

NewsFlow

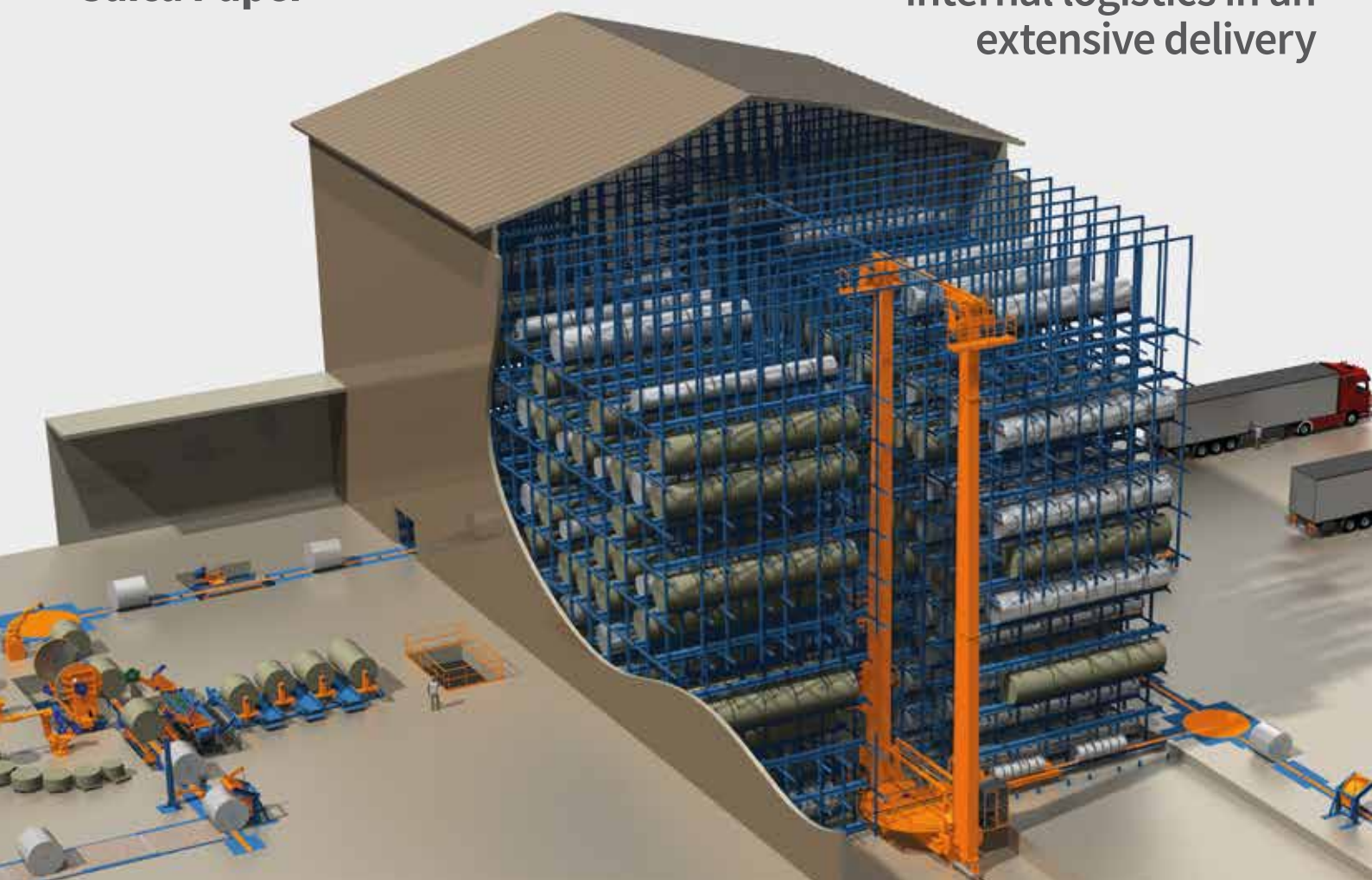
2018 • Paper



Pesmel
40 years
of quality

**New level of
efficiency for
Saica Paper**

**Stora Enso – streamlined
wrapping, storage and
internal logistics in an
extensive delivery**



PESMEL

NewsFlow

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Pesmel's engineering workshop in Estonia is very quality-conscious.



Kaj Fahllund,
Pesmel Oy

PHOTO: PEKKA NIEMI

Solutions for your needs

Throughout Pesmel's 40-year history, our passion and purpose has been to find solutions to our customers' specific and ever-evolving needs related to their internal logistics. Over time, we have become known as a system provider able to help our customers thrive in their specific business without bottlenecks in their packing, warehousing and shipping processes.

