendly as possible, there is still complexity faced by the packaging industry to try and realize sustainability goals.

All of the shifting consumer behaviors mentioned have created a significant tailwind for cellulose-based packaging producers. Containerboard grades making corrugated products and cartonboard have always been, and continue to be, looked upon favorably through a sustainability lens by the global packaging industry. These products are successful because they are produced, traded, used, and recycled all around the world. Packaging made out of cellulose fibers, which are readily available and cost-effective, performs reliably but there is still room for improvement. In the rest of this article, we will have a closer look at the current and future needs for containerboard and cartonboard and review some available solutions.

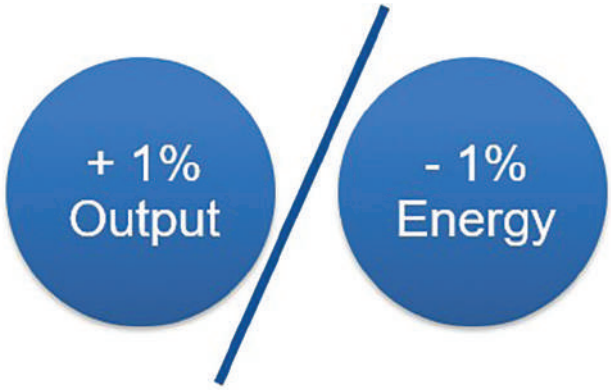
Omya, as a leading global producer of calcium carbonate and a worldwide distributor of complementary specialty materials, has built a solid network in the packaging board industry. Based on profound knowledge, and a strong product portfolio backed by a reliable supply chain the company is appreciated by its customers and partners.

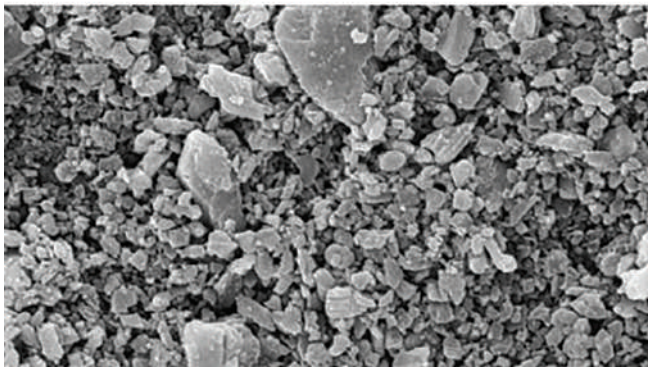
During the mid-2010s Omya began to look closer at containerboard, specifically testliner grades. The vast majority of this linerboard in most of the world is made out of recycled fibers, mostly old corrugated containers (OCC). In recent years the industry landscape experienced significant growth with new machine capacities by either green field projects, upgrading existing assets, or conversion from Graphic Paper machines. This growth resulted in greater awareness of recycled fibers as a precious raw material.

In 2015 Omya introduced a concept utilizing specific mineral fillers in the containerboard production process. With an initial focus on boosting board machine output, this concept has convinced a significant number of containerboard mills to begin using Omyaboard mineral fillers. Omyaboard grades improve the de-watering performance in the wet-end section of the machine. By having the same specific energy intake in the drying section, the machine output can be increased significantly. Based on experience as the rule of thumb 1% Omyaboard brings a 1% output increase or a 1% reduction in energy demand for drying.

This concept is not only limited to increased output. In cases machine speed is already maxed due to increased drive train or other mechanical reasons, implementing Omyaboard also allows reduced drying energy demand per tonne of paper produced. In these times of especially volatile energy prices, when for example Natural Gas EU Dutch TTF Spot (EUR/MWh) is almost four times higher in August 2022 compared with the beginning of this year. Similar strains are seen in the North American industry as the Natural Gas Spot Price Henry Hub (USD/million BTU) spiked in August almost 2.5 higher than in January 2022. Unused portions of available energy capacity can be utilized for other purposes when applying the Omyaboard concept in the scope of energy savings. Selling off overcapacity into the grid is an attractive option too.

The secondary ash content of incoming recycled fibers is a parameter that impacts the relevant mechanical properties of testliner grades, such as SCT (Short Compression Test) or Burst Strength. Fiber quality will always vary in each geographic region but the fiber mix will vary as well. In a specific case where the secondary ash level was 16%, when substituting recycled fibers with Omyaboard at 2% mechanical properties of the testliner were not degraded. Implementing this mineral filler concept could also support the quality consistency in containerboard grades. There are even ideal cases where an integrated ash level sensor measuring secondary ash level can trigger the appropriate dosage rate of such filler by targeting a constant ash level of the final linerboard.





Every case is unique because of the paper machine configuration, range of linerboard grades produced, available fibers, and other aspects. By starting with a comprehensive wet-end analysis covering various factors, Omya specialists will develop a proposal for the best-fitting Omyaboard product and can guide you through implementing this concept in your production.

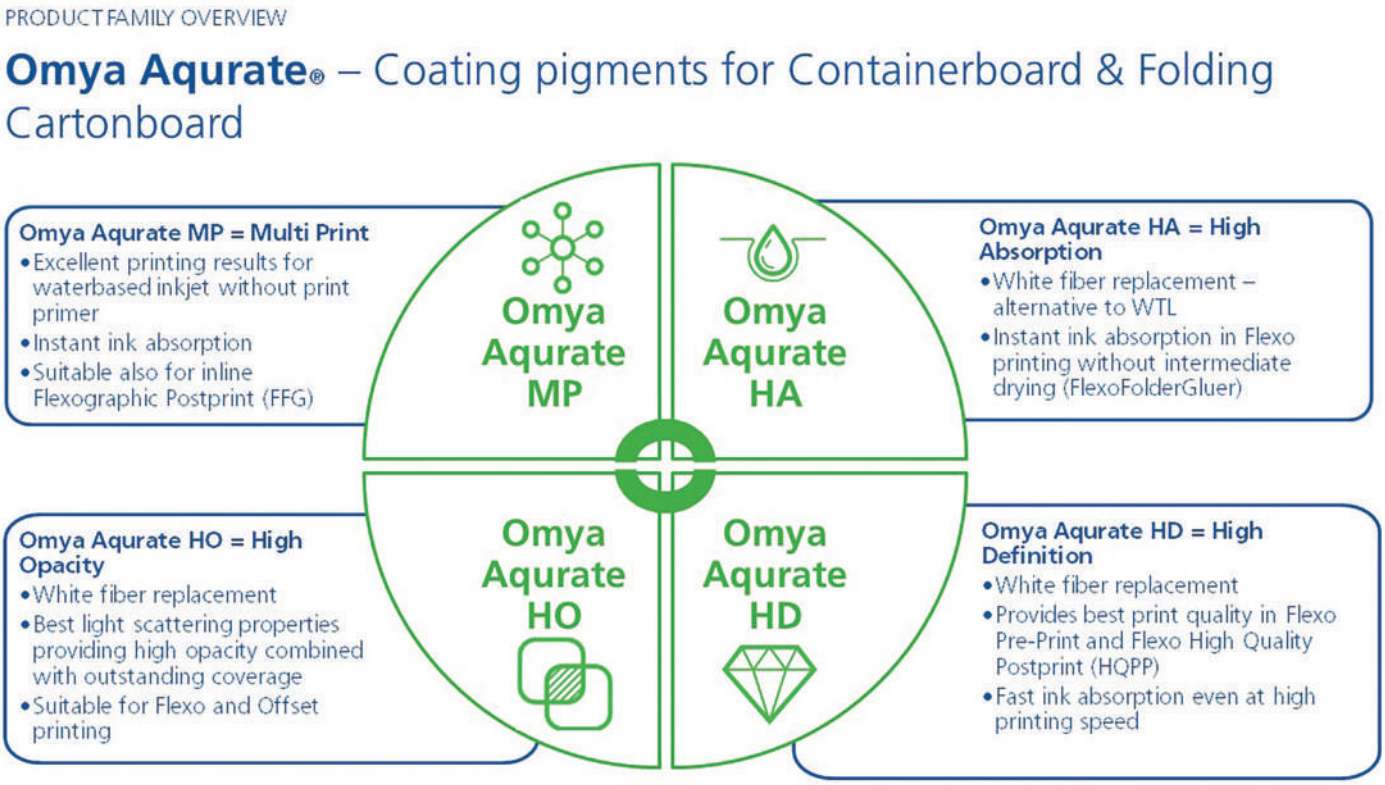
The attractiveness of recycled paper and board as a fiber source is only possible because of the reliable and proven infrastructure to collect and process this resource in many countries. However, structural changes in the paper market, specifically with the demand for graphic paper, are severally affecting the available volume of high-quality fibers which feed the recycled fiber streams. Stakeholders in the industry are continuing to report concerns about skyrocketing prices for white shaving or other adequate fibers. Besides the price, the availability of required volumes is even becoming a challenge. The future of white fiber availability doesn't seem likely to change, so what if there was a way to circumvent a dependency on white fibers?

The Omya Aqurate coating pigment product family addresses the needs of packaging board manufacturers and converters. Omya Aqurate is a modular set of products that offer alternatives to any packaging grades that contain a white ply through coating directly onto the brown or grey fiber plies. With Omya Aqurate, manufacturers can substitute white fibers completely with a coating.

Omya Aqurate products are not only focused on the board manufacturer because they perform well in other parameters beyond just excellent coverage and brightness. Omya Aqurate coated substrates also provide a solution to various challenges in the downstream printing and converting processes. Take for example Omya Aqurate HA25, a type of ground calcium carbonate (GCC) pigment that stands out with instant ink absorption. In this case, the Aqurate coated linerboard will work ideally when printed on a FlexoFolderGluer. These sheet-fed printing assets are still the vast majority of the machines installed for printing onto corrugated board. For Flexographic Inline postprint technology the biggest challenge is typically the lack of an intermediate drying step after each printing station. Even though most print jobs have only 2 or 3 colors, the board surfaces need to manage the incoming ink freight without compromising quality (ink smearing) or machine speed. Omya Aqurate HA25 is not the only Aqurate pigment that converts well, all pigments in the product family were designed and tested to allow for seamless converting increasing, folding, gluing, etc.

There is another side of printing on the packaging board where photorealistic designs are printed in high resolution. Renderings of lively color gradients, gentle skin tones, or homogeneous dark color full-tone areas are required. Ambitious prints like this are enabled by new generations of flexo printing machines like High-Quality Flexo Postprint (HQPP) and Flexographic Preprint. Typical substrates used for these printing jobs are Coated White Topliner (CWTL), Solid Bleached Sulfate (SBS), or Coated Bleached Kraft (CUK). The correct substrate is required to take full advantage of the excellent capabilities of these new, top-notch, printing machines and meet premium quality demands without compromising possible machine speed. Omya Aqurate HD30 top-coat pigments deliver precise and vivid high-color reproduction at high printing speeds because of their fast ink absorption.

While the performance of Omya Aqurate pigments in printing and converting is strong, the value of this product family is not only limited to these process steps. Taking a holistic view, with an Omya Aqurate-based coating replacing white fibers, a new space is opened up for different aspects of packaging board. Light-weighting, or said better, right-weighting of packaging can be realized by taking the Omya Aqurate approach. A typical WTL, substance 140 gsqm, has a white fiber ply of 35 gsqm and a target brightness of 73% (TAPPI). Based on proven cases, the white fibers can easily be substituted with a coating layer of approximately 15gsqm with Omya Aqurate HA pigments, achieving the same brightness, homogenous coverage, and identical converting results. The 20 gsqm saved by the difference between 35 gsqm of white fibers versus 15gsqm of coating, can now be allocated to a certain extent to the brown fiber ply to fulfill the mechanical requirements in SCT, Bursting Strength. When right-weighting board manufacturers can choose to use the Omya Aqurate approach to reduce the total weight of their board and reduce the Carbon Footprint of packaging by replacing precious white fibers and optimizing grammage.



Mathematical modeling of mechanical dewatering in the press section

Timo Frick, Simulation Expert, Voith Paper
Dr. Siegfried Graser, Simulation Expert, Voith Paper
Dr. Bettina Grashof, Senior R&D Manager Simulation, Voith Paper
Dr. Natalie Osti, Simulation Expert, Voith Paper

INTRODUCTION:

Sustainability has recently been a focal point of attention in the industry. This development has been highly accelerated by the soaring prices for fossil energy following the current global market situation. Sustainability comprises decarbonization of energy sources as well as lower energy and resource consumption. An improved mechanical drainage significantly reduces thermal energy consumption in the subsequent dryer section and hence increases the energy efficiency of the papermaking process. Furthermore, mechanical draining significantly defines the properties and quality of the paper. However, the physical processes inside the press nip are still poorly understood and can be only measured with high efforts. Sophisticated mathematical modelling and high-performance simulations offer process insights, which are difficult to achieve by measurements, and can be used to improve and redesign the process and components involved.

The drying process of the paper web is the reason that the pulp and paper industry is one of the most energy intensive industrial sectors. Within an integrated pulp and paper mill the energy requirements of the dryer section is one of the largest energy consumers [1] and is responsible for about 20% of the total energy consumption in the papermaking process [2]. By increasing the dry content of the paper web before it enters the drying section, high energy savings can be achieved (see Figure 1).

To reach this goal, the mechanical dewatering in the press section plays an integral role and needs to be optimized. In the press section the dry content of the paper web is increased by the application of mechanical pressure leading to a removal of free water from its pores. The mechanical dewatering in the press section not only allows for a reduction of steam consumption crucially in the dryer section, but also increases the strength of the web crucial to avoid web breaks. However, despite the economic and environmental importance of press dewatering, the processes taking place inside the press nip are not yet fully understood. These include the interaction between the two-phase flow of water and air, as well as the mechanical compression and expansion of the porous materials of the press fabric and the paper web.

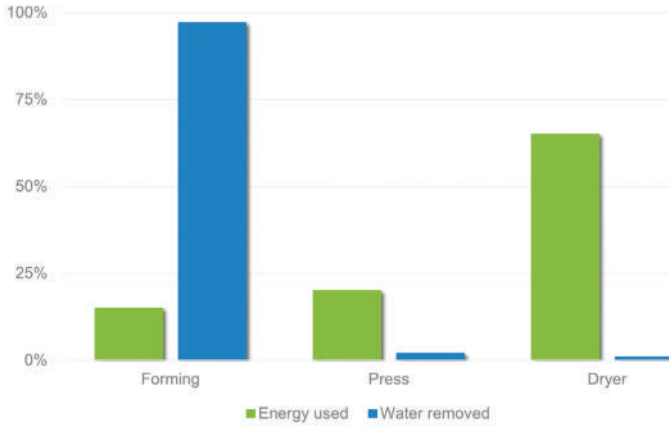


Figure 1: Comparison of the press section with the forming and drying sections concerning overall water removed and energy used [3].

Modeling and simulation of the process steps involved in the dewatering of the paper web offers insights into the mechanisms of water removal and sheet formation, which are not available solely from measurements and experiments. Additionally, virtual parameter studies allow for the identification of important influencing factors that are the basis for a suitable choice of test cases. In this work we will show that our simulations give new impulses that can directly be used to improve processes and redesign components. We will start by introducing our modeling approach and then present results of our simulations which are used to support and speed-up the development of new products in the press section. We will also point to challenges of the method especially in the identification of effective material parameters to describe the wet paper web and fabrics.

Figure 2: Voith's Tandem NipcoFlex press which combines two inline shoe presses is a press concept with a wide application window.

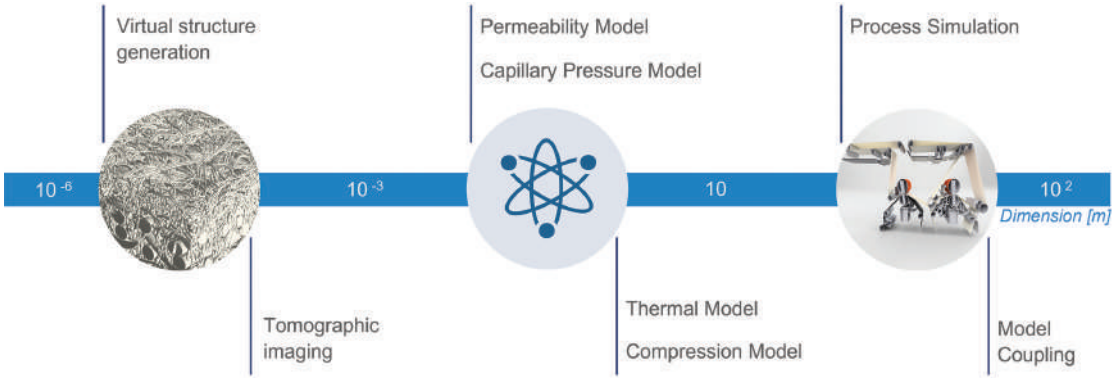


Figure 3: Multi scale approach to the simulation of the papermaking process.

Simulation approach

Our modeling covers the full paper machine from the initial dewatering of the paper suspension, over the mechanical dewatering of the preformed paper web up to the thermal treatment of the paper web in the dryer section. To achieve this, we use a multiscale approach, as shown schematically in reference (see Figure 3) with models covering the whole range of length scales from the micrometer scale of fibers and fillers to the several hundred meters of a full-scale paper machine. To obtain the needed geometry and parameters for our models, lab measurements especially tomographic imaging as well as virtually generated structures are used. On the micrometer scale, the effect of fines and fillers is included by modifying, parameters such as dewatering behavior or the pore volume distribution.

Different kinds of mathematical modeling and simulation tools for different length scales enable us to determine the necessary parameters and derive the required material models as described in the following sections. On the paper machine scale we use an in-house process simulation library that allows us to simulate complete sections of the paper machine. Here, we follow a modular concept starting from individual flow and material transport modules that are then combined to larger units, e.g., suction boxes or a press nip. It ensures fast and efficient calculations by reducing the level of detail and defining effective parameters describing the important aspects of the materials. Finally, we combine the different section models to describe the full length of the paper machine.

Image-based structural analysis and flow analysis

Realistic material parameters for both press fabrics and the paper web are required as input parameters for the process simulation model of the press section. The availability of high-accuracy tomographic imaging together with fast and efficient numerical methods to study the mechanical and fluid dynamic properties of the fiber web and paper machine fabrics enable a detailed view of the structures and properties of the materials. In CFD simulations, mass, momentum and energy balance equations are solved with numerical methods based on a calculation grid which describes the porous structures of the press fabric or the paper web. As a result, flow velocities v, concentrations c and pressure p distributions inside the pore volume of the press fabrics can be visualized in detail (see Figure 4). Studies of the fabric in different compression stages allow the determination of the compressed pore structure and its physical properties. The absolute and relative permeabilities κ and κ_r, which are related to pore size distribution and water saturation respectively, are derived from Darcy's law [3]

$$v = -\frac{\kappa\,\kappa_r}{\mu}\frac{\partial p}{\partial x}$$

with μ being the dynamic viscosity of the fluid and ∂p/∂x being the local pressure gradient. Darcy's law describes the two-phase flow of water and air, where water is described as incompressible medium, while air is compressible following the ideal gas law. These parameters are then used to describe the dewatering capability of the porous material during the process of mechanical dewatering within the process simulation.

Image-based analyses provide additional information on the pore size distribution, porosity and capillary pressure curves as a function of the water saturation. Porosity and permeability are related, e.g. by power-laws, depending on the results of the image analysis. For the process simulation of the press section this relationship is of great importance.

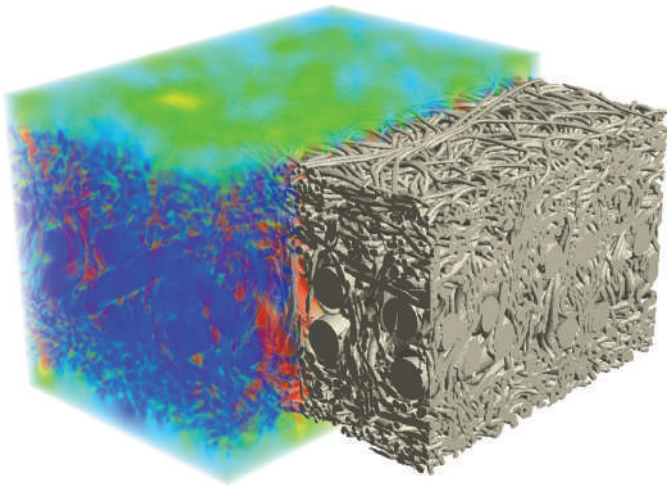


Figure 4: Flow Field of press fabric subject to a laminar flow.

Effective material models

With the small-scale simulations described in the above section, we obtain the effective parameters for the process simulation, describing the important aspects of the materials involved in the dewatering process. This is necessary because the complete process of paper dewatering cannot be modeled on this high level of detail. One of these models is described by Terzaghi's principle [5], where the total pressure is divided into hydrostatic pressure and structural stress and thus coupling flow and structural properties of the porous materials.

Other examples of our material models, as shown in Figure 5, are capillary pressure relations and relative permeability curves. These flow properties are archived by fitting, for example, a Brooks-Corey model [6] on the results obtained by CFD simulations described in the section above.

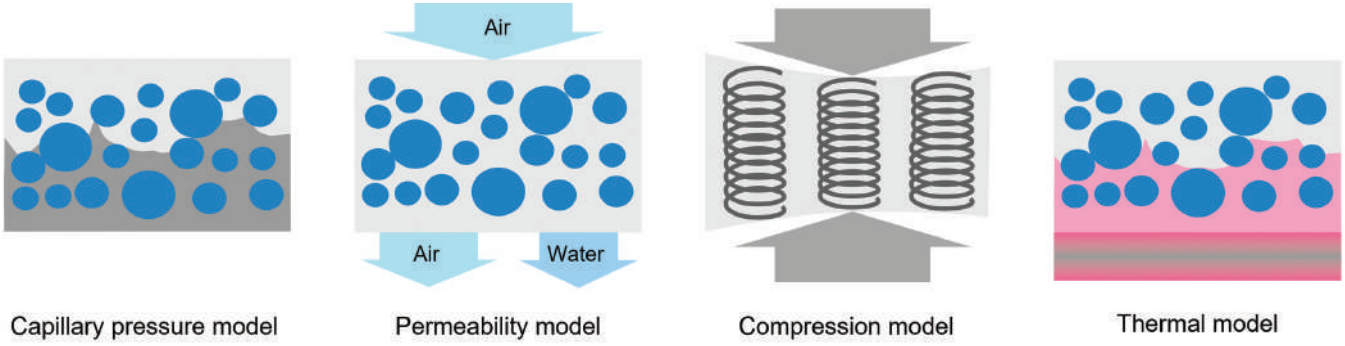


Figure 5: Examples of effective material models describing different aspects of the fluid-fluid, fluid-structure and structure-structure interaction which are used in the simulation.

To account for the compression of the paper web and the press fabrics either a viscoelastic-plastic model of the fiber mat [7] or an empirical model following compression curves from lab measurement are introduced as effective material models. For the study of thermal effects such as e.g., the evaporation and condensation of water inside the pores or temperature dependent changes of the viscosity of water we also included a thermal model based on the heat transport in a partially saturated porous media.

Process simulation library

The effective material models described above are then used as building blocks of the process simulation model describing the process behavior in the entire press section. They enable predictions of state variables like dry solid content, hydraulic pressure or water saturation, while not resolving the microscopic aspects of flow and compression. We use the Modelica modeling language and follow a modular concept, starting from the individual flow and material transport equations that are then combined to larger units. These units describe, for example, a press fabric layer or a layer of the paper web and can be combined to any requested paper – fabric – roll cover sandwich. The different units interact via connectors exchanging physical information about mechanical, hydraulic, pneumatic or thermal states and flows as shown in Figure 6. We include process variables as e.g., machine speed, line load and pressure shape (roll or shoe press) and are thus able to analyze the dewatering performance of different press sections or compare press fabrics for a defined press nip setup.

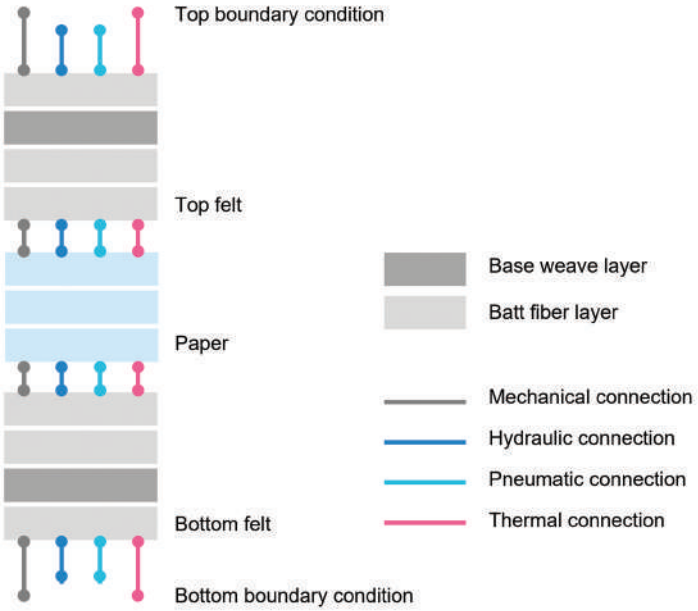


Figure 6: Schematic view of the process simulation model of a double-felted press nip showing the modular approach for the porous media layers as well as the press boundary conditions.

Application

To study the validity of our process model we developed a simulation setup analogous to a test setup in our experimental and pilot facilities. The setup defines a roll press nip with a single felt with defined initial saturation of the felt, constant speed and constant line load. Two different press fabrics were measured on the experimental setup and simulated in the process simulation by changing the press fabric parameters, e.g., permeability, porosity and compressibility. These parameters were obtained from lab data and small-scale simulations as described in the sections above. As a measure of the dewatering performance of the press fabric, the cumulated water mass flow from the bottom of the press fabric after the press nip is shown (Figure 7). The results show that felt A had a significant better dewatering performance compared to felt B. These results were also confirmed by the experimental setup where the same trends could be seen.

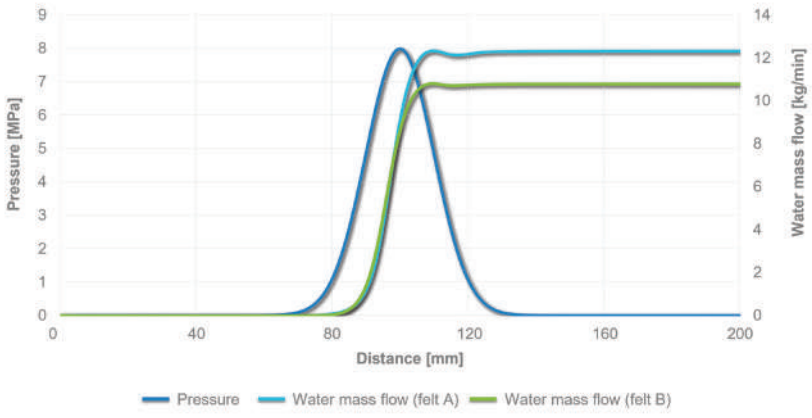


Figure 7: Results from the process simulation: Pressure profile and dewatering behavior of two different press fabrics in a roll press nip.

In addition, the influence of machine parameters, e.g., line load, as well as the influence of initial parameters, e.g., initial saturation of the press fabric, have been analyzed and confirm that we gain a deeper understanding of the interaction of the different elements in the press nip by making use of the mathematical modeling and simulation. Therefore, the process simulation helps us to reevaluate existing press fabrics and press nip concepts and is also used to develop new customized fabrics and concepts for specific customer needs. With each application of the current model library, we constantly reevaluate and refine the existing models and extend their validity and range of application.

CONCLUSIONS AND OUTLOOK

With its capabilities to optimize current processes with respect to resource efficiency and product quality process, simulation is at the intersection of two megatrends: digital transformation and sustainability. In comparison to virtual sensors or pure data models which gain their high reliability in the prediction of process parameters from a period of training, multiscale simulations keep their strong physical backbone in each step and allow insights into processes and materials. In the context of decarbonization and increased process automation, where new and disruptive technologies are discussed and no long-term experience is available, scientifically sound prediction of process stability, process efficiency, and production costs are essential to effectively decide which path to follow. Also, with new green materials finding their way into the product development of paper machine fabrics and roll covers, process simulation can help to predict their performance in their final application at the customer site. With an ever-growing field of applications and a constant advancement in the extent and the quality of our process simulation library our efforts also help in addition to secure know-how and extend technical expertise with modern and state-of-the-art tools and methods.

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Metsä Greaseproof Papers GmbH Düren saves water and energy at the mill

Martin Koepenick, Senior Marketing Strategist, Innova International Corporation

INTRODUCTION:

Baking and cooking papers play a growing role in the circular economy as chefs, bakeries, and cafeterias seek to provide healthy menus while cutting down on wasted food, energy, and water use for clean-up.

"High-performance SAGA papers from Metsä Greaseproof Papers in Düren, Germany are a clear win for sustainability for our customers…and at the mill," says Michael Barth, Vice President Operations GPP and mill manager.

Barth adds, "We use PEFC and FSC certified fiber from our parent company and outside suppliers. Our customized pulp and papermaking equipment achieves unmatched sheet properties for greaseproof papers – and we continuously look for ways to improve our production efficiency. What's more, our products are recyclable, biodegradable, and compostable - contributing to a reduced carbon footprint for the entire process."

Figure 1: Michael Barth, Vice President Operations Greaseproof Papers and mill manager (left) and Tim Godesberg of Metsä Greaseproof Papers GmbH Düren, produce the SAGA brand of greaseproof baking and cooking papers. They excel at achieving sustainability targets like water and energy savings. So do their cooking and baking customers. Add flexibility, productivity and less waste to the success, and you see the potential of a truly circular economy.

SAGA for baking and cooking--a true proof of success

SAGA greaseproof baking and cooking papers are used by cooking professionals to make millions of meals per year. By lining baking trays in bakeries and GN (Gastro-Norm) metal pans in institutional kitchens with SAGA paper, our professional customers rarely waste a single loaf of bread, pastry or food. Equally important, they save water, energy, and time because of easy clean-up. Easy freezing is another advantage. The same is true for at-home chefs.

Sustainability gains at the mill

Innovative process changes to one of the paper machines at Düren mill have boosted up-time, especially important with frequent grade changes. The mill's product mix is made up of several grades of baking and cooking papers. Baking, cooking and wrapping papers each have unique characteristics and requirements.

"In the past, we got the air out of our stock preparation system with a massive and costly decculator. A simple change to the POM system from AFT allowed us to reduce energy costs and much more," according to Tim Godesberg, maintenance manager at Metsä Greaseproof Papers Düren. Heated process water can now be utilized in the production process and not lost to the wastewater plant.

Figure 2: Comments Tim Godesberg, maintenance manager, "Greaseproof paper requires a lot of refining. We aim for no pinholes on the sheet surface. We must have an excellent network of fibers, then only a little silicon on both sides. Customized Finebar refiner segments help us meet our quality targets and use less energy."

About Metsä Greaseproof Papers, Düren

- PM5 paper machine making grease-resistant papers
- Global sales to over 60 countries,
- PEFC and FSC certified fibers from sister company in Finland, supplemented with PEFC/FSC pulp from other sources

Mill history with AFT

- Mechanical turnkey retrofit POM system, cleaning plant, engineering, installation, and start-up, combining with existing piping and equipment.
- POMp430 Degasser & Flexible Cascade cleaning system
- Spare POMp degasser, including basic engineering
- Finebar refiner plates, custom-designed for small units
- AFT cylinders and rotors for the headbox screen

As Godesberg puts it, "When you minimize circulation in stock preparation, you also reduce the amount of chemicals you need. You also have better control over fiber and your ability to improve performance in the sheet. Combined with optimized refining, we reach our targets for very smooth surfaces. The smoother the sheet, the better the product functionality for our customers. Installing the initial POM unit effectively impacted the mills production processes. "

Rapid ROI

Says Uwe Sonntag, AFT representative with Petax GmbH, "Everything about the AFT POM systems is small, except for the savings and increased output. Small investment. Small footprint. Reduction of time to change grades. Lower chemical usage. Less energy consumption. When we deliver a rapid ROI, and ongoing efficiency, we know we are making a difference that's highly valued."

The right team

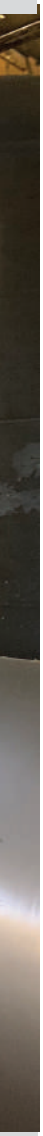
Godesberg stresses the importance of finding the right partners for projects, both short and long term. "What is good service? First of all, it's equipment that requires little service. Second, when you need help you can be assured it is achievable right away." Working together, Petax and AFT provide the fast response and knowledge on matters. "Our relationship is all about making our process more efficient, meeting and exceeding customer expectations."

Continues Barth, "Flexibility of ideas is what the best relationships are about. Sometimes figuring out how to overcome small bottlenecks opens the way for much bigger advances. That's our criteria for a lasting relationship. Our team excels because we have a clear vision. This allows everyone to seek targets with precision. With AFT, we have the confidence to keep or modify existing equipment while upgrading with strategic high-performance new equipment. Our decade-long relationship is based on truly cooperative decision making."

Concludes Godesberg, "AFT will support us in the upcoming projects, even outside the scope of what they supply, as they understand us well and our commitment to innovations and quality."

Figure 3: Notes Tim Godesberg, "Our management team seeks return on investment. AFT provided this with their POM system, allowing for easier grade changes and consistent quality."

AFT is a global supplier specialized in stock preparation, screening, refining and paper machine approach flow systems. With over 100 years of experience, they offer solutions tailored to the customer's furnish, mill process, and end product being produced in order to optimize the return on investment. For more on AFT technologies, visit https://aft-global.com



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How to optimize paper machine performance by upgrading your wire section

Roland Eckerstorfer, SmartTable expert and Business Development Manager, Röchling Industrial Oepping

INTRODUCTION:

Until now, Fourdrinier wire tables were designed for one main paper grade. At this grade, the activity of the fiber suspension as well as the dewatering performance of the equipment was in an optimum range. When producing products which were much different to the design grade, the activity level as well as the dewatering behavior could have been much different too. There were only limited adjustment possibilities to compensate these negative influences. This article describes a solution to be able to adjust the settings for all paper grades of a wide product range to an optimum.

These days the Pulp and Paper market is expecting a high flexibility from operators as well as paper machines. Many mills need to produce a big product range to fulfill the needs of their customers. Up to more than 100 different paper grades, all produced on the same wire table, are not uncommon. This leads to big differences in production parameters. Machine speed or basis weight are only two parameters which can be different by more than double.

These changed parameters of course do also influence the behavior of the suspension on the wire table. The activity level can change from totally flat to stock jumping, affecting the paper quality significantly.

Röchling Industrial Oepping recognized this challenge for papermakers early on and has been working on finding a solution for years. The advancing digitization and extensive automation came at just the right time. The company used its potential to develop the new Robasmart product family. The naming consists of “Roba”, which stands for the company’s affiliation with its roots - all product groups from this company start with this name - and “Smart”, which stands for the intelligence of this product family. A part of Robasmart is the SmartTable. It defines the intelligent wire section solution for optimized paper grade production by configuring the dewatering elements, vacuum and dry content values.

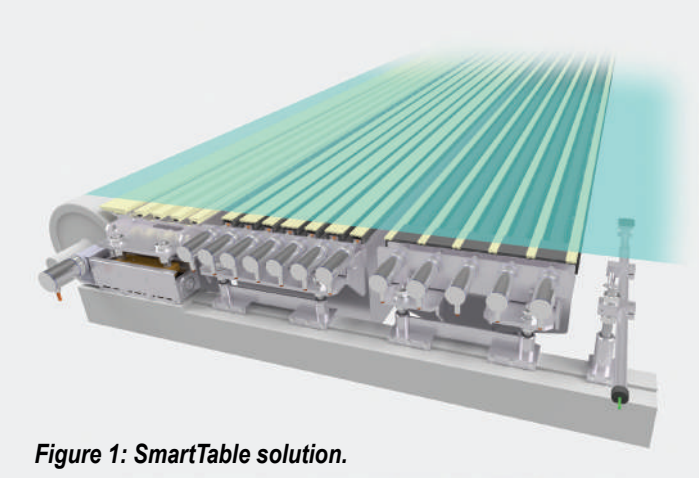


Figure 1: SmartTable solution.

The SmartTable solution allows to optimize every paper grade of a wide product portfolio with the highest efficiency and the best properties.

The SmartTable consists of individual components – Smart Foils, Smart Vacuum Valves and Smart Consistency Sensors. Each of them can be adjusted individually but also used as a complete solution package, which ensures a much better paper machine performance with increased efficiency. Figures like the following confirm the successful implementations at customers mills.

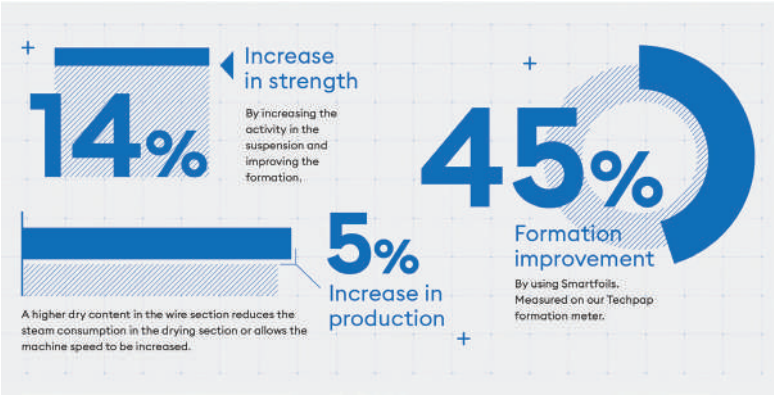


Figure 2: Improvements using a SmartTable.

Due to individual settings on the wire table, following improvements are possible:

1. **Formation and paper strength improvement**
2. **Increased drainage capacity**
3. **Reduced energy costs**

Let’s get in detail.

1. Formation and paper strength improvement

SmartFoils significantly improve the quality of all paper types. The possibility to individually adjust the foil angle and height increases the drainage capacity and optimizes the activity level in the sheet forming zone of the wire table where the fiber mobility takes place.

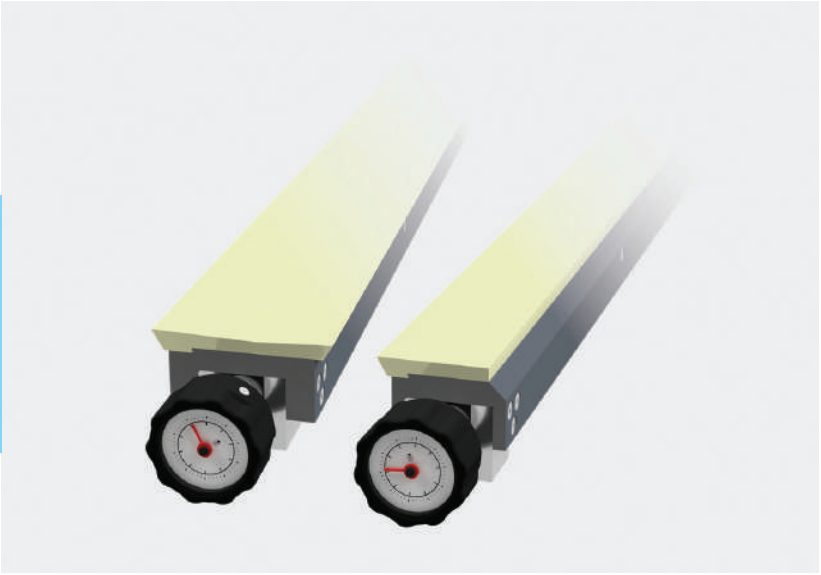


Figure 3: Smart ActivityFoil and HydroFoil.

Using the continuously adjustable elements, the foil angle (in case of HydroFoils) and the foil height (in case of ActivityFoils and FormationFoils) can be adjusted. This leads to an optimal activity level of the suspension. Subsequently the formation can be improved significantly.

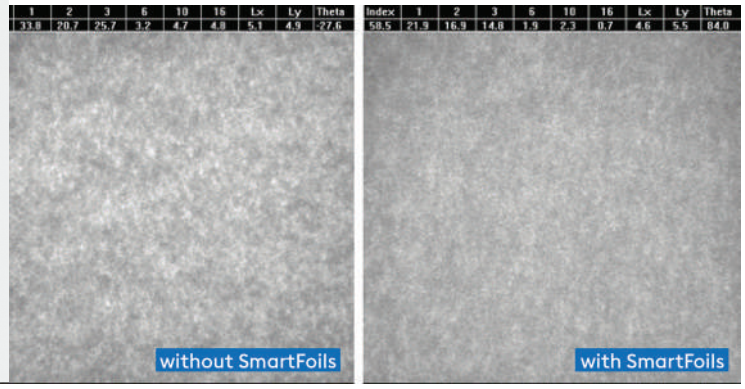


Figure 4: Comparison of not using SmartFoils and using SmartFoils | Formation value was measured with optical formation measurement laboratory device (Techpap 2D lab). The lower the value, the better the formation.

A better formation leads to higher strength properties, followed by a better paper quality, or the possibility to reduce costs for expensive raw materials like softwood or strength improvement additives.

Figure 5: SmartValves: Low-Vacuum and High-Vacuum Valve.

2. Increased drainage capacity

The vacuum is also just as important for the paper properties as the SmartFoils, and decisive for an optimal drainage efficiency. Incorrect vacuum settings and non-existent actual vacuum values very often lead to inefficient operation of the suction boxes, means high energy consumption and expensive operation costs.

Electronically controlled vacuum valves are an important part to individually control, both the low-vacuum area and the high-vacuum area of the wire table, and thus increase the paper quality and the dewatering performance through optimally applied vacuums.

Due to integrated vacuum sensors, operators have an overview of the existing vacuum in the suction boxes and are able to adjust it individually, if necessary. The vacuum control gives operators the safety to know what's happening inside the boxes as well as the possibility to easily reduce costs by minimizing the vacuum. The Röchling Smart Vacuum Valves are highly reliable due to their integrated cleaning mechanisms and maintenance-free because to their intelligent construction.

3. Reduced energy costs

"The more the better" is a common rule for the vacuum levels in a paper machine. But these unnecessary high vacuum levels often do not improve the dewatering. Quite the contrary, they lead to a high friction between dewatering elements and forming fabric. This friction causes several problems, for example:

- Higher wear of dewatering element and forming fabric
- High driving power
- Higher energy costs

With the combination of SmartValves for controlling the vacuums and the Smart Consistency Sensors, the vacuum can be reduced without losing dewatering efficiency. Unnecessary high vacuum levels are a thing of the past and therefore the driving power is reduced. Reduced vacuums also mean that less air flow needs to be provided. These two advantages can lead to significant energy savings.

Figure 6: Smart Consistency Sensor.

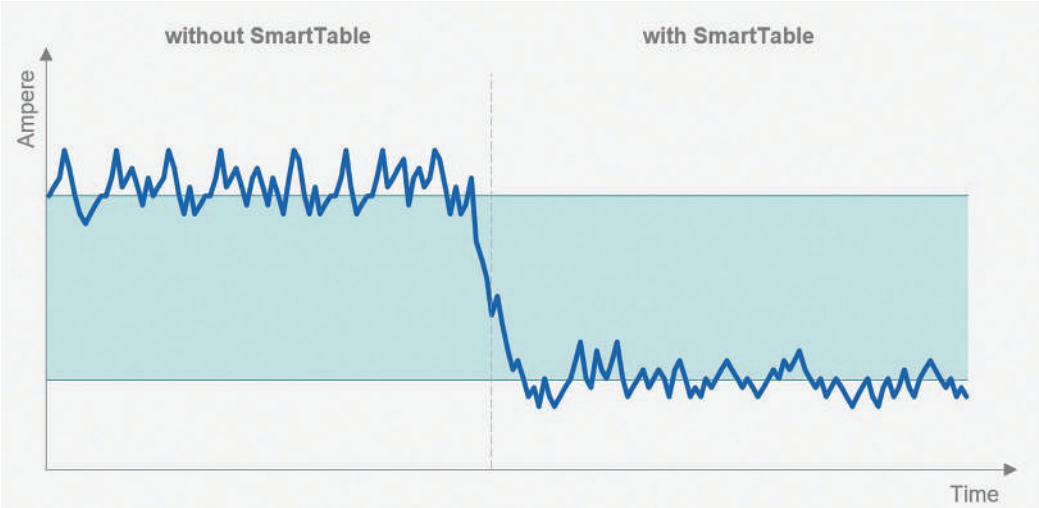


Figure 7: example for couch roll amps reduction.

Case study

A very successful packaging paper producer in the center of Mexico, who is now part of Americas biggest packaging paper producers, recently realized a fully automated SmartTable rebuild with Röchling Industrial Oepping. The scope of supply contained the complete SmartTable package:

- **An adjustable forming board box, which can be adjusted 100 mm in machine direction during operation**
- **New steel boxes equipped with Smart HydroFoils and Smart ActivityFoils**
- **New Low-Vac box with height adjustable Smart FormationFoils**
- **A trivac suction box**
- **The Smart Consistency measurement**
- **Smart Vacuum Valves**
- **SmartTable software**

The complete rebuild could be carried out in only 1,5 working days through the skilled Robaserv technicians from Röchling Industrial Oepping. Directly after the start-up, it took only two jumbo rolls to stabilize production until the improvements were visible. With the help of Röchling start-up engineers, the CMT value could be increased by more than +20% on all main grades with identical or also improved RCT values.

Furthermore, the dryness at the end of the wire table could be increased by +1%. This leads to a possible steam consumption reduction of 510 MWh per year.