Our solution-centered approach requires an engineering-driven mindset with a can-do attitude as well as close cooperation with customers' production personnel. Even if our customers' challenges often seem similar at the outset, the optimal solution is different every time. A strong and exhaustive product portfolio is the foundation on which to build, but in the end it is expertise, experience and ability to listen to the customer's needs that wrap up a successful logistics project. And that is what makes the difference between delivering a product and finding the right solution.

The customer is at the focus in our way of working: Getting close, listening, interacting, and sharing is a feasible way to find the right solution. This magazine highlights cases in which the integration of Pesmel's full-scope, automated warehouse to paper and pulp mills has proven successful thanks to our solution-centered approach with a strong focus on the customer's needs.

The demand for full-scope solutions for automated warehouses has been growing steadily over the past decade. It is the result of an increased need for effectiveness and automated inventory control at paper and pulp mills. Shorter delivery times, savings on operational costs, improved end product quality, and operational safety are among the key drivers for making investments in automated warehouse systems. And the same requirements relevant to production units are creating pressure for similar investments in port-side warehouses.

The most demanding task in system integration is to find the optimal location and create seamless connections between the production material flow and the automated warehouse process. This challenging task can only be carried out by system integrators who not only have all the products in their portfolio, but also possess the capability and skill to tailor each case according to the complete material flow, with all its variables.

I hope you will find the articles in our magazine both interesting and informative. Contact us today to find out more about how we can improve your operations.

Kaj

Automated roll warehouse – case Stora Enso Imatra

In the summer of 2016, Stora Enso announced plans to invest in their Imatra mills to increase their production capacity for extrusion-coated products, and to further enhance its position as a leading global supplier of premium paperboards. Alongside the new polyethylene (PE) coating plant, Stora Enso also made the decision to invest in a new automated roll warehouse.

Need for simpler internal logistics

Before this investment decision was made, Stora Enso's Imatra Mills had needed to utilize outside warehouses in the region to store their intermediate roll buffer due to space limitations in the warehouse at the mills, which used the traditional clamp truck warehouse concept. This meant multiple clamp truck handling phases between the base paper production, PE coating processes and shipping. This decentralized process inventory was challenging to control, very labor-intensive to manage, and led to quality costs. All PE-coated rolls had to be fully wrapped twice: once in order to tolerate the maneuvering by clamp trucks in the intermediate storage process, and again after the PE coating before being shipped to the customer. With the automated roll warehouse, the target was to integrate a sufficient intermediate roll buffer in the mill area between the production, converting and shipping processes, and to cut costs by simplifying and automating the internal logistics. After completing lengthy feasibility studies comparing various alternatives, Pesmel's TransRoll deep channel rack storage concept proved to be the most cost-effective solution.

Alternative automated warehouse concepts

In recent decades, in the paper industry, "automated warehouse" has meant the overhead crane concept, where rather than using clamp trucks, overhead cranes pile rolls on the floor into vertical stacks using a vacuum gripper (for unwrapped rolls) or a mechanical gripper (for wrapped rolls). The best-known suppliers for this warehouse concept are crane manufacturers like Konecranes and Demag. Eliminating the clamp trucks from the warehouse means that the storage density can be improved by 30–40%, as driving aisles are not needed. Piles of rolls stacked by cranes are normally limited to less than ten times the roll diameter to keep the stacks stable – e.g. a stack of 1.5 m diameter rolls has a maximum height of 15 m. This is double the height that is possible in a clamp truck-operated warehouse, but the roll handling and sorting capabilities prove to be a bottleneck for the overhead crane concept. With vacuum grippers, cranes can handle only one roll at a time, and with mechanical grippers, handling multiple rolls is very limited due to strict tolerance demands for roll diameter differences. This means that the overhead crane concept requires quite extensive conveyor systems to serve the cranes, especially in



Two stacker cranes moving roll sets in the central aisle.



Two pre-sorter cars moving rolls between the rack, PE plant and automated truck trailer loading.



A pre-sorter car's satellite pick-up cradle taking a roll set in



The stacker crane's satellite pick-up cradle storing the rolls in a deep, V-shaped channel.

cases where the handling capacity requirements mean more than two cranes are needed. This makes integrating these systems with mill layouts difficult and expensive.