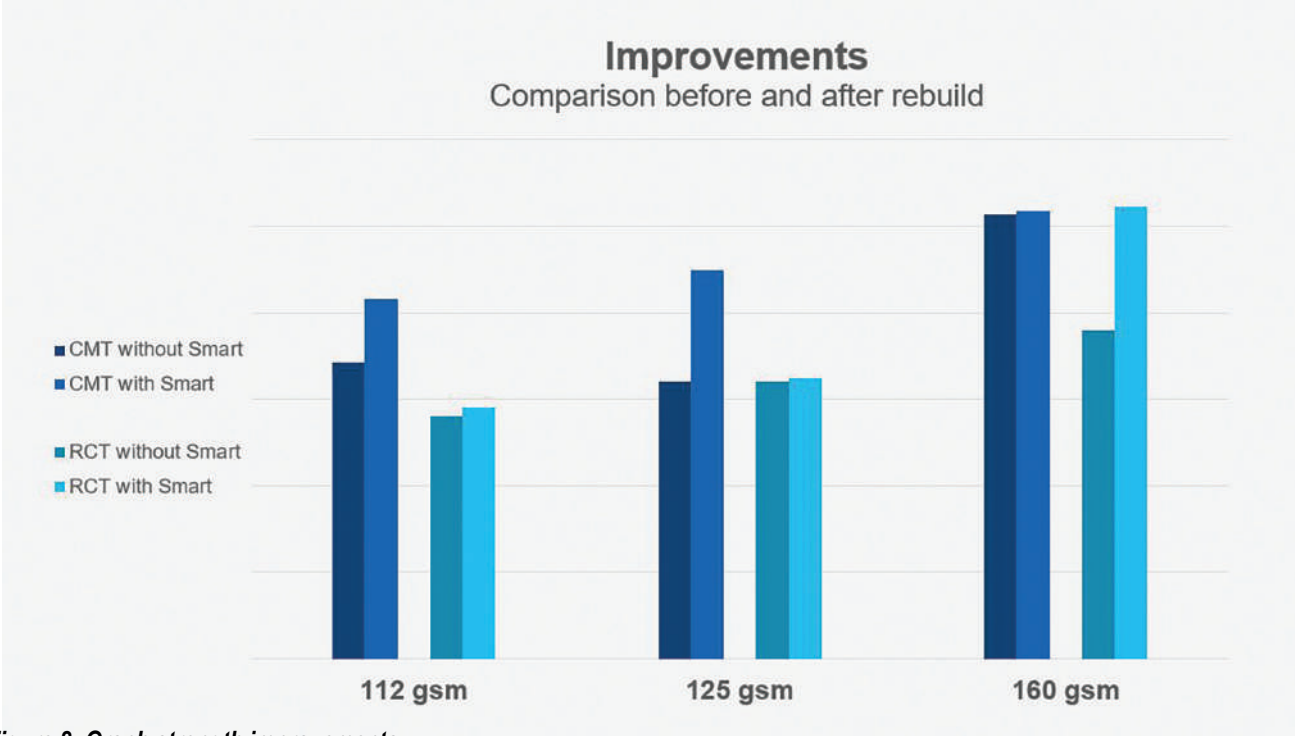
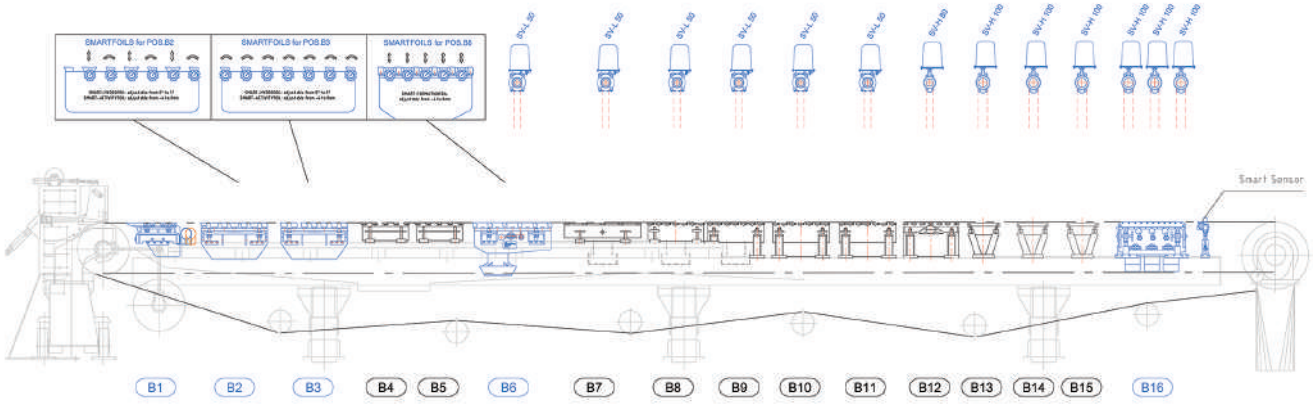


Figure 8: Graph strength improvements.

Figure 9: New wire table with SmartTable solution in Mexico.

Figure 10: Scope of supply.



About Röchling

In 1993, LERIPA joined the international plastic producing group Röchling and developed to a global player. To strengthen the force of the group, the company name LERIPA got renewed to Röchling Industrial Oepping. New name, but still the same expertise and product competence.

For more than 300 years now, Röchling Industrial Oepping has shown one more time that its pioneering force for innovative solutions works successfully. Röchling is more than only a spare part supplier. Röchling provides solutions and full packages with the goal of increasing paper machine performances, saving costs and keeping our environment healthy. SmartTable only is one product group Röchling has developed so far. But digital and sustainable values are the driving powers for ongoing projects.

Röchling

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How can you make more out of your biogenic CO_2 Episode 2

Engelbert Schrapp, Principal Corporate Account Manager, Siemens Energy

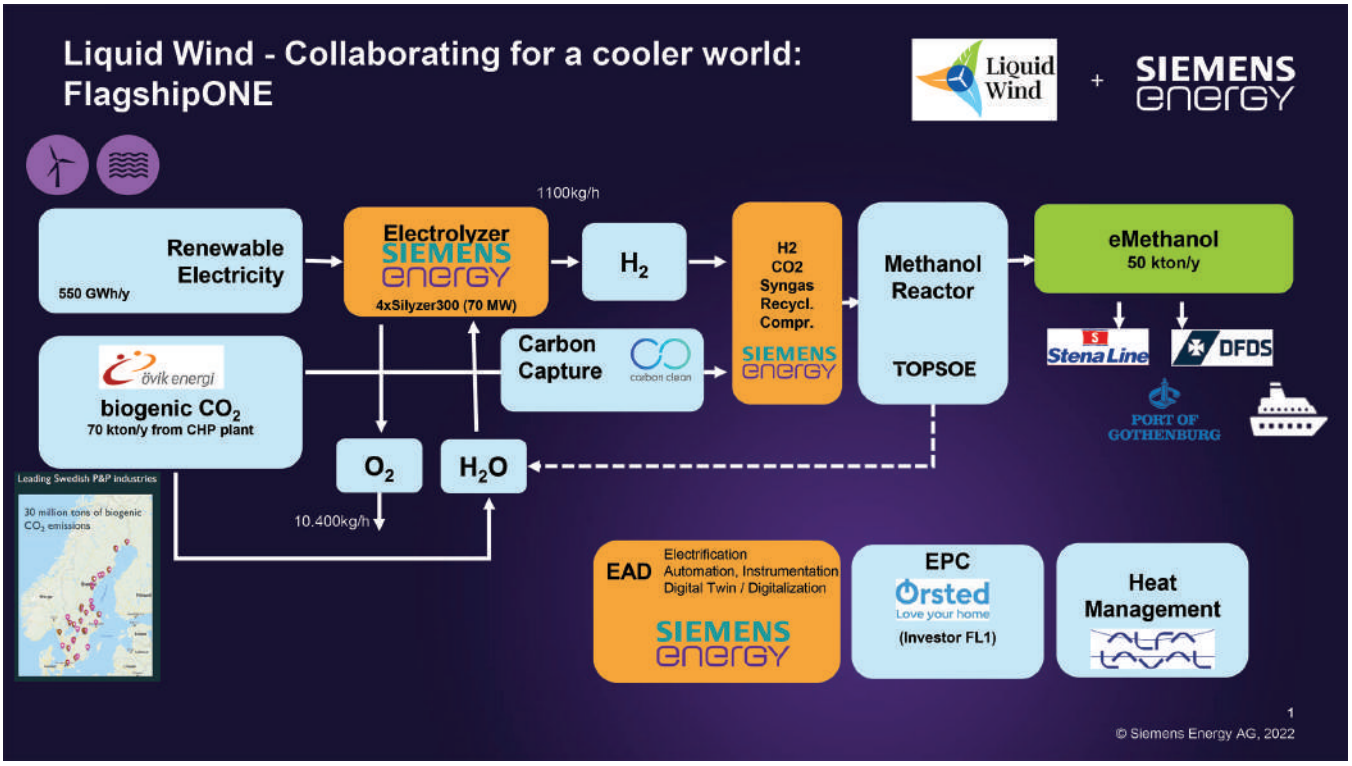
INTRODUCTION:

Regular readers of Paper Technology International might well remember the article I published in the 2022 edition, where I raised the question: "How can you make more out of your biogenic CO_2? The same would be the case for those who attended my presentations on the subject at the different Pulp & Paper Industry conferences last year, like the IMPS2022 in Munich or the Zellcheming in Wiesbaden. In both print and in person I have tried to give the Pulp and Paper community some" food for thought" on how and in which ways we can develop our industry to an even more sustainable footing. As well as additional benefits and business for the Pulp & Paper Industry, the environment can also be a winner.

For those who did not perhaps have access to Paper Technology International 2022 and therefore missed last year's article "How can you make more out of your biogenic CO_2 Episode 1?", I would like to briefly recap the content if I may.

The answer to this question is to use the biogenic CO_2 from your boilers etc., or from biomass based Combined Heat & Power Plants (as will be the case for Liquid Wind FlagshipONE) and use sustainable energy from Water, Wind and Solar Energy or your own powerplants. This electric energy feeds electrolyzers to produce Green Hydrogen. The H_2 and CO_2 moves on to Syngas Compression and a Methanol Reactor where, under high pressure and temperature, Green Methanol will be generated. Please see below overview about the FlagshipONE project, a Green Methanol plant which is now under construction and will start to produce in Q1/2025 round about 50.000 tons of CO_2 Neutral Methanol per year. Now following this short summary about FlagshipONE I would like to tell you about the actual Status Quo of this project, as certainly a lot of things have happened in the 12 months since the last article was published.

Figure 1: Methanol synthesis based on green hydrogen and CO_2 from biomass-based flue gas raises the prospect of a carbon-neutral industrial system. As a fuel for mobility applications and feedstock for the chemical industry, green methanol can decisively drive the de-fossilization of the shipping industry and other industry sectors. At the same time, integrating green methanol production into existing industrial facilities, such as pulp mills or combined heat and power plants, creates an opportunity to re-use a valuable resource like biomass-based CO_2.



In respect of FlagshipONE some major milestones had been achieved:

- The main, and most important milestone, was that at the beginning of the year of 2022 the investor to build this first of its kind eMethanol plant stepped in: Ørsted, a multinational power company and world renowned leader for offshore wind parks, located in Fredericia/Denmark. Coming from decades developing and building mainly wind parks, like the world biggest, Hornsea 2 off the UK East Coast, Ørsted decided to make the next logical step on their sustainability roadmap: using sustainable electric energy to generate Green Hydrogen or Green Fuels, as at FlagshipONE, to produce CO_2 neutral eMethanol.

- Another important milestone was that FlagshipONE obtained, in July 2022, the building permit from a district court under the Swedish Land and Environmental Court of Appeals, approximately nine months after the application was submitted, to build the first of its kind large-scale facility for producing eMethanol (or CO_2 neutral Methanol) at Örnsköldsvik in Sweden.

- But what is a plant for producing eMethanol without the off-takers for this Green Methanol? So in September 2022 Stena Line, DFDS, Ørsted and Liquid Wind partnered with the Port of Gothenburg to establish an eMethanol (e-fuels) hub in Gothenburg. As the largest port in Scandinavia, Gothenburg is the ideal choice for the first delivery and bunkering point for green e-fuels produced from FlagshipONE.

Stena Line is a Swedish ferry line company with an extensive European route network and DFDS is a leading European shipping and logistics company.

- On 19. December 2022 Ørsted's Board of Directors took a final investment decision (FID) on the 50,000 tonnes/year FlagshipONE e-methanol project. FlagshipONE will be Ørsted's first commercial-scale Power2X facility and is an important stepping stone towards their ambition of taking a leading position in renewable hydrogen and green fuels. Reinforcing the commitment to the FID, Ørsted has taken full ownership of FlagshipONE by acquiring the remaining 55% stake in the project from Liquid Wind AB, the original developer of the project.

- Ørsted will start onsite construction of FlagshipONE in the spring of 2023. The project will be located on the grounds of the current biomass-fired combined heat and power plant Hörneborgsverket in Örnsköldsvik, which is operated by Övik Energi. The e-methanol from FlagshipONE will be produced using renewable electricity and biogenic carbon dioxide captured from Hörneborgsverket; in addition, FlagshipONE will use steam, process water, and cooling water from Hörneborgsverket. Excess heat from the e-methanol production process will be delivered back to Övik Energi and integrated in their district heating supply.

- I can also announce that Siemens Energy, as with their other OEM partners for the building of FlagshipONE, have been contracted for the delivery of the Electrolyzers, entire Electrification, Automation, Instrumentation and Digitalization equipment, including the implementation of a Digital Engineering Master and Copy Landscape as the base for the future engineering of all other Flagships to come. The respective execution of the project is, in Siemens Energy, already under full swing, plant start of operation in the first quarter of 2025.

You may ask yourself meanwhile - interesting, but what has this all got to do with the Pulp & Paper Industry? Well, despite the fact that the Pulp & Paper Industry is the biggest emitter of biogenic CO_2, which is historically more or less 100% wasted (respectively "blown into the wind"), I would like to indicate that the "Making more out of your biogenic CO_2" is becoming reality and not anymore fiction or a "future vision". I can tell you clearly - step in! - you will no longer be the "first mover", which I know is something the pulp and paper industry doesn't like to be in most cases.

To raise your curiosity even more, I would also like to address the fact that FlagshipTWO is also already well on track and on the way to realization. In June 2022 Sundsvall Energi (Sweden/ Sundsvall) partnered up with Liquid Wind to be the host and provide carbon dioxide (and other infrastructures) for the second commercial-scale electro fuel facility in Sweden. FlagshipTWO is foreseen to produce double the amount of eMethanol as FlagshipONE, round about 110.000t/year of Green Methanol. Siemens Energy and the other partners of Liquid Wind are already working intensively on the respective FEED Study, to be finalized in summer 2023.

If you are still not convinced to also become, part of this success story, with "your own CO_2", it may help if I mention that FlagshipTHREE and FlagshipFOUR are also a part of Liquid Wind's road map, to have a minimum of 10 green Methanol facilities in operation by 2030.

Figure 2: Sundsvall Energi, biogenic CO_2 supplier and host for FlagshipTWO.

Integration into Pulp & Paper Mills

Coming back to the symbiosis of the Pulp Mill and e-fuel based methanol production: It is not enough just to utilize biogenic CO_2 from the pulp mill and subsequently e-methanol for the mill's truck fleet or shipping vessels for shipment. It is a symbiosis to use the surplus of the pulp mill´s biogenic electrical power and heat, the existing units for demineralized water supply and effluent treatment, also the surplus of oxygen from the electrolyzers and heat from the methanol facility. These can be used for the pulp mill´s bleaching and effluent treatment process, to skip the energy intensive air liquefaction on site and to generate a net of balance, as well as the bio-methanol/methanol route as part of the black liquor evaporation refinery step ahead of the recovery boiler. With the pulp and e-methanol production symbiosis the whole production could work as carbon neutral, due to the replacement of the natural gas fired lime kiln with e-methanol. (table 1)

	Adiabatic Flame Temperature, °C	Flame Length, m	Feed End Temperature, °C	Flue Gas Flow Rate, Nm³/h	Heat Rate, GJ/T lime	Max Refractory Temperature, °C
Liquid Fuels						
Crude tall oil	2109	7.7	261	33,243	6.8	1700
Tall oil pitch	1965	8.0	325	36,833	7.3	1617
Methanol	2108	7.7	251	32,689	6.7	1694
Turpentine	2075	7.8	275	34,053	6.9	1678
Fuel oil	2068	7.8	280	34,256	6.9	1700
Solid Fuels						
Conifer bark	2005	14.7	343	36,209	7.5	1449
Biomass wood	1982	14.9	354	36,780	7.6	1439
Lignin	2127	14.1	287	33,372	7.0	1487
Peat	2007	14.8	344	36,273	7.5	1445
Gasified Fuel						
Bark syngas	2226	13.2	244	31,033	6.6	1543

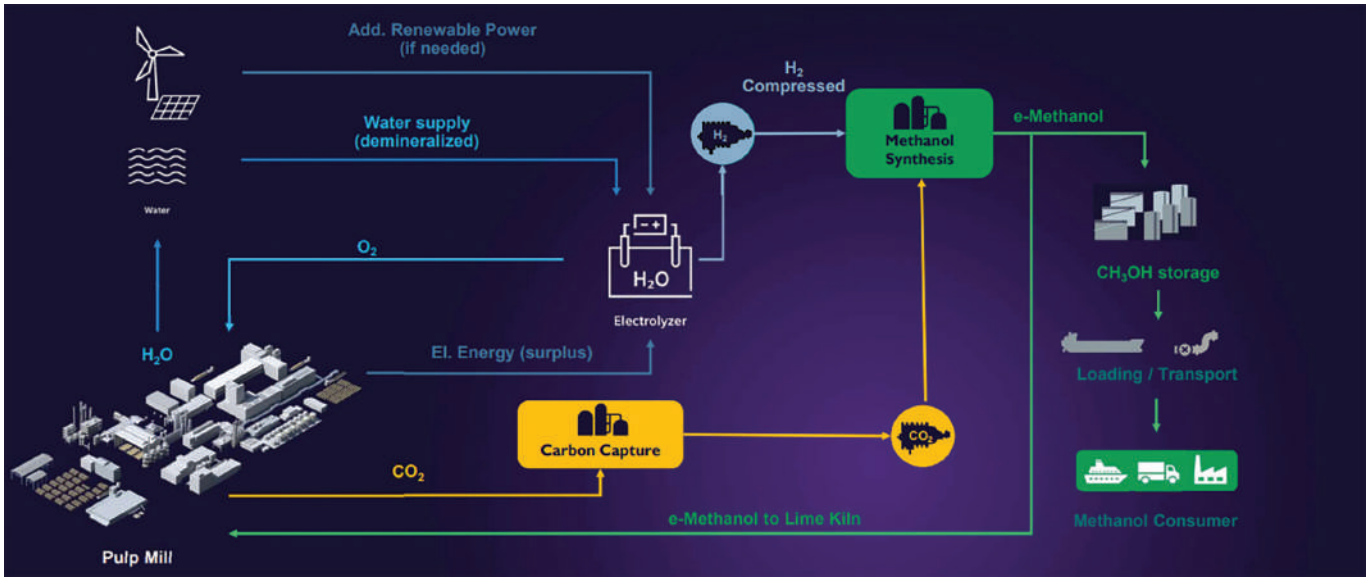
Table 1: Adiabatic flame temperature, flame length, and kiln parameter for alternative fuel source (Ivarsson, C. and Svendiv, K., "Study of the lime reburning process with biofuels," TAPPI/PAPTAC Int. Chem. Recovery Conf., TAPPI/PAPTAC, Peachtree Corners/Brossard, QC, Canada, 2007.)

A pulp mill with 1.5 Million tons pulp production for instance shows that a fifth of e-methanol production, based on excess electrical power production from the pulp mill, could cover the lime kiln process (pulp mill methanol production not considered). With that move carbon credits become obsolete.

The rest of the produced eMethanol can either be used for the mill's own logistics (replacing diesel from trucks, shipping fuel, etc.) or can be sold on the rapidly growing market for eMethanol (CO_2 neutral Methanol), the demand in the shipping industry is very high indeed.

I hope Episode 2 of "How can you make more out of your biogenic CO_2?" and the Liquid Wind approach with their Flagships makes you curious enough to think about how you can make an already highly sustainable sector, like the Pulp & Paper Industry, even more sustainable. And not to forget the opportunity the Pulp & Paper Industry now has to become an active part of the rapidly rising market for green fuels. Last, but not least, and out of my own experience of working for the last four years in this new industry, it's a great feeling to be part of this fantastic initiative to help fight the threats of global warming, we all have to do more, and drop by drop green fuels will very much help to make a difference.

Figure 3: Carbon Neutral Fuel by using green electricity and biogenic CO_2 from almost carbon neutral pulp mills.



Thai Tiger: BJC Cellox aiming to be No.1 in tissue

Dr. Elisabeth Wolfond, Global Director Marketing, Paper Fiber and Recycling, ANDRITZ

INTRODUCTION:

Thai tissue producer BJC Cellox needed a new tissue line to take advantage of growing demand for its high-quality products. ANDRITZ was chosen to supply a complete turnkey line including a PrimeLineCOMPACT tissue machine.

Berli Jucker Cellox (BJC Cellox), first established in 1990, is a dynamic, growing tissue manufacturer located some 150 kilometers southeast of Bangkok, in Prachinburi, Thailand. Since its founding the company has taken advantage of rapid growth in tissue demand in the region, and it now has five tissue machines dedicated to serving the Asian market.

"There is very healthy demand for tissue in Thailand as well as in the surrounding regions," says Apinan Laocharoensuk, Managing Director of BJC Cellox. "It is our aim to be the No. 1 tissue supplier in Thailand, as well as grow beyond our borders into other countries, for instance Vietnam."

The company makes a complete range of tissue products for bathroom, facial, kitchen towel and napkins under the brand names of Cellox, Zilk, Maxo, Belle, and Hygienist for AfH products. As well as the domestic market, the company also exports to neighboring countries including Singapore, Cambodia and Burma.

Figure 1: Berli Jucker Cellox is a dynamic, growing tissue manufacturer located southeast of Bangkok.

BJC Cellox is in an excellent position in a region that is only set to grow when it comes to consumption, "In our region tissue consumption per capita is still low when compared to other countries such as Japan or South Korea. In fact here per capita consumption is just one quarter of the amount of that consumed in those countries," adds Laocharoensuk.

Figure 2: Apinan Laocharoensuk Managing Director Berli Jucker Cellox.

"Ultimately we chose ANDRITZ to supply what is now PM 5 as we knew the company was one of the leading suppliers to the tissue industry globally. When commercial discussions began, straight away we had excellent collaboration."

ANDRITZ ticked all the boxes

To assist in its ambition to be No. 1 and to cope with burgeoning tissue demand, in 2018 the management at BJC Cellox began looking very closely at all suppliers to the tissue industry in search of the best solution for its expansion needs. Laocharoensuk says, "Ultimately we chose ANDRITZ to supply what is now PM 5 as we knew the company was one of the leading suppliers to the tissue industry globally. When commercial discussions began, straight away we had excellent collaboration.

The company decided on a complete tissue production line supplied by ANDRITZ. The delivery consisted of a PrimeLineCOMPACT tissue machine with steel Yankee and shoe press as well as a complete stock preparation system, forming fabrics, press felts and shoe press belts. It also included automation with Metris digitization technology for remote support, which was to provide a vital lifeline during start-up.

The tissue machine has an annual capacity of 35,000 t/y, a design speed of 1,900 m/min and a working width of 2.80 m. The Yankee diameter is 16 ft. The stock preparation system is split into a short and a long fiber line and is equipped with ANDRITZ Papillon refiners with a cylindrical refining zone. Ji Haihong, ANDRITZ Project Manager Stock Preparation, explains: "The special geometry of our Papillon refiners combines gentle and homogeneous fiber treatment. Thanks to the compact rotor design, the refiner concept offers significant improvements in energy consumption compared to other refiners on the market."

"ANDRITZ simply ticked all the boxes with its solution of the complete tissue line," says Laocharoensuk. "In addition, they have a remarkable USP, namely their PrimeLineTIAC, the world's most modern tissue pilot plant. This gives us the unique opportunity to deeply exchange know-how and to develop our products further and to achieve even better quality. This will bring us ahead of our competition!"

Remote assistance during start-up and for ongoing optimization

The complete tissue production line was successfully started up in early 2021, right in the middle of the worst of the COVID-19 pandemic. A key part of the successful start-up was down to Metris Remote Assistance, which was utilized to the full, allowing ANDRITZ specialists from all over Europe to fully take part in the technical procedures. Some ANDRITZ experts were also on location during the start-up.

"Despite the COVID-19 situation we had full support from ANDRITZ," says Laocharoensuk. "We had technicians on site, as well as remote assistance and I have to say that our mill team here together with ANDRITZ did a great job and we achieved a remarkable result. We even started up on time." Tine Kocbek, ANDRITZ Project Manager Tissue, says, "Managing the start-up with remote assistance by experts from our European locations and colleagues on-site at Prachinburi was quite an experience,

Figure 3: Tine Kocbek
Project Manager Tissue
ANDRITZ.

Figure 4: Ji Haihong
Project Manager Stock Preparation
ANDRITZ China.

"Thanks to the compact rotor design, the refiner concept offers significant improvements in energy consumption compared to the market standard."

especially in the middle of a serious pandemic. This project to me was like my very own baby, and I must admit I had one or two sleepless nights. However due the open communication and absolute respect from both sides, we mastered the challenge."

Remote assistance via Metris has continued as PM 5 now is up and running and adding another 20 t/d of high-quality tissue production to the mill's total output of 90 t/d. Pisit Samatta, Associate Manufacturing Director, BJC Cellox, says, "One of the features we are really pleased with on the new tissue line is the remote assistance we receive from ANDRITZ when optimizing the efficiency of the machine. Specialists are able to see exactly how well the line is running, and offer assistance to optimize the line even further. "This was really helpful during the learning curve when we started up, and now to have remote assistance whenever we need it has come in really handy."

"Due to the open communication and absolute respect from both sides, we mastered the challenge."

Figure 5: PrimeLineCOMPACT tissue machine with resource saving components.

Figure 6: The combination of a 16 ft. PrimeDry Steel Yankee and the latest PrimePress XT Evo shoe press technology enables a high drying capacity and achieves remarkable cost savings and operational flexibility as well as improved product quality.

Figure 7: High-quality and energy efficient tissue production at Berli Jucker Cellox.

Higher quality, less energy costs

The tissue line from ANDRITZ is now running at 1,700 m/min producing high-quality tissue at markedly reduced energy consumption. This is due to ANDRITZ's focus on the ever-growing importance of energy savings in tissue production, but it's also down to one of the key components supplied to the tissue line at BJC Cellox; the PrimePress XT Evo shoe press. When used in combination with the steel Yankee, the shoe press dewaters the paper web very gently, but very thoroughly. By doing so it achieves a higher dry content than conventional presses. Due to the special design of the press, and the reduced need for thermal drying, as much as 20% of energy can be saved under optimal operating conditions. In addition, the StrataPress T press felt ensures peak performance in the press section at high machine speeds.

Mr. Chusak Soysungvam, Mill Director, BJC Cellox, says, "We are very pleased with the speed of the machine and the quality of the tissue coming off the new line, the increased bulk of the tissue means we can possibly even enter new markets. But what we are really impressed with is the amount of energy we are now saving due to the shoe press using so much less LPG. The shoe press removes a large amount of moisture before the Yankee cylinder meaning we save a lot of money in the drying process." With the introduction of the new line from ANDRITZ, BJC Cellox is now well on its way to achieving its ambition to be No.1 in tissue in Thailand. Laocharoensuk says, "We have an ambition to be the market leader in Thailand, which will happen very soon, as well as having our expansion plans into other markets.

We clearly made the right decision to select ANDRITZ for our PM 5 project. We received really professional and outstanding service and support covering all areas from commercial evaluation, technical clarification, machine installation and start-up, as well as ongoing support."

Figure 8: Stock blending system as part of the stock preparation.

Figure 9: Metris Remote Assistance by ANDRITZ specialists enabled a straightforward commissioning-to-start-up phase and, in addition, ensures constant optimization of production processes, operator troubleshooting and decision support.

Figure 10: The ANDRITZ tissue pilot plant PrimeLineTIAC (Tissue Innovation and Application Center) enables customers to develop or improve their right tissue product.

Turning the page to profitability

How biotechnology can set up paper mills for long-term competitiveness

Pedro Loureiro, Global Business Development Manager Pulp & Paper, Novozymes A/S,
Christian Reinholm, Global MarCom Manager, Novozymes A/S
David Ellis, Copywriter, Novozymes A/S

INTRODUCTION:

Over the past couple of years, an unpredictable and highly volatile economy, and a variety of changing conditions across the globe have put unprecedented pressure on many businesses. The pulp and paper industry is no exception. In fact, a number of factors have combined to make it particularly hard for mills to remain competitive.

The lockdowns during the COVID-19 pandemic resulted in a huge rise in online sales, with a 43% increase in 2020 alone[1]. This rapid increase in e-commerce drove a huge demand for papermakers in the corrugated packaging segment, a demand that is becoming even more pronounced as growing environmental concerns are resulting in higher taxes and penalties on plastics. During the same time period, the tissue and towel segment also saw a sharp rise in demand, while printing and writing struggled to deal with shifting market trends as their segment continued to decline. All of these changes caused materials shortages across the industry and higher raw material prices.

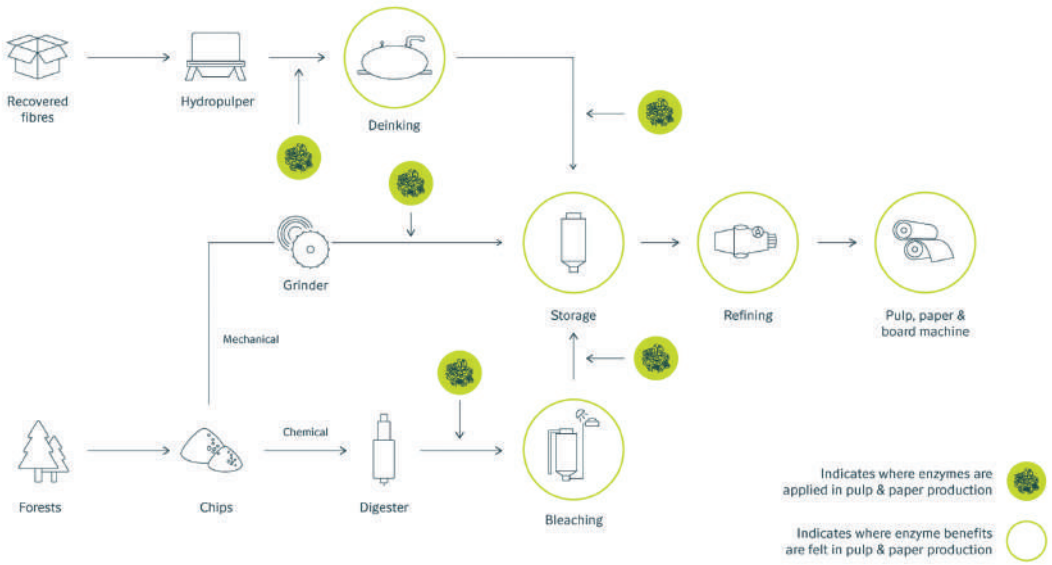
And, as some paper mills struggle to come to grips with these challenges, rising operating expenses have strained their bottom line to the breaking point. In 2022, the energy cost required to run a mill can be equal to or even greater than the full sale price of paperboard a year ago. As a result, many paper mills have shut down operations entirely, putting pressure on those that remain to find ways to increase production while still maintaining a profit margin, remaining competitive, and improving their environmental profile.

Mechanical and chemical optimization no longer hold the answers

The most obvious answer to increasing margins and producing more is to optimize efficiency. However, conventional optimization methods have their limits and, in some cases, are no longer viable due to sustainability concerns.

For most paper mills, the efficiency of mechanical optimization of existing equipment has plateaued. Efficiency can only be improved so far when the fundamental capacity and processes remain the same. Focusing on mechanical improvements also is costly in terms of CAPEX spending. Rather than improving margins, this creates a vicious cycle where future growth opportunities are compromised by marginal short-term gains. Carving out cost savings becomes increasingly difficult.

Chemical optimization methods used in papermaking — dewatering and retention aids, strength additives, and debonders, for example — have limits to their effectiveness as well. Additionally, stricter environmental regulations — like the European Green Deal — and uncertain fate under the Chemical Strategy for Sustainability (CSS), mean that mills are increasingly forced to abandon conventional chemical treatments with high CO_2 footprint in favor of more sustainable solutions.



The power of enzymes: finding answers in nature

As paper mills look for ways to take on the increasingly difficult questions of improving cost-effectiveness and increasing sustainability, many are turning to biotechnology for answers.

Enzymes are proteins found in nature that are produced by every living organism that act as catalysts to speed up chemical reactions.

In humans, plants, and animals, they play a key role in a wide variety of life-sustaining functions, including metabolic processes like respiration and digestion. In industry, enzymes have been used for centuries as catalysts in a broad range of applications. Because they are highly selective as to their function, they produce fewer side reactions, require fewer reprocessing and purification operations, and produce less pollution and effluents, enzymes have become cost-effective, biodegradable, environmentally friendly solution for synthetic processes at an industrial scale.

Every type of enzyme is a unique chain of amino acids that has evolved to perform a single catalytic activity on a specific substrate — sort of a natural lock and key mechanism. The enzyme's unique three-dimensional structure seeks out a substrate molecule with a complimentary geometric shape. During the enzymatic reaction, the substrate binds to the active site of the enzyme, converted to a reaction product, and released. Most enzymatic reaction rates are millions of times faster than those of chemical or metal catalyzed reactions. And, like any catalyst, enzymes aren't consumed by the reactions. The enzymes remain intact after the reaction and moves on to react with more substrate molecules. That´s why only a very small amount of enzyme is needed to produce the desired result and deliver value.

Thanks to modern technology, it is now possible to develop robust enzymes to fit the needs of specific industries like household care, food and beverages, agriculture, animal production, biofuels, and textiles. And it stands to reason that this natural approach to adding value should apply to an industry that is as deeply rooted in nature as pulp and paper.

An enzymatic approach to paper mill optimization

Using enzymes in pulp and paper mills isn't new. They have been recognized as having great potential to save on chemical and energy use and add value to a number of pulp and paper products. Improvements in production efficiency with enzymes are now used on an industrial scale in the industry, as additional ground-breaking biotechnology research continues with the aim of replacing different conventional pulp and paper processes with more sustainable and efficient solutions.

Historically, multi - enzyme "cocktails" have been tested and used in pulp and paper for decades with varying results. These applications were explored and tested before the technology was developed to make well-defined, single-enzyme products. Although they can produce measurable benefits in some instances, this shotgun approach has potential drawbacks. The most abundant and important component of papermaking fibers is cellulose. The goal of enzymatic fiber modification using cellulolytic enzymes, or cellulases, is to add value to the fibers while preserving fiber yield.

Cellulases, are produced by fungi, protozoans, and certain bacteria. In nature, they aid in the decomposition of plant matter. Different types of cellulases can break down cellulose molecules into simple sugars (monosaccharides) and other sugar molecules in a concerted manner. This saccharification process is a critical step in the production of biofuels. Cellulases can also be used to modify fiber in the pulp and papermaking process.

However , the use of multi-enzyme cocktails to produce this degree of action on cellulose in papermaking fiber can produce undesirable results. A problem that only gets worse with crude enzymes that are not refined to a sufficient level to meet pulp and paper needs. What is required is a level of technology that is designed and standardized for the production of high-quality cellulase-based products.

The use of cellulases to modify paper fiber requires the use of carefully selected molecules that add value to the fiber while also preserving its integrity. Multi-component cellulolytic enzymes are more difficult to control and can do both harm and good to the fibers. Additionally, when using multiple enzymes, there's often no way to fully ensure that enzymes aren't present in the final product.

The alternative is a more targeted, "rifle" approach based on mono-component enzyme products. Modern biotechnology allows the production of single-enzyme products that produce a more controlled modification of fibers and other components in papermaking.

Targeted enzymatic treatment can deliver potential benefits across the entire pulp and paper process, with minimal risk of the adverse effects sometimes experienced with multi-component treatments. These include improvements to deinking, bleach boosting, deposit control, and starch modification. But some of the most pronounced benefits in terms of boosting production and getting the most paper and board possible from every tree come from using enzymes in fiber modification.

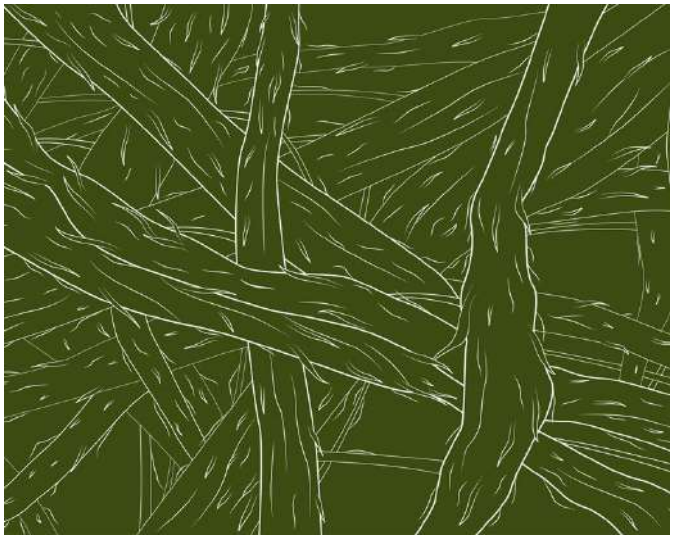


Figure 2a & 2b: before and after - "FiberCare® modifies the fiber surface and improves pulp fibrillation for more contact points and better bonding".

Enzymatic fiber modification is largely based on endoglucanases, which are cellulase enzymes. They act on paper fibers resulting in the formation of fine fibrils that increase inter-fiber bonding potential. This improves refinability and the strengthening potential of the fibers, which enhances paper and board's strength and structure.

The result is a significant improvement in paper and board structure and strength. Papermakers can take advantage of this in a number of ways — saving on fiber costs; reducing the amount of energy required for refining or drying; reducing the use of chemical strengthening agents; and producing a higher quality end product in a more sustainable manner. This process, which is already established practice in tissue and towel manufacturing, is being increasingly applied in the printing and packaging segments.

Implementing a plug-and-play solution

In a case study by Novozymes, one of the world leaders in bio innovation, a mono-component cellulase product was tested in a full-scale implementation in the printing and writing segment.

Industry experts performed an analysis to find the application point in the mill that would provide the greatest potential benefits. The trial was then implemented with minimal disruption and risk to mill operations.

The process was very straightforward, with no adjustments to existing mill operations and no CAPEX investment. All that was required was the enzyme product itself and dosing pumps to add the product to the application point.

Enzyme application experts provided guidance throughout the process and monitored conditions to ensure optimal results.

Economic—and environmental—sustainability for paper mills

The printing and writing case study overwhelmingly demonstrated the benefits of enzymatic fiber modification for the pulp and paper industry. The mill saw a significant ROI in terms of fiber savings, increased production, improved refining, and increased bandwidth and budget for new product development.

The paper mill reported a tensile strength increase of 16 percent and a 17 percent increase in internal bond strength. As a result, the solution delivered almost immediate short-term savings, cutting the energy required for refining by 50 percent.

For a European paper mill that refines 200,000 tons per year (TPY) of bleached pulp with 80 percent hardwood and 20 percent softwood, this is an energy reduction of 20 kilowatt-hour per ton (kWh/t) and 45 kWh/t respectively, a total savings of 5,000 megawatt-hour (MWh)/year. Based on the 2021 average European Union energy cost of 0.1445 €/kWh, this represents a value of 3.5 €/ton or 720,000 €/year. That's the equivalent of importing about $130,000 USD less natural gas per year[2].

The mill in the case study also noted that, by shrinking their energy footprint, mono-component enzymatic fiber modification also significantly reduced the mills' environmental impact. The immediate effect is the ability to get the most out of every tree harvested by producing more from less. Lower refining energy and steam consumption resulted in an annual greenhouse gas reduction of 1,100 tons of carbon dioxide (CO_2)[3] — an effect equal to taking 470 cars off the road.

Expanding the application of enzymes to other stages of the pulp and paper process can potentially move mills even further toward their environmental goals by displacing or removing various chemicals in the pulp mill, bleach plant, and stock preparation. Additionally, enzymes used in the dewatering process can also allow mills to use more recycled materials and less virgin fiber by improving the dewaterability.

Getting the most from the mill…and from every tree

As growing demand, increasing costs, and tighter environmental regulations make even razor-thin margins nearly impossible to maintain, papermakers need to explore alternatives that move beyond the diminishing returns of traditional mechanical and chemical optimization methods.

With minimal operational adjustment and no additional CAPEX investment, paper mills can use enzymes to lower operating costs through significant energy savings in the refining process. They reduce materials cost by maximizing the papermaking potential from existing wood and pulp. And they potentially reduce or eliminate the cost of strengthening agents and other chemical products used throughout the papermaking process.

From an environmental standpoint, better utilization of existing fiber both reduces the pressure on forests and lowers the amount of wood or fiber needed for each ton of product. Additionally, adding strengthening potential to fibers with enzymes allows for the final product to be lighter without compromising strength. That means that, in addition to lowering the CO_2 output of the mill itself, enzymes contribute to lowering CO_2 in the transport sector in a time of rapid e-commerce growth. And, by reducing the need for chemicals, enzymes bring mills one step closer to meeting their sustainability goals. All without added investment in environmental initiatives.

A huge variety of industries worldwide — from agriculture, animal production, and biofuels to household care, textiles, baking, brewing, fermenting and pharmaceuticals — are already taking advantage of the added value, cost-savings and environmental advantages of enzymes. As they strive to make their margins in a world where demand is outstripping supply, enzymes offer a proven means by which pulp and paper manufacturers can meet demands in a cost-effective, sustainable way and regain a competitive edge.

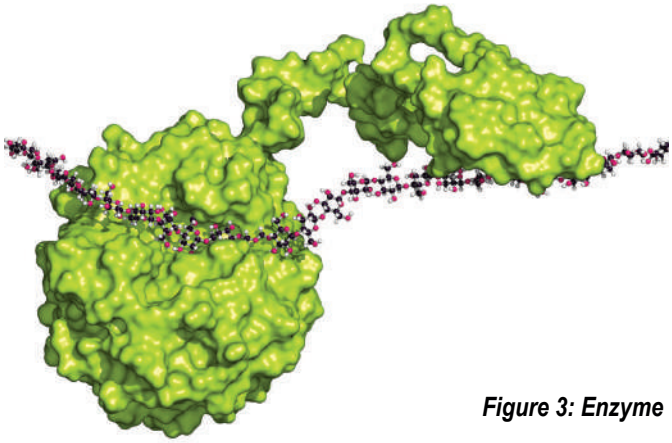


Figure 3: Enzyme

Notes

[1] 2020 Annual retail Trade Survey (ARTS) Tables https://www.census.gov/programs-surveys/arts/data/tables.html
[2] Based on a natural gas price of $7.84 USD/MMBtu (09/05/2022)
[3] Based on the 2020 EU average of 230 grams of CO2/kWh grid mix, including the carbon footprint of the enzyme

ISRA VISION
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Toscotec launches breakthrough innovations for a more sustainable tissuemaking

Giulia Fabbri, Global Marketing and Communication Manager, Toscotec

INTRODUCTION:

In 2022, Toscotec has launched three breakthrough technological innovations aimed at reducing the energy consumption and carbon emissions linked to tissuemaking and at guaranteeing the highest tissue quality:

1. INGENIA, a new concept tissue machine to produce structured tissue
2. TT Induction SYD, a steel Yankee dryer that relies on electromagnetic induction instead of steam for drying
3. TT Hydrogen Burner, a new generation of burners for Yankee hoods fueled by 100% hydrogen.

1. INGENIA

Energy, sustainability, and quality are the most challenging topics in R&D and design process for papermaking today. State-of-the-art technologies for structured tissue have an undisputed high-end paper quality benchmark fixed by TAD (Through Air Drying), which is currently identified as the top process to manufacture high quality, highly absorbent and soft tissue. The market also offers other intermediate technologies that also produce a textured tissue and can lead to a reduction of energy usage, but whose final products do not compare to real structured paper. Undoubtedly, the most important leaps in tissuemaking technology are moving around the possibility to produce structured tissue similar to TAD, but with less energy need and capital investment required.

Toscotec has developed INGENIA, a new concept tissue machine to produce premium quality structured tissue paper. The quality generated by INGENIA line is substantially higher than textured tissue and close to Through Air Drying (TAD) produced paper but using 35% less energy.

Figure 1: Toscotec's headquarters in Lucca, Italy.

With INGENIA Toscotec responds to the challenge of today's paper market calling for premium quality tissue obtained with lower energy use and lower capital investment than TAD lines. INGENIA's concept is based on consolidated technologies for premium tissue, building on vast internal know-how of Toscotec's and Voith's R&D, and field data validation on TAD and structured paper systems.

Figure 2: Toscotec's INGENIA line.

Paolo Raffaelli, Toscotec Chief Technology Officer, says: "The key factor for energy reduction compared to TAD, is that INGENIA achieves significantly higher dryness through non-thermal dewatering on a structured moulding fabric. With TAD, the thermal drying starts from 24-26%, whereas INGENIA achieves a much higher dryness level without using hot air or steam. This maintains the premium quality obtained through rush transfer and structured moulding fabric, but uses much less energy."

Ultra-premium tissue quality

Through non-compressive water removal technologies and efficient fiber moulding, INGENIA produces much higher tissue quality properties than other technologies for textured or conventional DCT tissue. These properties include bulk, softness, stretch, and absorbency, which improve the tactile "hand" feel and the final paper characteristics that compete with premium segments for toilet, facial and towel tissue grades.

The specific pattern of the structured fabric and the use of a calender can further enhance the quality of end products.

Energy Efficiency through Process Innovation

The process of this new concept machine begins with a dilution profiling layered TT Headbox-ML operating on a twin-wire forming section. Like TAD machines, INGENIA operates wire rush transfer at low consistency, but its key capability is an enhanced vacuum de-watering system without pressing the paper web, which ensures that dryness is greatly increased while fibers are being supported in the same shape as they originally formed when fully water saturated.

At the end of the wet section, TT NextPress shoe press uses low loading pressure to gently stabilize the web dryness content and transfer the paper to the drying section without bulk compression. The combined action of a third-generation design TT SYD Steel Yankee Dryer and high-efficiency TT Hood achieves the final desired dryness.

The process is completed by dry creping, sheet stabilization integrated with dust removal, and precision winding using an electro-mechanical TT BulkyReel fitted with a Center Wind Assist on the primary and the secondary arms. The Center Wind Assist fully preserves bulk by reducing the nip pressure against the reel drum during the winding process.

Flexible Configuration

The new INGENIA offers top flexibility, as it can easily swing from the production of premium quality structured tissue to conventional DCT. When in conventional mode, INGENIA delivers top machine speed and production capacity.