Automated storage facilities using racks, widely used in other industries, had been thought unsuitable and expensive for paper mill usage due to the odd pallet storage adaptations for paper rolls. But deep channel technology has been developed specifically for paper rolls, tremendously expanding the capabilities of the rack storage concept. With deep channel technology, the rolls are stored horizontally in V-shaped supporting channels on both sides of the center aisle where the stacker cranes move. This kind of rack

structure has an unlimited number of possible connections from the long side of the storage system, as any channel on any level can be used as in- or out-take lines for the warehouse, as needed. This enables simpler layouts with fewer conveyors than with overhead crane concepts.

For Stora Enso, where this new central distribution buffer required eight connection points, the TransRoll rack concept was much simpler and less space-consuming to implement than any alternative method. An additional benefit is that it can be easily expanded in the future, if needed – the rack just needs to be extended, which can be done without disturbing the ongoing production process. >>

Project manager **Tommi Myller**, from Stora Enso Imatra mills says, “This new automated roll warehouse simplified our internal logistics a lot. Now we only need one operator to control the process of buffering and sorting the production between paper machines, PE coating and shipping. This is a huge advantage over the previous decentralized operations, with multiple clamp truck drivers and supervisors to manage and handle the intermediate inventory.”

Key elements of TransRoll

This automated warehouse in Imatra operates both as an intermediate buffer for rolls going to PE extrusion coating, and also as a shipping roll buffer for finished customer rolls. The volume was defined to be around 30,000 tonnes, with a wide range of roll dimensions and weights.

The storage facility has one central aisle with two stacker cranes, giving the system redundancy. One stacker crane can be moved to the servicing area, while the other one continues to serve the production. Two pre-sorter cars were added to new PE plant to handle the intake and sorting of finished PE-coated rolls, and to do the automated truck trailer loading. These four units for moving rolls are the only powered elements in this system, besides the connecting conveyors. The rack itself is a static structure that supports the cladding (walls and roof).

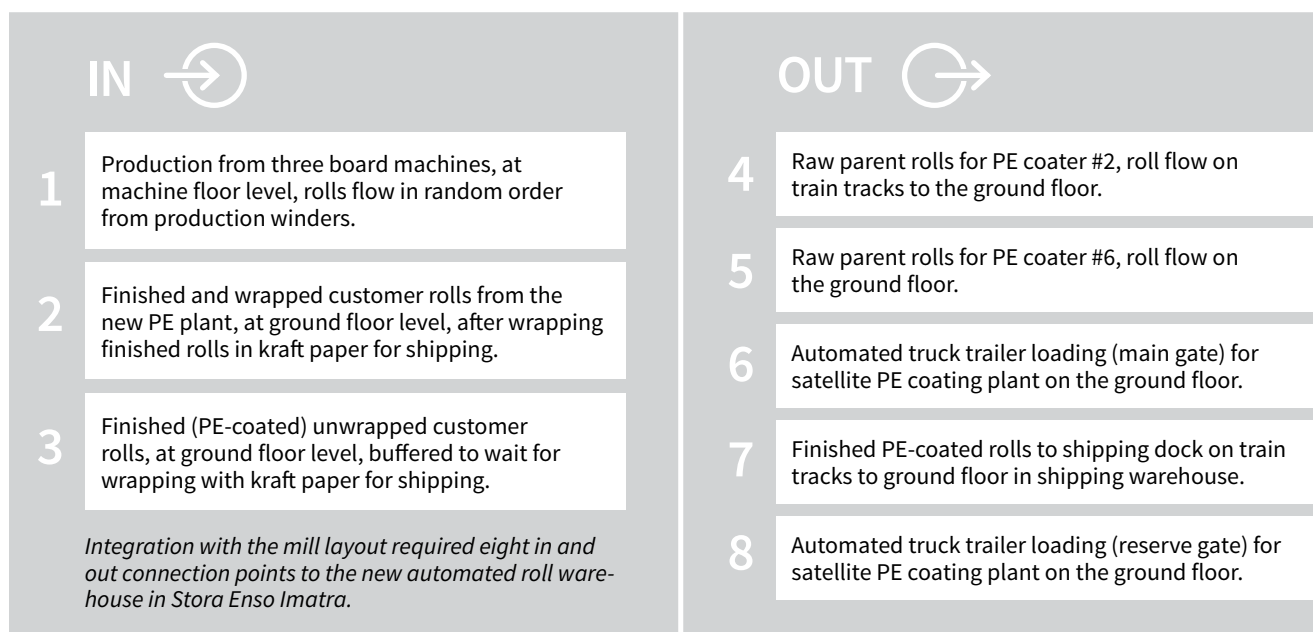
The rolls lie cradled on their sides in V-shaped channels.

They are not pushed or dragged; they are lifted and lowered directly from the channels or the conveyors by the stacker crane’s satellite pick-up cradle, which can handle mixed sets of rolls, of different dimensions, and wrapped, unwrapped or partially wrapped, all at the same time.