INGENIA features widths up to 6 m, a production capacity from 100 to 250 tpd, and operating speeds up to 1,500 m/min in structured tissue mode or 2,000 m/min in conventional mode, depending on machine size and customer requirements.

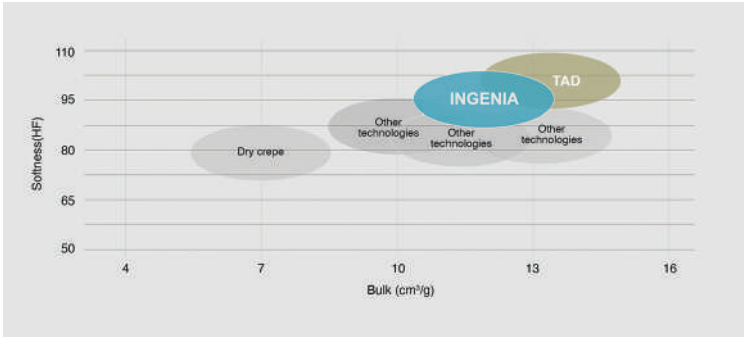

Figure 3: INGENIA-produced premium quality toilet tissue (unconverted).

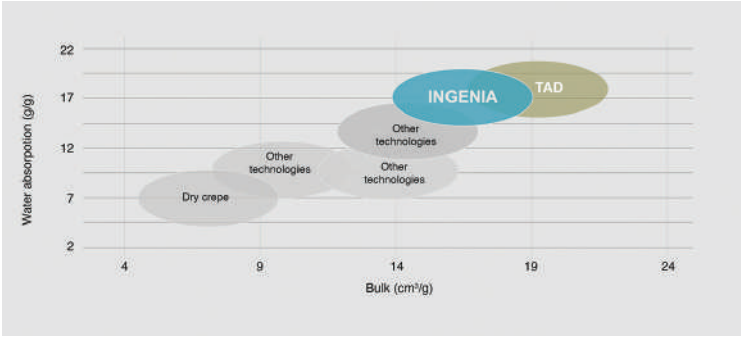

Figure 4: INGENIA-produced high absorption towel (unconverted).

2. TT Induction SYD

TT Induction SYD is a carbon-reduction breakthrough developed by Toscotec that redefines Yankee dryer technology entirely. TT Induction SYD uses electrical induction instead of steam energy to dry the paper web, thereby cutting direct greenhouse gas emissions to zero.

In 2000, Toscotec pioneered a major technological innovation, TT SYD, the first Yankee dryer entirely made of steel. Steel Yankees have since surpassed their cast-iron equivalent to become the benchmark for drying efficiency and safety in the paper industry. TT Induction SYD is now set to be the new game changer in tissue for its capability to use clean energy and slash direct carbon emissions associated with the drying process.

Figure 5: Toscotec's TT Induction SYD.

A disruptive innovation for dry crepe and TAD tissue machines

With TT Induction SYD, the internal steam distribution and steam/condensate removal systems are entirely replaced by an induction system composed of static coils installed inside the shell and electrical controls and instrumentation located outside for easy maintenance and monitoring. As a result of precise coil geometry, the induction system delivers a very fast and accurate heating effect exactly on the areas of the shell where it is required, while preventing residual circulating currents in other areas.

Steam-heated Yankees use steam energy typically generated by burning fossil fuels. TT Induction SYD uses electrical energy that can be derived from renewable energy sources while delivering the same result, i.e. uniformly heating up the Yankee's shell in contact with the paper web to achieve dryness. TT Induction SYD is suitable for installation on dry crepe as well as Through-Air-Drying (TAD) tissue lines.

Luca Ghelli, Toscotec R&D Director, says, "Sustainability is the guiding idea of TT Induction SYD's design. As a proven industrial technology, an induction system offers multiple advantages when applied to the most energy-intensive section of the tissue machine. The efficiency of this cutting-edge technology will dramatically reduce the carbon footprint of papermaking. Based on our expertise in steam-heated TT SYD and induction systems, we succeeded in developing a more efficient and sustainable steel Yankee dryer."

Substantial carbon reduction with unchanged productivity and paper quality

Normally, approximately half of the carbon dioxide emissions produced by a tissue machine originate from the operation of the Yankee dryer. By using clean energy, TT Induction SYD achieves zero direct emissions, while maintaining productivity unchanged and reducing energy consumptions because of the higher efficiency of the induction system. Due to the precise heating of the shell, it also eliminates possible moisture profile issues related to uneven condensate removal, thereby ensuring an improvement in moisture uniformity in both cross direction (CD) and machine direction (MD).

Maximum safety, easier operation, and maintenance

TT Induction SYD was designed without any electrical, mechanical, and radiation risk to ensure maximum safety. Besides offering safe operations, it also clears all issues related to the maintenance of steam-heated Yankees, including pressure vessel's mandatory and planned controls, maintenance of condensate straw pipes against potential plugging and of special heads for steam and condensate inlet and outlet. The entire Yankee system is simplified in the absence of steam: the heads, the internal surface which is groove-less, and the steam and condensate auxiliary system disappears entirely, including the steam generator with related maintenance and controls and delicate controls for steam quality. TT Induction SYD simply requires relatively easy maintenance on the electromagnetic induction system.

3. TT Hydrogen Burner

TT Hydrogen Burner is a new generation of 100% hydrogen fueled burners especially designed and tested by Toscotec for Yankee hoods. Within the context of the energy transition from fossil-based to zero-carbon industrial operations, Toscotec developed this patented innovation to drive the conversion of paper manufacturing to clean energy.

TT Hydrogen Burner is an in-line burner featuring precisely controlled combustion and two safe operation modes. In carbon-free mode it runs on 100% hydrogen; in carbon-reduction mode it is fueled by a mixture of natural gas and hydrogen, where the percentage of hydrogen is accepted across a wide range.

Figure 6: Toscotec's TT Hydrogen Burner.

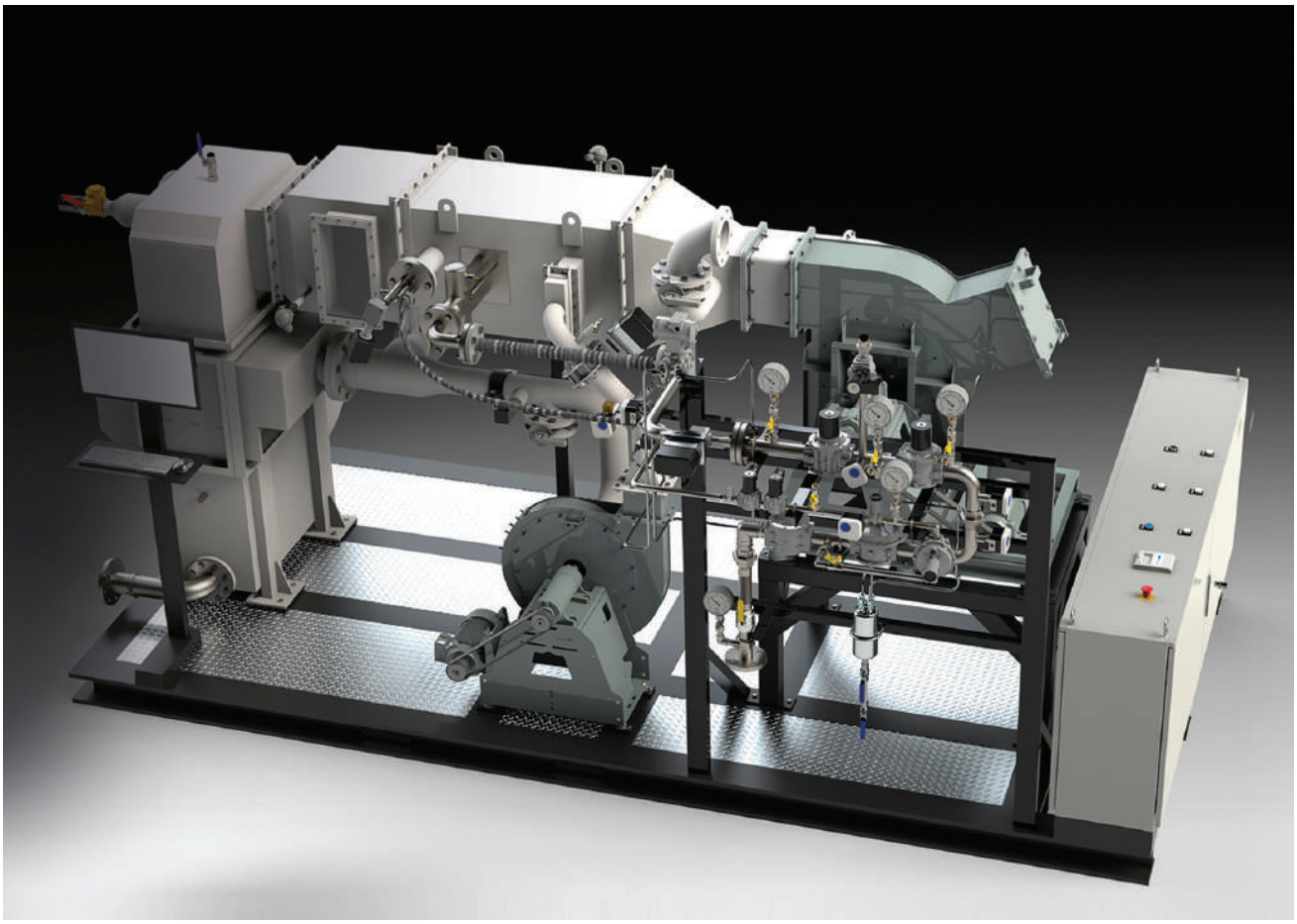

Figure 7: Toscotec's headquarters office building in Lucca, Italy.

Fossil-free fuel for a more sustainable tissuemaking

TT Hydrogen Burner entirely matches the high performance of gas-fired burners, using a carbon-free fuel. In fact, hydrogen combustion does not emit carbon dioxide into the atmosphere. The key factor in the overall energy balance is that hydrogen fuel is produced from renewable energy sources. If this is the case, in the future hydrogen may possibly replace fossil fuels in all thermal processes associated with tissuemaking, including steam production and air system burners. In terms of its infrastructure, hydrogen can be stored in pressure vessels, or injected into the existing natural gas grid.

Stefano Pecchia, Energy Technology Director at Toscotec, says, "Tissue producers are asking for technological innovations that will allow them to work in full hydrogen mode. Whether they choose to replace their existing burners or install new tissue lines, tissue producers aim to be ready for when this fuel will be widely available, cost competitive and green. In response to this demand, Toscotec has invested in building a dedicated air system test bench to ensure guaranteed results according to the specific operating requirements of paper mills".

Ready for industrial application

The design of TT Hydrogen Burner is ready for industrial scale production because it has been successfully tested to operate under the same conditions of air speed, temperature, and humidity of the actual air system of a tissue machine. TT Hydrogen Burner is suitable for immediate installation. Currently, hydrogen availability for tissue mills is limited, so the burner can be set to operate burning hydrogen mixed with natural gas in carbon-reduction mode, or even only natural gas if necessary. When hydrogen becomes readily available, in order to switch to full hydrogen mode, TT Hydrogen Burner simply requires a nozzles replacement, which is a one-day easy procedure. This will guarantee the highest possible combustion efficiency based on 100% hydrogen gas.

Turnkey projects: Full control equals maximum efficiency

Toscotec is recognized as the global leading supplier of turnkey tissue projects. In its capacity as turnkey supplier, Toscotec ensures a strong focus on energy saving across the entire plant. The magnitude of the turnkey scope allows Toscotec to push the envelope on carbon reduction by designing a new production line through the lens of energy efficiency. Turnkey projects include a fully customized engineering design which is based on available energy sources and raw materials, as well as selection of equipment for the entire plant. Therefore, turnkey operations guarantee maximum production efficiency.

Rebuilds: The highest value for a limited scope

In the space of energy and production efficiency, tissue machine rebuilds are a very effective way to optimize a section of the tissue machine with its associated processes with a relatively limited budget.

Customization is key in rebuilds. Toscotec carries out site surveys and rebuilding analysis to pinpoint the most effective targets for upgrades and process optimizing solutions. These can also serve as guidelines for tissue manufacturers to identify the technological investments that yield the highest returns.

The main targets of Toscotec's tissue rebuilds are threefold. The first is increasing the productivity of an existing machine both by boosting its drying capacity and by reducing its energy consumptions. The second is improving paper quality, which allows the mill to achieve premium quality or to produce lower basis weight, high quality tissue paper, thereby reducing raw material costs. The third is ensuring equipment safety: by upgrading outdated machinery, Toscotec guarantees maximum operation safety on the production line.

In 2022 Toscotec has managed more than 25 tissue machine rebuilds for leading manufacturers that remain confidential. The projects are located at different mills across 6 continents: Africa, North and South America, Asia, Europe, and Oceania.

Figure 8: Toscotec's headquarters in Lucca, Italy.

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Forward to a carbon neutral future

Vesa Puoskari, Valmet

INTRODUCTION:

At Valmet we believe technology plays a key role in the transition to the carbon neutral economy. Our aim is to enable 100 percent carbon neutral production for our customers and to improve the energy efficiency of our current offering by 20 percent by 2030. Already today we offer an extensive range of solutions for reducing raw material, energy, water and chemical consumption.

The target of achieving a carbon neutral economy is now higher on the agenda than ever for many companies. Laura Puustjärvi, Head of Sustainability at Valmet, opens up the reasons for the changes in the markets.

"The Paris Climate Agreement was a game changer. It has pushed signatory countries to mitigate climate change and pursue significant emission reductions and carbon neutrality. Thanks to the agreement, many governments have set national targets to phase out fossil fuels."

The EU has set a binding target of achieving climate neutrality by 2050 as part of the European Green Deal. The goal requires current greenhouse gas emissions to fall in the coming years. Additionally, the EU has raised its 2030 climate ambition to cut emissions in the economy by an average of at least 55 percent. In Europe, the pulp and paper industry has raised its ambition, at up to 61 percent by 2030 compared to 2005.

Laura Puustjärvi, Head of Sustainability at Valmet.

The push for carbon neutral production is driven by the expectations of consumers, regulators, and the financial sector alike. While Europe is leading the way, other continents are embracing a similar trend.

"The EU is united in addressing climate change and achieving carbon neutrality by 2050. China aims to achieve carbon neutrality by 2060. They have announced that CO_2 emissions will peak before 2030, after which they will start to decline gradually," says Puustjärvi.

"The financial sector is also accelerating the transformation through green finance instruments across all industries. The EU is dedicating 30 percent of its post-Covid recovery budget to green funding and technologies," she says.

Valmet has set CO_2 reduction targets and concrete actions for the entire value chain

In 2021, Valmet launched its ambitious climate program – Forward to a carbon neutral future – which sets targets for its value chain, including the supply chain, Valmet's own operations and the use phase of technologies. Valmet aims for an 80 percent cut in CO_2 emissions in its own operations and 20 percent in the supply chain by 2030. The baseline year for these targets is 2019.

In the use of its technologies, Valmet targets an achievement of a further cut of 20 percent in energy consumption compared to the current technology portfolio. The ultimate goal is to enable 100 percent carbon neutral pulp and paper processes by 2030. Valmet is already providing its customers today with energy solutions and pulp technologies that enable carbon neutral energy production using biomass.

"The Paris Climate Agreement was a game changer, thanks to the agreement, many governments have set national targets to phase out fossil fuels."

"Our climate program is a continuation of our systematic approach to fostering sustainability in our value chain. For example, we've been improving energy efficiency – both our own and that of our customers – for a long time. Our approach creates cost savings and decreases emissions, which is a win-win situation for everyone," Puustjärvi says.

The reduction of CO_2 emissions goes hand in hand with the energy market transformation. Alongside continuous energy efficiency improvements through digitalization and service upgrades, key decarbonizing actions include the replacement of fossil fuels with renewables and the introduction of CO_2-free electricity and district heat when available.

"We're among the few players in the market to take a comprehensive value chain approach to CO_2 emission reduction. Not only do we offer our customers solutions for carbon neutral production – we also support and cooperate closely with our suppliers in finding new ways to decrease emissions across the value chain," she adds.

Toward carbon neutral production processes by 2030

Janne Pynnönen, Vice President of R&D at Valmet, underlines that technology will play a crucial role in the transition to carbon neutrality. Valmet's total carbon footprint was approximately 104 million tonnes of CO_2 in 2021.

"We've estimated that around 95 percent of the environmental impact is caused by our customers' use of our technologies over their entire lifecycles. The remaining 5 percent comes from the supply chain and our own operations."

The pulp and paper industry aims to be a forerunner in the transition to a low-carbon economy. A key contribution is made by continuous R&D work, which is being done in all Valmet's business lines. Valmet aims to enable all its customers to move gradually to carbon neutral production by 2030.

"The impact comes from investing in the best available technologies, optimizing mill design and selecting the right automation, and Industrial Internet and service solutions in tissue, pulp and board and paper production. By developing new technologies, we aim to enable entirely carbon neutral pulp and paper production, with the customer using carbon neutral electricity."

For example, the Valmet Industrial Internet (VII) offering covers an extensive range of solutions and applications for advanced monitoring and prediction to increase production capacity, machine uptime and energy efficiency, and to reduce quality losses and overall operating costs.

Energy efficiency and replacement of fossil fuels are key to emission reduction

"When we're developing new technologies and products, our new-generation innovations consume less raw materials, chemicals and water. Energy efficiency is a key priority in our climate program," confirms Pynnönen.

"Drying is the most energy-intensive part of the papermaking process, accounting for roughly 80 percent of energy use. One of our focus areas is to replace gas burners with electric dryers," notes Pynnönen.

He adds that there are currently two significant focus areas in Valmet's energy-saving strategy. "We're researching opportunities to reduce the need for water in the papermaking process, which will also reduce the need to dry the product. Another focus area is to find ways of harnessing low-temperature heat, which is often not recovered in papermaking."

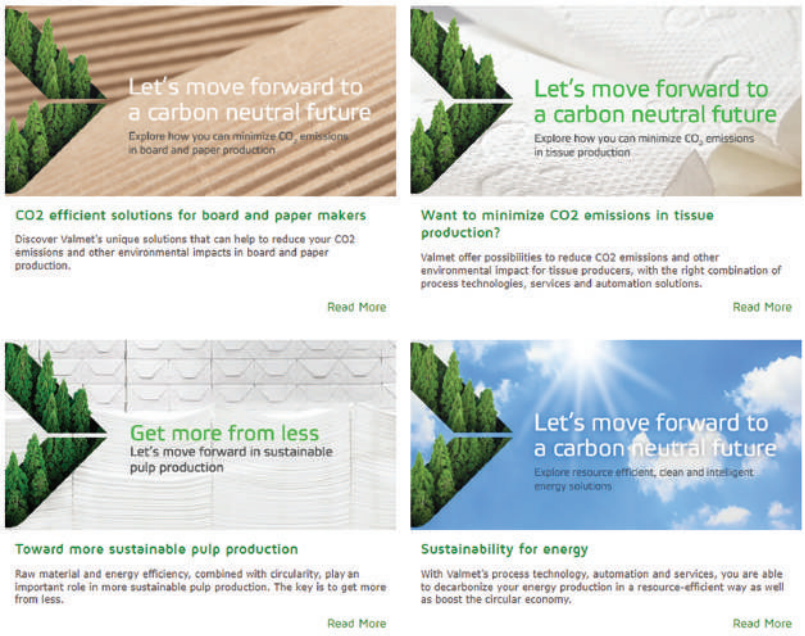
Janne Pynnönen, Vice President of R&D at Valmet.

Another key step is to fully eliminate the need for fossil fuels in papermaking by providing customers with Valmet's current energy solutions, which enable carbon neutral energy production using biomass.

"In pulp production, we can already attain full carbon neutrality today by using bioenergy. Valmet is a leading global supplier of biomass-based heat and power generation solutions. We design our emission control solutions to ensure safe operation with low emissions," he explains.

"Our customers produce recyclable and carbon neutral products for the consumer market. I don't foresee any major upheavals in this segment over the next ten years. Paper and board production will remain essentially the same, but we can continuously improve and increase efficiencies. On top of this, new products will make the industry even more diverse," predicts Pynnönen.

"The increasing demand for process technology, automation, and services that enable carbon neutral industrial processes is obvious," Pynnönen adds. "Our customers and end users have the same goals, even though legislation and scenarios vary in different countries and continents. Ultimately, everyone is working toward the same goals."



Valmet's offering for reducing CO2 emissions and other environmental impacts: valmet.com/climateoffering.

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Mondi Neusiedler increases the flexibility of its production plant with Pasaban machinery

Iker Malles, Marketing & Communications, PASABAN S.A

MONDI Neusiedler - part of the global Mondi Group

GEOGRAPHIC AREA SERVED
Ulmerfeld - Hausmening, Austria

THE CHALLENGE
Enhancing the **flexibility** of the plant and increasing the production in order to cover the ever growing demands of the market

THE SOLUTION
This challenge has been met thanks to a complete solution consisting of: a **winding machine**, a **paper & board sheeter** and a **packaging machine** all designed specifically to achieve the company's goals

RESULTS
In this project the solution fully meets the needs raised by Mondi.

- It provides a **high operating performance** throughout the planet.
- It achieves consistently **excellent product quality.**
- It enhances the **response capacity** during demand peaks.

The food-packaging sector is continuously evolving. The new packaging trends demand sustainable, environmentally-friendly packaging and the compliance with strict hygiene standards. For global packaging and paper producers like Mondi Group, this means producing paper with optimum technical quality, which in turn entails constant renewal of the machinery. To meet these market demands, Mondi requested Pasaban to jointly develop a series of top quality customised machines.

"The quality demanded by our customers can constantly be achieved with Pasaban equipment. The projects were professionally implemented and the open points aroused during commissioning were carefully processed."

"Thanks to Pasaban, we can now respond to our customers' requests with greater flexibility."

Bernhard Huber - Project Manager (Mondi Neusiedler).

Client Challenge

Mondi is a global leader in packaging and paper, employing around 26,000 people in over 30 countries. The company is fully integrated across the packaging and paper value chain - from managing forests and producing pulp, paper and plastic films, to developing and manufacturing effective industrial and consumer packaging solutions.

Their paper mill in Ulmerfeld-Hausmening (Austria) produces uncoated fine paper, a variety of specialty papers and paper for professional printing, including some for food sensitive applications.

Due to the aforesaid market demands, Mondi decided to define and develop a series of machines that, in conjunction with Pasaban, would be specifically designed to meet its needs and the characteristics required of its finished product. By doing so, the desired solution would enhance the flexibility of the plant when responding to market demands.

The Solution

Pasaban's total solution for Mondi's Neusiedler plant consisted of different machines delivered in various phases.

Phase one was devoted to designing and manufacturing a paper winding machine. One of the factors that tipped the balance in favour of Pasaban's solution was the option of full design customisation that enables the required automation to be installed.

After the excellent outcome of the first project, Mondi considered that Pasaban, due to its flexibility and high quality, was the most capable company for carrying out some of the upcoming projects.

The second project consisted on replacing the old paper sheeter. They needed a machine that provided flexibility, productivity and the highest quality of the finished product. The result was highly satisfactory. Thanks to the solution provided by Pasaban, the cut quality of the finished product is completely clean.

Finally, the finishing area of the Austrian plant was completed with a double exit ream wrapper, which enabled Mondi to obtain the number of reams required in the shortest possible time.

These machines provided Mondi with a complete solution adapted to their needs and capable of meeting their objectives by providing precise, high-availability machinery, optimal for meeting the requirements of a sector as demanding as the food industry.

The outcome of the project was satisfactory in all phases.

"Pasaban machines are very precise and ensure high operating performance for longer runs than other types of similar machine." Bernhard Huber - Project Manager (Mondi Neusiedler)

Figure 1: Pasaban paper sheeter.

Pasaban, a global benchmark for paper & board converting machines

Pasaban offers high quality, robust, and precise converting machinery for the paper and board converting industry. It has been supplying the Pulp and paper industry with sheeters, winders and other finishing equipment customized solutions for more than 90 years. These have been improved and adapted to meet customer demand and the company continues to expand internationally. The company's development has been such that today it is one of the major quality benchmarks in the market.

"The most requested machines are folio-size sheeters for paper and coated board. However, on the top of that, Pasaban offers customized features that may add value to the solution made for customers and users" says Carlos Muriel, Sales & Marketing Director of Pasaban.

Figure 2: Carlos Muriel, Sales & Marketing Director of Pasaban.

Mills and converters generally request the KB folio-size sheeter, which offers a level of customization and automation that allows the highest quality and cutting precision in the market. This machine is aimed at high production mills and converters that need great flexibility and the highest quality of the finished product.

Figure 3: Dani Garcia, CEO of Pasaban.

Converters (with less production volume), printers and packagers mostly request the Compact sheeter. This machine was created to offer a modular concept that allows implementing a wide range of options in order to meet the production needs of each customer. Aimed at plants with medium production volumes.

"We offer the most robust and precise machinery on the market, and this is what makes us a benchmark in quality",states Dani Garcia, CEO of Pasaban.

Having a high-quality product is not enough on its own. For this reason, Pasaban advocates accompanying the customer throughout the purchase cycle, project execution, and after-sales service. Trust is not achieved in a day; it is necessary to work on it in order to build close and fruitful long-term relationships. Nowadays it is essential that the attention a customer receives is from an expert, and Pasaban advocates for a service in which the customer always deals with specialized technicians.

"We must continue to invest in improving the service and proximity we offer our customers. This is something they demand, and for this reason we are putting all our efforts into carrying it out",says Iñigo Pagola, Customer Service Director of Pasaban.

The most frequently requested services are machine upgrades. Despite the fact that Pasaban machines have an average service life of more than thirty years, it is of great importance to keep the machines up to date in order to extend their lifetime and get the best out of them.

The benefits of this type of maintenance include increasing machine availability, performance and improving the quality of the finished product. Thus, increasing productivity, mitigating obsolescence and enabling the automation of some of the machine's processes. This service is also available for Pasaban machines and other brands such as Jagenberg or Bielomatik among others.

Pasaban remains committed to providing customers around the world with customized solutions that help increase their competitiveness and position them as a global quality benchmark. The main value is to continuously offer our customers high quality machines and solutions alongside an impeccable service to gain their trust. Meeting these requirements is what makes Pasaban a leader in the design and manufacturing of machinery for the conversion of paper and cardboard.

"We are increasing our efforts to expand our international markets, to build stronger customer relationships, and to innovate as a basis for sustainable business", continues Garcia.

Pasaban Service, Helping Customers Worldwide

"Being close to our customers and offering them quality service are our main priority". Iñigo Pagola, Pasaban Service Director.

At Pasaban, it is important to ensure that customers will receive excellent technical service. Pasaban's extensive knowledge of the paper converting industry and its technical problems allows them to offer a close, fast and efficient service all over the world; it also creates a long-term relationship of trust with our customers.

Pasaban Service, Pasaban's technical service, is formed by highly qualified engineers specialized in machinery upgrades, emergency services, machine installation and preventive and corrective maintenance.

For Pasaban, customer proximity is a priority, for this reason, they offer a wide range of service options that can cover any need that may arise:

Firstly, they like to help customers plan the correct preventive maintenance of their machines, so that their experience with Pasaban machines is long-lasting. To this end, they offer a range of commercial proposals that can be tailored to the specific needs of customers.

Most of the inconveniences that may arise with paper and cardboard converting machines can be solved by remote support, they solve 85% of them in this way. This service avoids unnecessary downtime and significantly reduces maintenance costs.

Pasaban supplies mechanical, electrical, hydraulic and pneumatic spare parts with a quick response and at a competitive price. You can consult our online store, here you will find any type of spare part for any inconvenience in your paper and cardboard converting machinery.

Upgrades or modernization of sheeters and winders is essential to increase the life of old machines and improve their performance, this is a highly requested service. As time goes by, machine obsolescence also advances, so there are times when proper maintenance is not enough.

The benefits of this type of maintenance include increasing machine availability and performance and improving the quality of the end product. In turn, it will increase productivity, mitigate obsolescence and allow automation of some of the machine's processes.

Figure 4: Pasaban paper sheeter at Mondi Neusiedler

Pasaban believes that it is essential that companies that have purchased Pasaban machines, or other brands such as Jagenberg or Bielomatik, continue to get the most out of these great machines.

We believe that no one is better suited for the machine displacement task than the one who has created the machine and has first-hand knowledge of its nature. Pasaban ensures that disassembly, transport and assembly at the final destination are carried out in a coordinated manner and that the machine is commissioned on schedule with optimum results. In addition, the customer has the guarantee that the replaced parts will be original.

Finally, with the in-site training service, Pasaban provides basic machine training, safety training, advice on process optimization and machine operation analysis.

Again at Pasaban they aim to build a long-term relationship of trust with customers. Thanks to the quality, efficiency and immediacy of their services, they make customers feel that we are at their side for any issue that may arise. This is all thanks to our staff of specialized technicians and engineers that will make you feel that you are dealing with professionals.

Pasaban, where precision is needed

Pasaban is a world leader in paper, board and pulp converting machines. They design and manufacture high quality machines customized to the needs of our customers, being able to offer complex turnkey projects with a high degree of automation.

Pasaban is a world leader in sheeting, winding and packaging machines and work together with customers to provide innovative solutions, at a low operating cost, helping to minimize environmental impact.

Pasaban's global sales and service network supports manufacturers, converters and printers right around the world. The company currently has more than 250 customers with 550 machines installed, and a high and well established international reputation.

Figure 5: Pasaban Headquarters.
Auzo-txikia, 17, Apdo.53 | 20400, Tolosa - Spain.
info@pasaban.com
Telephone: Head offices (CET 9.00-20.00): +34 943 65 16 32.
Technical services (CET 9.00-20.00): +34 943 65 16 32.

Figure 6: Pasaban customer service.

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Intelligent design of Yankee Coatings

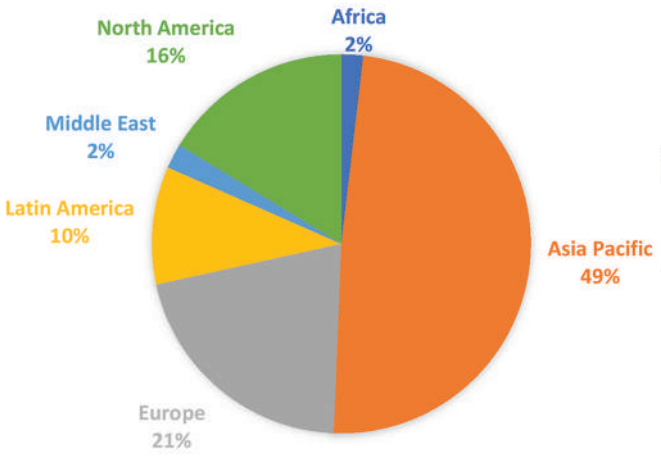
Gary S. Furman, Senior Corporate Scientist, Nalco Water, an Ecolab Company
Robert Melchiors, Senior Industry Technical Consultant, Nalco Water, an Ecolab Company
Marisa A. Rocha, Lead Chemist, Nalco Water, an Ecolab Company

INTRODUCTION:

All Yankee coatings must perform three critical tasks basic to their performance. They must (1) protect the Yankee surface, (2) provide adequate adhesion to transfer the sheet onto the Yankee and to develop enhanced sheet properties at the creping blade, and (3) be soft enough to allow blade tip penetration into the coating and below the sheet. The tissue machine type and grade being produced greatly influence the ability of the coating to perform these functions. Thus, the coating package and the coating properties which develop must be designed for the machine type and grade conditions in order to run the tissue machine efficiently and produce the desired tissue quality. Nalco Water's Yankee coating offerings including the TULIP™ and NAVIGATOR™ adhesive product lines, when coupled with the appropriate release and modifying agents, perform these tasks over the broad range of conditions employed in the industry today. This review will highlight the coating needs and recommendations for each major machine type – conventional wet press (CWP), (creped) through-air dried (TAD) and hybrid.

Background

Globally, the tissue and towel industry remains in a dynamic phase with good growth, a reaffirmation by consumers of the importance of these products to their personal hygiene, and steady advances in production technology. The FisherSolve® Next database shows a current global capacity for tissue and towel products of over 55 million MT (air dry basis) with the regional breakdown shown in Figure 1.



FMT = Finished Metric Tons
55,360,289

Figure 1: Global capacity for tissue and towel products by region. Total capacity = 55,360,289 finished metric tons (FisherSolve® Next).

Most analysts estimate the underlying growth rate of the industry remains in the 3-4% range per year even though the COVID 19 pandemic has caused some recent fluctuations. Hoarding by consumers in the early days of the pandemic caused a spike in apparent usage (followed by a lull) and emphasized the critical nature of tissue products.

The most important properties to consumer preference remain softness, bulk, absorbency, and cleaning ability. Base paper or parent roll manufacturing of tissue and towel can be categorized into three different technologies: (1) conventional wet press or CWP, (2) through-air dried or TAD and (3) hybrid machines. The hybrid technologies have the capability to produce a structured sheet (prior to creping) like TAD but without utilizing a TAD dryer. Global market share by technology is dominated by CWP (91% of global tons) but the TAD and hybrid machines have steadily increased market share in North America, as shown in Figure 2, now accounting for 41% of the NA tons.

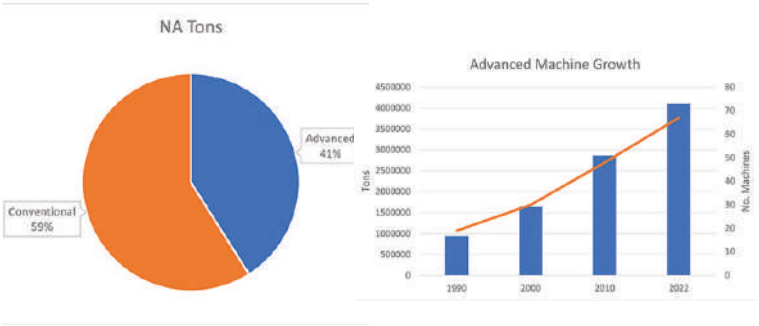


Figure 2a: North America tissue and towel tonnage by machine type. (FisherSolve® Next)
Figure 2b: North America growth of advanced machines.

All current machine technologies emphasize improvements in softness, bulk and absorbency while maintaining necessary product strength in use, however, the TAD and hybrid technologies excel at this, thus resulting in their popularity in N. America. The TAD and hybrid technologies can also be referred to as "advanced" tissue machines that produce "structured" sheets. These technologies are increasingly used by tissue manufacturers to produce premium and ultra-premium products for well-known national brands as well as for the private label market. Reviews of advanced machine technologies capable of producing structured sheets have been presented by both Janda *(reference 1)* and Reisinger *(reference 2)*.

Creping remains the key unit operation in the tissue making process having an inordinate influence on machine efficiency, and at least in conventional tissue making technology, largely defining the end-product attributes of the tissue. Creping is governed by the complex interaction between various mechanical, operational, and chemical factors, some of which are depicted in Figure 3. (*overleaf*)

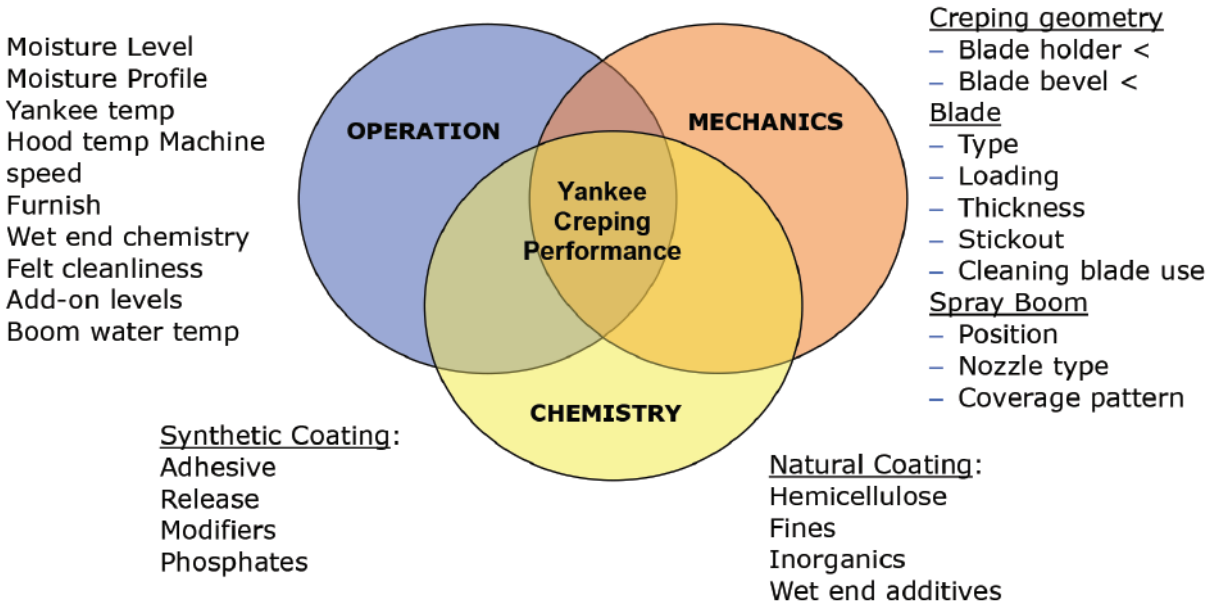


Figure 3: Yankee Creping Performance – Some Key Factors.

Yankee Coating Requirements and Definitions

Given the importance of creping, the chemical component of creping or the Yankee coating is also critical to the overall performance of the tissue machine both from an operational efficiency and finished product quality perspective. The Yankee coating may be described as a thin film which is an agglomerate of (a) materials sprayed directly onto the Yankee surface and (b) "natural" coating components deposited from the furnish and wet end of the tissue machine as depicted in Figure 4 *(reference 3)*. To support efficient machine operation and good quality (i.e., good creping) of the tissue, the Yankee coating must perform three critical functions.

1. Protect the Yankee surface against mechanical and chemically induced defects.
2. Provide adequate adhesion to transfer the tissue sheet to the Yankee dryer and then to crepe it effectively to develop the required properties of softness, bulk, and absorbency.
3. Have the correct film softness to allow the tip of the doctor blade to reside within the coating layer and provide good creping and machine operation, yet still be durable enough to protect the Yankee surface.

A practical way to understand the characteristics and behavior of Yankee dryer coatings is to use a model known as "Coating Space" (Figure 5), *(reference 4)*. This model corresponds to the functions listed above where the protection function is now described as durability. It is easily understood by tissue technologists and mill operations personnel.

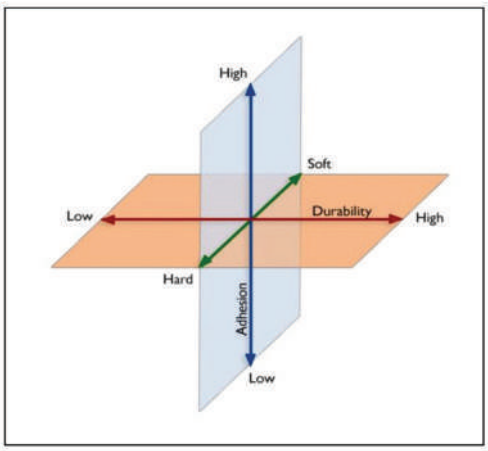


Figure 5: Depiction of the Coating Space Model concept showing the three axes defining film properties (reference 4).

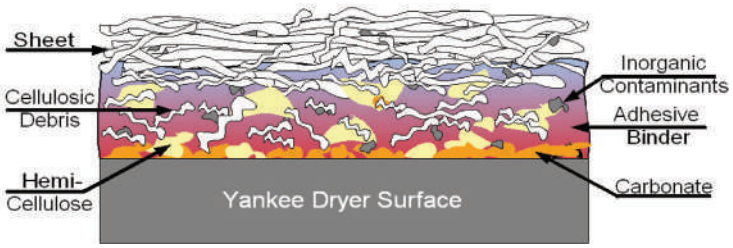


Figure 4: Depiction of Yankee Coating showing various components comprising the film (reference 3).

Before discussing Yankee coating design considerations and to provide a common understanding of the synthetic coating components listed in Figure 3 and depicted in Figure 4, it is helpful to offer the following Yankee coating component definitions.

- **Adhesive** – The adhesive functions to form the main cohesive protective film or coating on the Yankee while providing the necessary adhesion for transfer of the sheet to the Yankee and then to crepe the sheet effectively. More than one adhesive can be used, and these materials are typically film forming polymers.
- **Release** – Release products have traditionally been oil-based with added surfactants for emulsification and application through the spray boom. These products provide release from the Yankee and blade, while controlling excessive coating film build-up.
- **Modifier** – Modifiers are typically surfactant-based and more compatible with adhesives than release oils. They can soften the coating film while increasing its uniformity in terms of appearance and thickness *(see reference 5)*. Modifiers are more commonly used on advanced machines where they provide the necessary release at the blade as well.
- **Humectant** – Humectants can be used to help retain moisture in the coating to keep it flexible and soft while remaining adhesive.
- **Phosphate** – Phosphates are used as inorganic protective agents for the Yankee surface. They can also help anchor the coating thus providing uniformity. Monoammonium phosphate (MAP) is a typical example.

Yankee Coating Design Considerations

Before discussing design of Yankee coatings for specific machine types, it is important to acknowledge other tissue and towel grade factors that will impact coating performance and the choice of components. Primarily these will include furnish, wet end chemistry and end product performance targets like softness and strength. Specifically, a number of these factors contribute to or influence the natural coating components like hemicellulose content, ash, and fines as well as wet end chemistries like strength aids and debonders/softeners *(reference 6)*. Operational considerations, particularly, creping moisture will also play a major role in coating design.

We will now discuss coating design considerations for the major machine types or technologies of CWP, TAD and hybrid. A primary consideration here is the sheet moisture prior to transfer to the Yankee dryer. Figure 6 provides this moisture range for the three machine types.

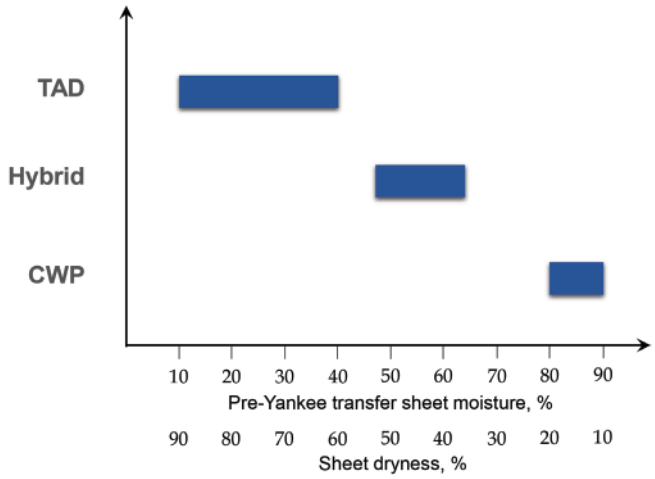


Figure 6: Sheet moisture at Yankee transfer by the three major machine types.

These ranges are approximate but encompass most machines within the machine type classifications. The driest transfer moistures are encountered in TAD with values as low as 10% and the wettest transfer moistures in CWP with values close to 90%. Hybrid machines bring an intermediate moisture content to the Yankee.

CWP – The vast majority of new CWP machines are crescent formers and so we will restrict our discussion to these machines. Crescent formers can run with all furnish types and tissue manufacturers will utilize a wide range of creping moistures (3-7% typical) dependent on softness and energy use targets. When considering an appropriate adhesive for crescent formers, it must be durable enough to withstand the wet transfer conditions (~80-90% sheet moisture) and essentially flooded conditions within the pressure roll nip *(see reference 7)*. Another consideration is the film softness at the creping blade which must be accommodating of the creping moisture. Typical adhesive add-ons can be in the 1-5 mg/m² range. Both release and modifier chemistries may be employed. Oil-based releases are more typical for away from home (AFH) and higher creping moisture grades, whereas modifiers are more common in at home (AH) higher softness grades creped at lower moisture levels. Sometimes humectants can be employed to keep the coating soft at low creping moisture conditions. Phosphate use is common but will be dependent on water chemistry.

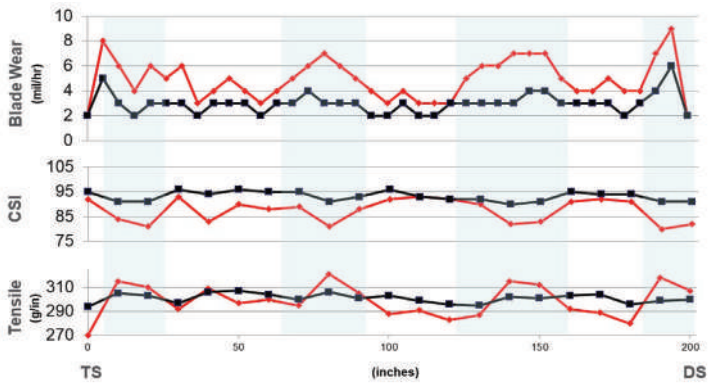


Figure 7: Cross directional profile on a CWP machine showing blade wear (mils/hr), crepe structures per inch (CSI), and tensile strength (g/in) for TULIP™ (in blue) vs. a conventional PAE (in red). The light-blue shaded columns in the CD represent areas of higher sheet moisture coming to the Yankee and hence areas subjected to potential durability issues for the coating. On the x-axis TS and DS represent the tending and drive sides of the machine, respectively.

CWP Case Studies – Nalco Water's TULIP™ adhesive product line, based upon a modified vinyl polymer architecture, offers a unique set of properties including high transfer and creping adhesion, soft film characteristics and good moisture tolerance. It has proven a good fit for CWP machines and *references 8 and 9* may be consulted for further details. A particularly compelling example of Tulip's moisture tolerance is provided in Figure 7. Here a cross directional profile of blade wear and sheet properties is provided for Tulip (in blue) vs. a conventional PAE (in red). Note that the light-blue shaded columns in the CD represent areas of higher sheet moisture coming to the Yankee and hence areas subjected to potential durability issues for the coating. In these high moisture areas, the PAE adhesive has problems with higher blade wear, lower crepe structures per inch, and higher sheet tensile. The Tulip adhesive provides a relatively flat profile for these properties across the CD showing its higher tolerance for moisture variation and thus a wider operating window.

Tissue Results	Before	After
Yankee Speed (m/min)	1900	1950
Reel speed (m/min)	1491	1580
Stretch (%)	15.3	18.0
Crepe ratio (%)	21.5	19.0

Table I: Result summary from a CWP Yankee coating trial utilizing TULIP™ vs. a competitive PAE adhesive on a 16 gsm tissue grade.

On another machine running at 1900 m/min (see Table I), the Tulip adhesive was able to improve tissue stretch values from an average of 15.3% to as high as 22.1% due to the improved creping adhesion. This improved stretch capability was utilized to decrease the crepe ratio while running at higher Yankee and reel speeds. In turn, this resulted in an approximately 2.8% production increase.

TAD - TAD machines can provide a wide range of sheet moistures coming to the Yankee from as low as 10% to upwards of 40%. These machines almost exclusively utilize virgin furnish due to the high softness grades produced, as well as perceived difficulties in efficient use of the TAD dryer with recycle furnish. Creping moistures are typically less than 5%. For TAD machines the adhesive needs to provide the necessary wet tack adhesion to transfer the relatively "dry" sheet to the Yankee. Traditionally this has been accomplished with a two-part adhesive program utilizing polyvinyl alcohol (PVOH) for wet tack and a polyaminoamide-epichlorohydrin (PAE) polymer for dry tack at the creping blade and durability. Recently a simplified single-component advanced adhesive has been introduced for TAD and hybrid machines eliminating the necessity for two-part adhesive programs *(reference 10)*. Required adhesive add-ons are high (30-60 mg/m²) to build a thick enough coating layer to transfer the structured sheet which will only have a contact area of 25% or less with the dryer surface. For TAD coatings modifiers are typically used to soften and control film build as well as to adjust the film durability. Humectants can be used to accommodate the lack of moisture contribution to the coating from the sheet and the low creping moistures. Phosphates are typically beneficial in contributing to uniform films. It should also be recognized that the release chemistry used on the TAD fabric can also impact the Yankee coating properties.

TAD Case Study – Nalco Water's NAVIGATOR™ adhesive products offer customers unique PAE-based adhesives in terms of film softness and durability. Although they can be used on CWP assets, they are particularly effective on advanced machines. Table II provides a snapshot of a recent conversion from a competitive PVOH/PAE adhesive program to a PVOH/Navigator program. Improvements were observed in speed, breaks per day and blade life resulting in a 7% production increase.

Towel Results	Before	After
Yankee Speed (ft/min)	4,250	4,500
Breaks per Day	14	10
Production (relative tons/time)	1	1.07
Creper Life (hr)	24	48
Cleaner Life (hr)	4	8

Table II: Result summary of a TAD Yankee coating conversion from a competitive PVOH/PAE adhesive program to a PVOH/ Navigator program on a 26 gsm towel grade.

Hybrid – Hybrid machines currently encompass several branded machine types including Advantage™ NTT®, Advantage™ QRT® and Advantage™ eTAD® from Valmet and ATMOS from Voith. The NTT, QRT and ATMOS machines can switch from conventional to structured sheets dependent on the fabric or belt installed. Hybrid machines can present a fairly wide sheet moisture range at transfer to the Yankee (46-64%) and represent an intermediate range between that of CWP and TAD. Hybrid machines are more versatile that TAD's with their ability to handle recycle fiber. Creping moistures tend to be similar to TAD at less than 5%. Hybrid machine technologies are still evolving at a rapid pace, and similarly, components like fabrics/belts and Yankee coatings are also still in a dynamic phase of development. Current Yankee coating technology tends to be a hybrid of TAD and CWP considerations. PVOH is typically used as an adhesive component, similar to TAD, in conjunction with a PAE. Simplified one adhesive programs are also taking hold *(reference 10)*. Depending on machine type, the coating needs to accommodate both "flat" and structured sheets with surface contact areas of essentially 100% (flat) to approximately 25-60% for structured sheets. Adhesive add-on ranges tend to be in the 15-30 mg/m² range, although extremes can be seen as low as 10 mg/m² and as high as 70 mg/m². Both modifiers and releases can be used as well as humectants and phosphates.

Hybrid Case Study – In this example Nalco's NAVIGATOR™ adhesive technology in conjunction with PVOH was utilized to provide dependable transfer to the Yankee, more reliable machine runnability, good adhesion at the creping blade and much more uniform parent reel building. A before and after comparison of reel build with the previous PVOH/PAE program to the PVOH/ Navigator program is shown in Figure 8. The combination of good transfer and creping adhesion resulted in a flatter reel profile.

Parameter	CWP	Hybrid	TAD
Transfer Moisture (%)	80-90	46-64	10-30+
Contact Area (%)	~100	~25-60 (structured)	~25
Adhesive Add-on (mg/m^2)	1-5	10-25	30-60
PVOH Use	No	Yes	Yes
Modifier	Sometimes	Mostly	Mostly
Release	Mostly	Sometimes	Sometimes
Humectant	Sometimes	Mostly	Mostly
Phosphate	Varies	Varies	Mostly

Table III: Summary of Yankee coating considerations for the three major machine types.

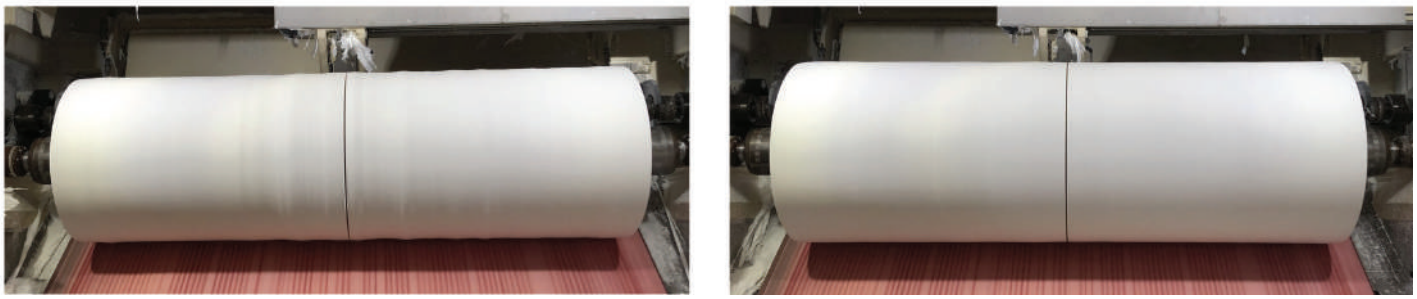


Figure 8: Before and after photographs of parent reel build on an NTT hybrid machine when changing the Yankee coating from a PVOH/competitive PAE program to a PVOH/Navigator PAE program.

CONCLUSION

Yankee coating considerations for the three major machine types discussed in this review are summarized in Table III. The major points discussed in this review include,

- Creping is the key unit operation in the tissue making process and largely defines the end-product attributes of the tissue. It is governed by a complex interaction between mechanical, operational, and chemical factors.
- Yankee coating is critical to the creping process and, therefore, to the overall performance of the tissue machine both in terms of operational efficiency and finished product quality.
- The coating design needs to accommodate the machine type (operating conditions) and grade considerations (fiber and wet end chemistry). Therefore, innovative coating suppliers strive to provide a comprehensive range of adhesive platforms that are tailored to these different conditions.
- Equally important is a full range of other coating components including releases, modifiers, humectants, and phosphates.
- Aligning the correct coating to machine type and operating conditions drives enhanced and more consistent sheet quality and machine efficiency.

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New and revolutionary Körber Warm-up Contactless redefines hot embossing and its benefits for tissue manufacturers

Stefano Palazzesi, Product Manager, Körber Business Area Tissue

INTRODUCTION:

Tissue manufacturers are under unprecedented pressure. Pulp price volatility and the skilled labor shortage remain primary concerns. However, the increased emphasis on sustainability, product differentiation, and global competition cannot be ignored. Increased pulp prices are likely the norm for the foreseeable future. Tissue manufacturers and converters are placed squarely in the middle of the supply-and-demand struggle. Questions about costs and profitability are inevitable.

In response, source rolls of less expensive fiber are being used to help control costs. Hot embossing is heavily relied upon to deliver toilet paper and paper towel rolls of increased firmness and volume while simultaneously preserving tissue quality.

Doing so helps tissue manufacturers deliver to customer quality expectations and remain competitive in the global marketplace. Customers are particular about the tissue products they use, and a shift in quality could cause dissatisfaction. Loyal brand advocates may leave and take their dollars — and tissue manufacturers' margins — with them.

There are also the issues of product differentiation and sustainability. Tissue tensile strength, softness, and absorbency are at the heart of successful outcomes in these increasingly important and competitive areas.

The challenges are many, as are the opportunities for innovation. Finding a broad-based solution that addresses these pain points requires advanced tissue technologies and the expertise it takes to apply them.

The disadvantages of hot liquid embossing systems

Conventional hot embossing methods rely on hot oil or pressurized water to heat each embossing roll in its entirety. The piping networks needed to circulate the heating liquids are expensive and complex, require roll modifications and excessive downtime for installation, and can be dangerous in the event of failure. Long heating and cooldown times and high thermal dissipation also contribute to low overall equipment effectiveness (OEE).

While oil and pressurized water hot embossing systems work, they also limit the ability to efficiently respond to shifts in market demand for certain product differentiators. As a result, tissue manufacturers could miss opportunities and lose competitive advantage.

Tissue manufacturers have been left to make do with liquid hot embossing systems. However, compromise is no longer an adequate strategy during turbulent times in the industry.

It's an unenviable position for tissue manufacturers. It's also the impetus behind the embossing breakthrough developed by Körber engineers.

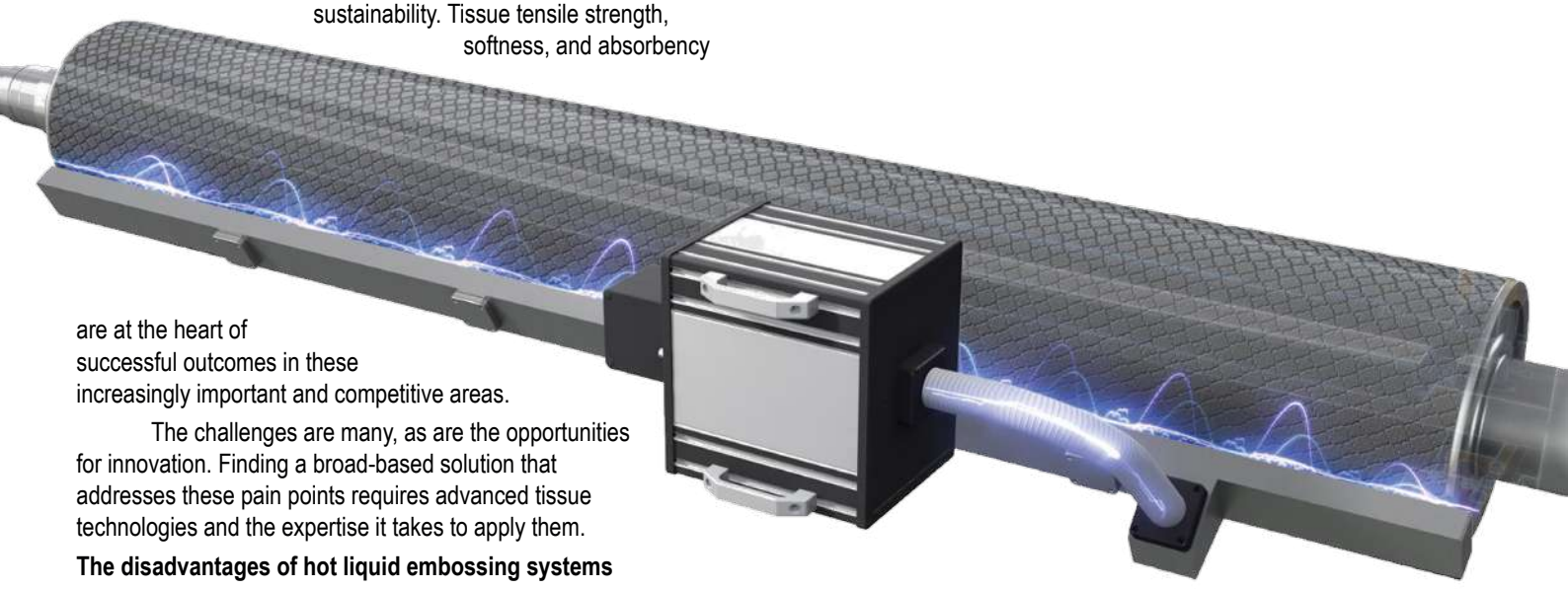


Figure 1: Körber Warm-Up Contactless.

Warm-up Contactless: A real market revolution by Körber

New Körber Warm-up Contactless is the first patent-pending hot embossing system to use induction heating — a proven method in other sectors such as automotive, but barely used in the tissue industry.

Unlike liquid hot embossing systems, induction heating heats the embossing rolls from the outside with no need for physical contact with the rolls themselves. It's what makes Warm-up Contactless effective in offering tissue manufacturers:

- **CAPEX Control: Easy retrofitting on existing embossing units without having to replace or modify the existing rolls**
- **Efficiency: Shortens roll heating time through concentrating heat at roll tips instead of the entire roll, resulting in 60% less energy consumption**
- **Flexibility: Freedom from piping, modified embossing rolls, and internal heating elements mean faster roll changeovers and greater opportunities for expanding product mix**
- **Simplicity: Easy, quick installation, more efficient than traditional liquid hot embossing systems — no complicated piping and power heater systems to house and maintain**
- **Safety: Strong reduction of safety risk due to the elimination of high-temperature liquids.**

The Warm-up Contactless system design is more streamlined compared to complex and fragmented configurations where paper is first moistened and then dried. Moreover, tissue manufacturers can use less expensive fiber to achieve up to 20% greater roll volume! These results are impressive in their own right, but they can be further augmented when the Warm-up Contactless technology is installed on a Perini Constellation line to maximize rewinding efficiency.

Körber Warm-up Contactless is yet another example of how Körber leans into innovation to help tissue manufacturers consistently control costs, quality, and outcomes.

Figure 2: Körber Perini Constellation.

Headquarters and Roll Converting Equipment:
Körber Tissue S.p.A. , Via Giovanni Diodati, 50 - 55100 Lucca (LU) Italia, Telefono: +39 (0583) 460 1, Fax: +39 (0583) 435 543

TAPPICON
ADVERT

Improving energy and paper machine efficiency by using Wefapress expert knowledge and spare parts

Achim Kneifel, Sales and Service Manager for Paper Industry, Wefapress Beck + Co. GmbH

INTRODUCTION:

Papermakers have different reasons to change paper machine spare parts. Next to wear and poor performance it might be better dewatering and energy efficency with new design, noise reduction, simplified maintenance or increased working safety. With more than 125 years of experiance, Wefapress supports pulp and paper mills all around the world to solve individual challenges.

Case:1

Increased production output cause in many cases headbox overloading with higher flow rates or stock consistency than originally designed. Combined with low microturbulences in the forming section this will lead to poor paper sheet formation and fiber agglomeration will create wet paper areas which limits the paper machine speed due to fixed drying capacity. With new dewatering elements it is possible to increase microturbulences in stock suspension and to equalize the paper sheet on the forming fabric. The fresh dewatering elements ensure an even dewatering about the entire machine width and enable like this a higher production speed. To increase the dry content at the end of the wire section results also in huge energy and cost savings in the drying section.

As a plastics specialist and long-time partner to the paper industry, Wefapress developed the hybrid material CeramX, which is a UHMW-PE with ceramic additive. This hybrid material is extremely wear resistant and satisfies also the most ambitious customers as it combines the advantages of ceramic and plastic drainage elements like

- Extremely Low Friction
- Easy Handling
- Short Delivery Times
- Low Investment Costs
- At Least Doubled Live Time

CeramX allows service lives that are significantly longer than possible with normal UHMW-PE while the costs and simple handling of flexible parts match those for other plastic parts. It can be used for forming boards, foils and suction box covers in the wire section at machine speeds up to 1200 m/min and in the press section even up to 2000 m/min for uhle box covers.

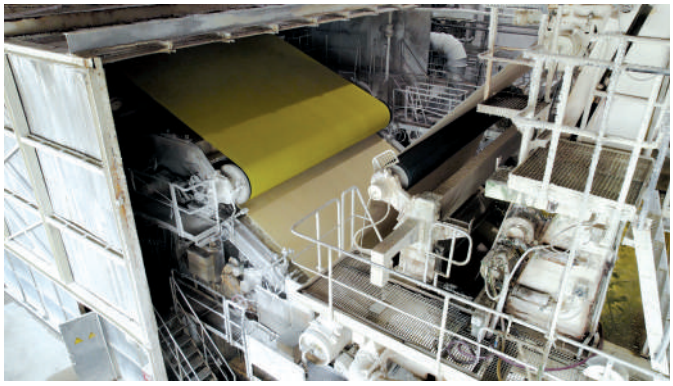


Figure 2: Forming and press section with Wefapress dewatering elements.

Figure 1: Suction box cover in CeramX material.

Case:2

Slotted uhle box covers are not so efficient in dewatering the press felt and especially for seamed felts it makes sense to change to drilled cover perforation in order to support the felt and to avoid that it get sucked into the slot over the complete machine width. This gentle dewatering protects the felt seam and results in longer felt life times. For the premium tissue manufacturer Hakle GmbH, which produces high quality products at 1750 m/min, Wefapress replaced ceramic uhle box blades with a drilled uhle box cover in CeramX material. Mr. Faltin, the technical director at Hakle GmbH confirms that it is very easy to install, saves drive power consumption and further advantages of drilled uhle box covers in combination with seamed felts are

- the down time for felt installation gets reduced dramatically
- no complicated cantilevering is needed
- work safety is increased as no papermaker need to climp on rolls or framing

Figure 3: Chris Faltin, Technical Director at Hakle GmbH.

Case:3

Steady production increases at many paper machines often force gear drives made up of cast iron wheels to reach their capacity limits. Vibrations and high noise are the result.

Replacing cast iron wheels with pinions and gear wheels that have gear rings in plastic eliminates vibrations, ensures significantly improved smooth running, and often eliminates the need for expensive lubrication. Another major advantage is that gear wheels no longer have to be completely dismantled for maintenance – it is only necessary to loosen a few screws in order to replace individual segments while the metal rim stays installed in position. This reduces the conventional downtime of several hours to just a few minutes and consequently increase the system availability. Nylatec 360 gear wheels are hydrolysis resistant and get used successfully in many paper and cardboard mills. Even at the high temperatures and air humidity found in closed drying hoods, the material remains stable and doesn't become brittle. It can absorb high mechanical forces still after many years of application and that ensures long service lives.

To support paper mill maintenance Wefapress offers also the gear wheel mounting service on site.

Figure 4: Nylatec360 gear wheel for drying cylinder drives.

Case:4

Tambour coupling stars in metal are very expensive, heavy and difficult to install. Normally there are at least two fitters needed for installation and in some positions even a working plattform so that it is not possible for a single shift fitter to change it alone. Wefapress replaced the coupling stars for different rewinder and offline coater with flying splice system and biggest demands due to heavy tambour weights around 25.000 kg and highspeed production.

The customers profit from

- low weight and costs
- easy handling
- reduced noise
- improved work safety

Especially due to the reduced weight and the easy handling, fitters don't want to install coupling stars in metal anymore.

Figure 5: Gear wheel mounting service at paper mill.

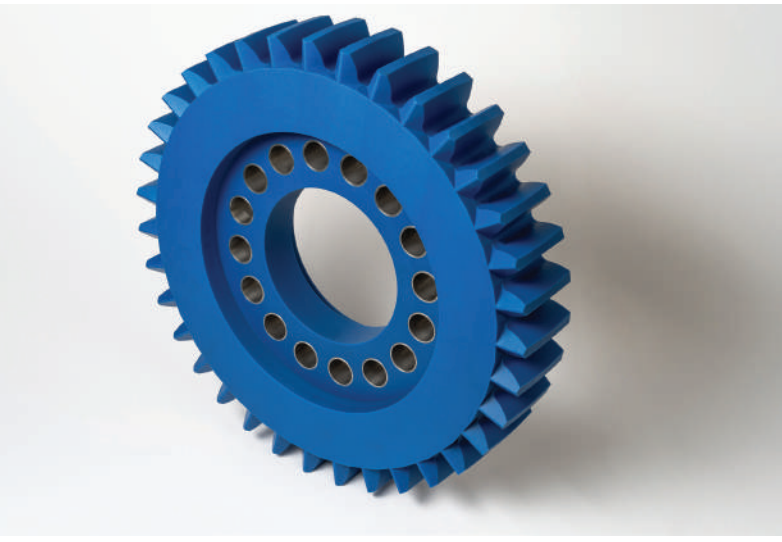


Figure 6: Coupling star for Tambour Drive.

Talk to the experts

At Wefapress, we understand the challenges and consequences in papermaking process. Since 1895 we serve our customer needs and our service engineers are allways happy to support with their huge experience of thousands of applications. Talk to the Wefapress experts in order to improve your spare part handling, energy efficiency, product quality and machine runability.

Our knowledge and huge application experience allows us to work with our customers and to help them get the most from their systems, while ensuring they achieve both, their operational and process goals.

MEVA ENERGY ADVERT

Peace of mind with Sulzer

Pekka Salmi, Head Business Development CSS, Business Unit Industry, Sulzer Pumps Finland Oy

INTRODUCTION:

Sulzer manufactured and delivered the first pump as early as the 19th century. Since then, we have been keeping liquids on the move by an ever-increasing number of various pump and agitator types. In the past decade we increased our product portfolio to cover high-speed compressors. Together with acquisitions and growth in own our sales, we have delivered altogether well above half a million machines, and they can be found in every part of the world. Most of them serve tirelessly in continuous duty in the customers' main processes. However, to make the best out of them year after year, they need high-quality and timely maintenance.

Although we are currently serving various kinds of process industries in their most demanding applications, our roots are in the pulp and paper industry. Our customers continuously drive the development of the production processes and their reliability. Over the decades we have had a vast number of projects with pulp and paper industry customers and with major engineering and process manufacturing companies, aiming at better energy efficiency, higher reliability, and ease of maintenance. Thanks to this cooperation and our own engineering skills, we have developed products that are a perfect fit for the process applications in pulp and paper mills. We have also created innovative service concepts and products to bring equipment availability and reliability to the level desired by the customer.

Continuous development

Sulzer has been developing pumping solutions for the process industries for more than 130 years. When purchasing a Sulzer product, a customer buys into a vast network of expertise and knowledge available from the moment an agreement is made through to when the pump retires from action.

Among the major successes we can list the removal of duplicate stand-by pumps from the processes and changing the pumping of medium-consistency stock from positive displacement technology to centrifugal pumps. Since the first commercial installation of an MC centrifugal pump in 1980 we have developed two more generations with ever increasing pumping capacity and energy efficiency. We have also supported a major leap for easier and faster maintenance by back-pull-out designs and assemblies with no need for manual adjustment of clearances.

Getting rid of duplicate stand-by pumps was mainly achieved by better manufacturing materials, including duplex steels and other highly durable alloys, sturdy product structures with adequate material thicknesses, and strong components like bearing and sealing arrangements that handle higher loads than in the past. We have continued the development towards even more modular product structures allowing easier and less costly changes to products as well as cross-utilization of components.

Our medium-consistency centrifugal pump technology cut the customers' energy and maintenance bills remarkably. High hydraulic performance and high energy efficiency have been on our demand list for every product development project for a long time. In pulp and paper applications, the energy cost accounts for well over 90% of a pump's lifetime costs.

One of the latest additions to our portfolio is the mechanical seal. With the acquisition of a mechanical seal manufacturer, we got access to mechanical sealing technology and a great opportunity to develop our own Sulzer mechanical seal to fit our equipment perfectly. To begin with, we focused the development work on our process pump series and then continued with other products like agitators and multi-stage pumps. Our development work has proven to be very successful as we now have a very large number of pumps and agitators running with Sulzer mechanical seals around the world. Our own mechanical seal allowed us to integrate the seal to our products in an optimal way, also ensuring its efficient servicing.

Figure 1: Sulzer has an experienced global service network to help its clients in all their pumping, mixing and aeration needs.

Figure 2: Our pump service masters even the most demanding applications in pulp and paper mills.

Performance is everything

When it comes to pumps, agitators and high-speed compressors, performance is everything. Processes and operations depend on them, often transporting hazardous or corrosive liquids. Pumps always need to be in working order – many applications require continuous operation, and downtime costs money. Sudden part failure can be disastrous.

Even though our products are very durable by design and construction, they are still subject to various external loads and particles or impurities in the pumped or mixed liquids. For this reason, we pay considerable attention to how our products can be serviced efficiently. We use the latest technology when manufacturing the components of our equipment. Thus, the parts are precise by dimensions and materials and the delivered spare parts are exactly the same as in the originally delivered equipment. They will fit in place perfectly in one go, every time. This speeds up the maintenance considerably, which is crucial should the equipment have failed suddenly and need immediate repair.

In addition to regular spare parts, we started to kit the small wear items in service kits more than 20 years ago. Our service kits have proven to be very popular among maintenance teams because they are easy to order and use when replacing major components like impellers, side plates and seals and when servicing the bearing unit. The service kits include exactly those small wear items that should be changed at the same with the major spare part to ensure reliable operation for the planned mean time between service.

An even more impressive solution for quick service is our exchange unit program in which Sulzer delivers a complete rotating assembly of a process pump to the customer. It can be installed into the pump in just a couple of hours, and the pump can be put back into duty right away. The customer returns the worn unit to Sulzer for inspection and reconditioning.

In addition to ease of maintenance, this exchange unit program also offers the customer a clear financial benefit.

Sulzer also provides a full range of inventory management solutions to support customers to manage their stock and reduce inventory costs. With our solution, customers may release capital currently tied in their spare part inventory for more productive use.

Keeping customers up to speed

Sulzer's global Customer Support Services network carries out regular mill surveys and energy audits to ensure optimal performance. The service experts can suggest improvements such as replacing ageing spare parts with technologically superior alternatives. The energy efficiency and performance studies may reveal that the whole pumping system or parts of it could be modified to reduce power consumption or to enhance reliability.

Regular consultations with Sulzer help extend the lifetime of the pumping and agitation systems by ensuring more reliable operation, fewer unexpected failures, and lower lifetime costs.

The modular approach of Sulzer's solutions is designed to make operation as convenient and functional as possible. Maintenance or upgrading can be carried out easily, and the modular structures allow the customers to manage with less spare parts.

We can upgrade the equipment with more durable materials, change the seal to our Sulzer mechanical seal with proven reliability, change the pump type or include additional features like air removal or self-priming without changing the pump size. With our continuous research on fluid dynamics and the resulting hydraulic development, we have also brought various hydraulic retrofits to the market. The intelligent modular designs and retrofits allow the customers to keep the original footprint, avoiding all the costs of changing the pump base and piping.

Digital technologies

Our development efforts do not focus only on equipment and their components and features. We have introduced a smart condition monitoring system, Sulzer Sense, to turn pumps into intelligent, connected devices. This is a great asset also in the pulp and paper industry where the pumps, agitators and high-speed compressors are mostly in continuous duty. Our condition monitoring system is designed to measure the temperature and vibration of the pumps in operation and to transmit the data wirelessly. The users receive information about the performance and reliability of their pumps and can act upon alarms or other signals showing abnormal development of monitored values. Our condition monitoring system is a valuable addition to our long list of developments to increase the reliability of the equipment and to generate cost savings.

Driving sustainability with Sulzer

Our technology is helping to recycle clothing, create bioplastics and renewable fuels as well as repurposing a large number of our pumps. 95% of Sulzer's products are well serviceable by design and 99% of the materials used in our products are recyclable.

More than a decade ago Sulzer management decided to set aside a budget to buy back some pre-owned process pumps from businesses that no longer needed them or had ceased their operation. To facilitate a seamless process, the sales, procurement, operations, and financial departments joined forces to locate second-hand pumps, purchase them and then find a new purpose for them by refurbishing the pump to its new duty. Sulzer guarantees the performance of the pump with a normal test run and offers a standard one-year guarantee.

The process has winners on all sides. The previous owners have now realized the value of an asset that was unused, even if it was a brand-new spare pump. Sulzer in turn has acquired a pump that it can easily repurpose and refurbish, thanks to the extensive in-house pump knowledge and expertise. As far as the new customer is concerned, they effectively get a perfect-quality pump with a very short lead time, saving time and money for the project in question.

The customer looking for pre-owned equipment contacts their local sales representative with their requirements. The delivery time of pre-owned equipment may be just a few days depending on the scope of delivery. With the pre-owned equipment offering together with the exchange unit service, Sulzer is at the forefront of the sustainability movement.

Figure 3: Spare parts are delivered quickly from our parts processing centers.

Long-term trust with great future

Sulzer builds the existence of the business on long-term relationships and partnerships with our customers. The true value of selecting Sulzer is in our deep knowledge of the customers' processes and their pumping, agitation, and aeration applications. We earn our position day after day by providing state-of-the-art products, spare parts, and highly competent field service and workshop repair solutions to our customers.

The pulp and paper industry has always been a bio-based industry developing towards an even higher utilization rate of the raw material used in the production processes. Like many other industries, pulp and paper is also continuously evolving with new innovations related to the production processes and the products. Sulzer wants to be a fundamental part of this evolution and story of the future.

Sulzer's in-depth knowledge of pumping, agitation, and aeration applications gives us a perfect position to offer and develop our products and service solutions to perfectly fit the customer needs, right now and in the future.

Figure 4: HST high-speed compressors add to our product portfolio for the wastewater treatment plants.

Figure 5: Mechanical seal testing at our full-scale research and development center.

TISSUE WORLD ADVERT

How innovative roll handling equipment can increase safety and create energy savings in paper mills

Jonis Mahmutllari, Sales & Marketing Manager, MoveRoll Oy

INTRODUCTION:

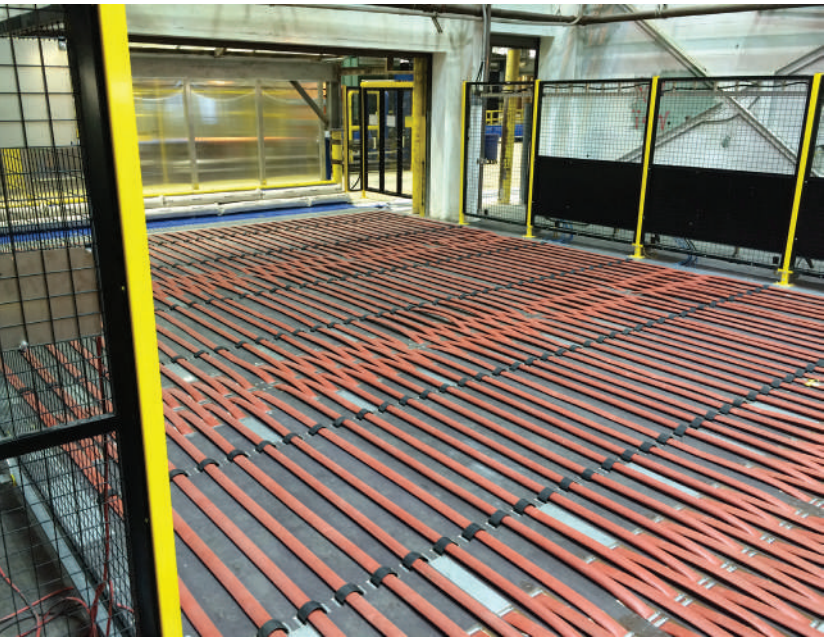
Safety and energy saving are two of the most important considerations when it comes to efficient operations in a paper mill. Firstly, and most importantly, is the safety of employees, as working with moving products and machinery can lead to potentially hazardous situations. Every factory goal is to minimize the hazards and of course have zero accidents. Secondly, the safety of machinery and products produced at the location are also an extremely important consideration. Damaged equipment can lead to production downtime, which is highly costly in a paper mill; damage to paper rolls themselves are equally costly.

Energy savings have become an increasingly important aspect of profitability for any business, especially with the current energy crisis the world is facing. Therefore, managers in paper mills must make sure that when making new investments, the above aspects are taken into very careful consideration.

One company constantly developing innovative Roll Handling solutions, that offer increased safety and energy savings is MoveRoll Oy, a Finnish based company. The unique roll handling equipment of MoveRoll offers several benefits for system integrators and paper mills.

The innovative products can easily be integrated into current roll handling systems, and offer a simple and practical way to gently convey, kick, receive and slow down paper rolls. MoveRoll's conveyors, kickers, receivers and braking pads offer both easy installation and maintenance, resulting in savings for both system integrators and paper mills.

Increased safety in paper roll handling is of utmost importance for MoveRoll. When we are developing new products, one of our first questions is always how a new product can best improve roll handling and give maximum operator safety.



How do MoveRoll Conveyors increase safety in paper mills?

MoveRoll Conveyors are flat (40 mm) and have a modular built. It is easy to install them on a level factory floor. The conveyors use standard pressure elements to transport rolls in a simple rolling motion.

Ramps or sloped floors in the finishing area are a very often a risk to operator safety when rolling paper or cardboard rolls move freely on them. Usually, the rolls gain speed, move in an uncontrolled fashion and bounce back and forth heavily when they hit against steel stops. Consequently paper mill staff working near or on these ramps are at risk of getting hit by paper rolls or even getting crushed between them.

With MoveRoll Conveyor however, ramps are not needed anymore for moving rolling paper and cardboard rolls from point A to point B. No decline is needed to initiate the rolling motion. Instead, compressed air in the pressure elements actuates the rolling motion and the pressure elements transport the rolls safely and always at a controlled speed. That way changes in the rolling direction are also avoided. MoveRoll horizontal conveyors use only 2.5 Bar compressed air to move rolls up to 10.000 kg. Such low air consumption, and having no mechanical components, helps the paper mill to significantly reduce energy costs in the roll handling section.

MoveRoll Conveyors are safety engineered against power failure too. If the compressed air supply should fail and the MoveRoll Conveyor is mounted on level ground, the rolls stay where they are. In case they are rolling, the rolls lose power and normally stop within less than a 500mm distance.

Figure 3: Braking Pad on winder deck.

How do MoveRoll Braking Pads increase safety in paper mills?

Over 150 paper mills worldwide now use MoveRoll braking pads in many different applications, to reduce the speed of the rolls in the finishing line. The Braking Pad is a simple and innovative roll speed reduction solution.

The MoveRoll Braking Pad is designed on the basic principle of reducing kinetic energy of the incoming roll. The combination of soft material, air exhaustion, and absorption of kinetic energy can reduce roll speed up to 0,5m/s or can, under certain circumstances, even stop rolls completely. Reduced roll speed means minimal roll bouncing and significantly shorter settling times. Depending on the length, the portable Braking Pad consists of a certain number of cushions and can easily be placed on flat surfaces. The product design and soft special materials ensure gentle contact with the roll and no damage is incurred either on the roll or the roll handling equipment. Reduced roll speed and decreased roll bouncing significantly increases in operator safety, as well as the minimization of manual roll pushing. Notably, in high-speed applications such as Winder Decks, the combination of a MoveRoll Zero Energy Receiver and MoveRoll Braking Pad achieves the greatest increase in work safety.

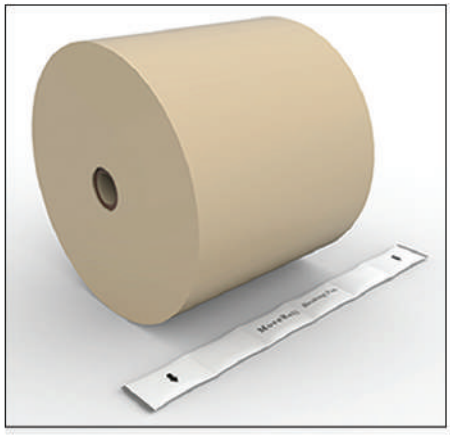
How does the MoveRoll Braking Pad work?

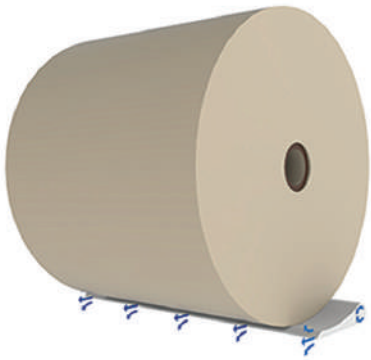
The Braking Pad is made of thin cushions which are designed to be positioned on the rolling surface and to stay in place without any attachment. The kinetic energy is reduced by special soft material placed inside the braking pad, and air that exhausts out of the braking pad as the roll weight squeezes.

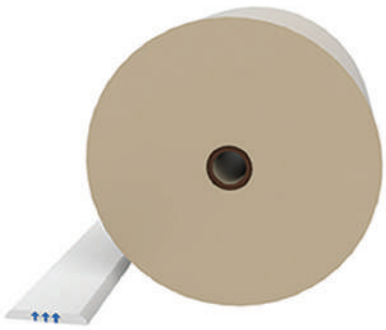
The Braking Pad is placed on the floor as seen in (fig 1a.) acting as a barrier to reduce the speed of the paper roll. When reaching the Braking Pad, the paper roll goes over, initially collecting air on the front end of the pad which will later be realised from the exhaust ports on the back of the braking pad (fig 2b.) When the air exhausts from the pad's front, at the same time it causes counter pressure on the back which results in speed reduction or stopping of the roll. When the roll has left the surface of the pad, the inside special material returns to its previous form and is ready to handle the next roll (fig 3c.)

The MoveRoll Braking Pad is feasible for various roll handling applications. For example, paper mills can place Braking Pads in front of slat or chain conveyors to slow down roll speed and reduce roll settling time. Similarly, Braking Pads are useful on different sections of ramps, to slow down roll speed before the rolls

Figure 1a, 2b, & 3c left to right: Braking pad.







impact on stoppers. In situations where the roll speed is high, e.g., on winder decks, the pads are most effective in two separate rows, for example, in front and behind separation stoppers.

For the convenience of different roll handling applications, MoveRoll Braking Pads are available in different standard lengths but can also be tailored to individual requirements. The Braking Pads are available in two different versions, Magnetic and Non-Magnetic Bottom. The Magnetic Braking Pad has a very thin layer of strong magnetic matting and is suitable for applications where the roll handling surface is metallic. In other applications, paper mills have used the Non-Magnetic version.

In some cases, the rolls are heavy and need to be stopped completely, the Braking Pad alone cannot achieve this alone, therefore another product is needed.

A mechanical Receiver has typical been the most common solution to this, however, Mechanical Receivers are often costly, require continuous maintenance, and in some applications can even damage the paper roll, even resulting in material loss. In more serious cases the safety of operators has been a challenge due to rolls bouncing back .

To resolve the above issues in such roll handling applications MoveRoll has created another patented innovative product called the MoveRoll Zero Energy Receiver.

How does MoveRoll Zero Energy Receiver increase safety in paper mills?

MoveRoll Zero Energy Receiver is the smart solution to cushion roll impact. Meant for low-frequency roll handling applications, the patented Zero Energy Receiver is equipped with special self-inflating roll handling cushions. The material of the cushions is flexible and prevents rolls from hitting the metal frame of the Zero Energy Receiver, hence roll damage is avoided. Notably, the Zero Energy Receiver does not need any energy sources to absorb the kinetic energy of paper or board rolls, therefore many problems common with traditional roll receivers are easily solved. As mentioned above, traditionally, paper mills use steel stops, pneumatic stoppers, or mechanical receivers to catch rolls that come down ramps or sloped floors. These rolls move in an uncontrolled fashion and gain speed before they hit such inflexible stopping equipment. The rolls can bounce back and forth heavily, again resulting in a potentially dangerous work environment, easily damaged rolls and longer roll settling times than necessary.

In contrast, the soft cushions of the patented Zero Energy Receiver reduce the kinetic energy on average by more than 75 %. Since the cushions absorb the kinetic energy of the rolls, they hardly bounce back and forth at all. Thus, the risk that paper mill staff could get hit by, or be crushed, between paper rolls is significantly lowered.

Figure 4: Zero energy receiver.

In applications where paper rolls are very heavy or have a high incoming speed , combining the MoveRoll Braking Pad and MoveRoll Zero Energy Receiver has been the best solution to ensure safe receiving of the roll.

Figure 5 (below) shows a typical installation where the combination of these two products is used to give optimum handling performance. The Braking Pad has two functions: Firstly, it reduces the kinetic energy of the roll before hitting the Receiver and, secondly, prevents the paper rolls from bouncing back to the winder deck area.

The Zero Energy Receiver will cushion the roll gently and stop it to the belt conveyor without any damage. All this is achieved with zero energy consumption, as the receiver does not require any air supply to function.

Figure 5: BP-Zero energy.

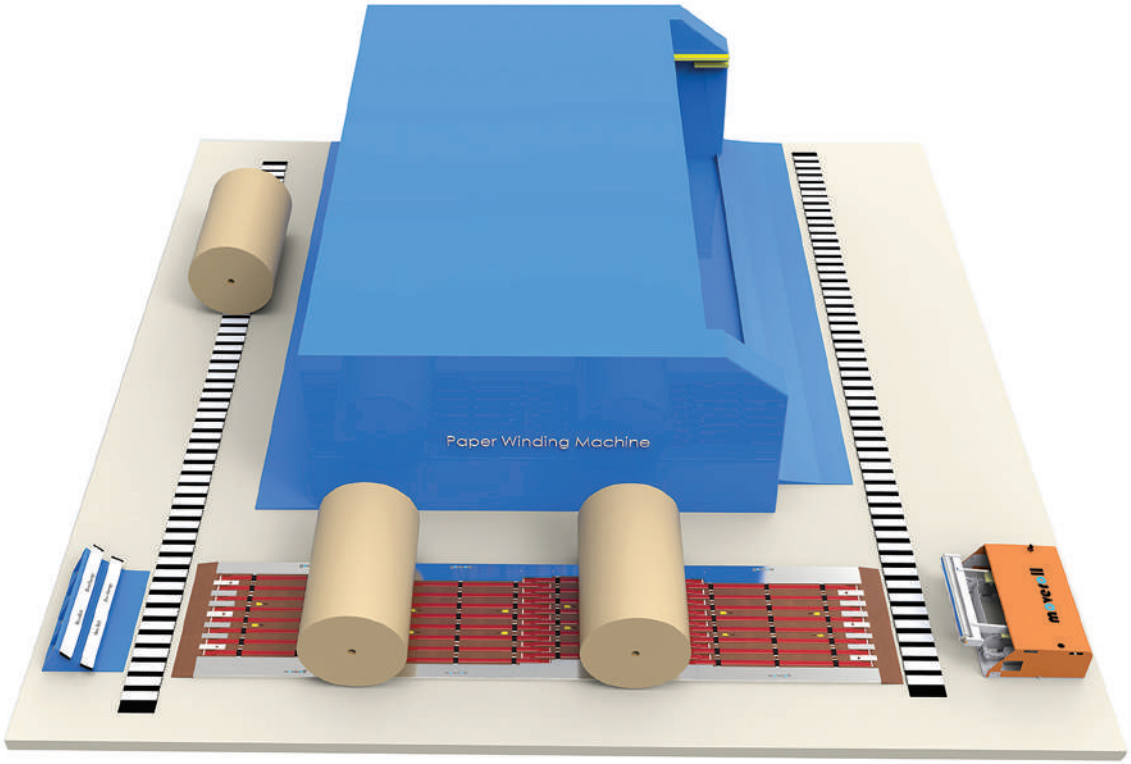


Figure 6: Horizontal conveyor application.

System Integrators use MoveRoll products to benefit their customers.

MoveRoll has delivered innovative solutions to the paper industry for nearly 14 years. The delivery of MoveRoll products across The World is done by a network of leading roll-handling suppliers that integrate MoveRoll products in their roll handling projects.

One of MoveRoll's European Handling Partners is SCM Handling, based in Somerset, UK.

Says Mike Crarer, Sales Manager at SCM Handling: "SCM Handling have partnered with MoveRoll for over five years and have completed several projects that have utilized their cutting-edge technology. Their range of innovative roll handling equipment is unparalleled in its design and a favorite amongst our customer base across the world. The ease in which we can integrate elements, such as their market leading Horizonal Conveyor, Kickers & Zero Energy Receivers into our roll handling systems makes our life as a system builder that much easier!"

"We have supplied MoveRoll's Horizontal Conveyor & Zero Energy Receivers to customers across North America and the United Kingdom, which have added real value to their operations especially when it comes to the safety of people and equipment" adds Mike.

MoveRoll will continue to develop innovative ways to make roll handling easier, safer and more cost efficient for both system integrators and paper mills. Cooperating with our Roll Handling Partners internationally has helped us to focus on what we do best, and further develop MoveRoll solutions of next generation roll handling.

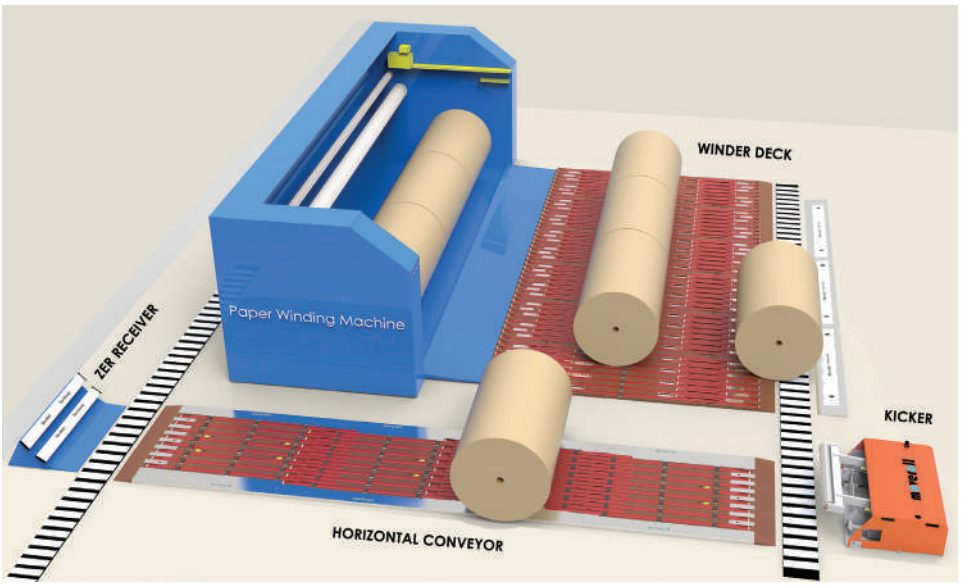


Figure 7: Winder deck.