Total cost of ownership defines the selected concept

When comparing different type of automated warehouse concepts, it is very important to analyze the total cost of ownership of each alternative. This means the CapEx and OpEx costs related to the warehouse concept itself, but also the costs of the systems and structures needed to integrate it into the mill operations. This means the ability to integrate the automated warehouse into the center of the production process with a minimal number of conveyors, and the civil engineering to feed the roll flow in and then to distribute it for converting and shipping. Here, system suppliers like Pesmел, who can offer the full scope, including conveyor system and all warehouse concepts, have the upper hand over part suppliers who concentrate only on their own core area. This advantage was obvious in the Stora Enso Imatra case, where the automated warehouse was integrated with the production operations around it by eight automated connections at different floor levels, in a very limited amount of space. •

Stora Enso Imatra mills – new 30,000-tonne automated roll warehouse with eight connection points



Powerful packing and streamlined internal logistics

In addition to the TransRoll high bay storage, Pesmel's delivery to Stora Enso Imatra Mills included a kraft wrapping line and an innovative internal logistics system with conveyor connections and automatic shuttle truck loading. The design and delivery of all these took only a little over a year to complete.

When Stora Enso Imatra Mills, the world's largest manufacturer of liquid packaging board, built the new PE6 coating line, new roll packing capacity became necessary. Pesmel's kraft paper packing line with customized layout was built into the PE6 building to keep the food-grade board rolls clean. It features automated roll handling and conveyors, robots to manage core plugging for different core sizes, and the kraft wrapping machine.

Genuine automation ensures hygiene

The fully automated packing line has no manual work phases. The operator only monitors the system

via a PC interface and refills the packing materials when necessary. The absence of manual work has two major benefits: firstly, the process is very safe for employees, and secondly, the rolls cannot be contaminated through careless touching. Stora Enso places great value on quality, and board for liquid packaging and food packaging must be absolutely clean to ensure the appropriate level of hygiene.

In addition to ensuring the pristine condition of the board rolls during handling, Pesmel's high-quality packaging method keeps the rolls protected against physical damage, impurities, odors, and pollutants that could affect the quality of the board during transportation and storage.

Major improvement of internal logistics

The Imatra mill complex is very large, and rolls need to be transported between various buildings. Pesmel was able to provide innovative solutions to significantly improve the internal roll logistics at the mill. This was done with conveyor tunnels from production lines to the new high-bay storage and a special shuttle truck from the new storage facility to the existing mill units. Both the conveyors and the truck trailers were designed to maintain the purity of board rolls.

Previously, board rolls were kraft-wrapped when being moved to coating lines within the same mill complex, approximately one kilometer away – only to be unpacked again for the coating process. The intermediate wrapping phase naturally meant more work and higher costs, but the strict requirement for hygiene prevented the transfer of unpacked rolls even within the mill area. To keep unpacked rolls clean during transportation, Pesmel designed a short-distance truck connection with an innovative, fully automated trailer loading system at the TransRoll storage, and an unloading system at the existing PE coating factory.

All in all, Pesmel's extensive delivery helped eliminate many bottlenecks and drastically reduced the need for manual roll handling. Clamp trucks have been largely replaced by automated conveyor systems, and Pesmel's advanced control and management systems ensure that storage and packing operations are seamless and efficient. •



40 PESMEL YEARS

Pesmel will turn 40 at the end of 2018. The company has reached a respectable age, but is as innovative and passionate about creating new engineering solutions as ever.

THE EARLY YEARS

Pesmel was founded by two sets of brothers, **Hannu** and **Jari Mäki-Rahkola**, and **Pekka** and **Pauli Rahkola**. They first provided electrical installations for both consumers and companies, but machine industry was on their minds from the start. It all really kicked off when Jari started working full-time at Pesmel in 1980.

Quite soon, the Rahkola brothers moved on to other challenges, selling Pesmel to Hannu and Jari, who became the face, body and soul of the company.



Jari Mäki-Rahkola and
Hannu Mäki-Rahkola
1980

“When the operating personnel heard that there is programmable logic in the equipment, they believed that no less than an engineer could use it. However, the only thing to use in automated equipment was a switch that had to be turned when the equipment was started. This problem has been eliminated by involving the operating personnel in the trial run.” (Hannu Mäki-Rahkola, presentation on the automation of a storage and conveyor system for parceled goods, 1984)

Ekokem 1984



1980s: THE BEGINNING OF AUTOMATION KNOW-HOW

Pesmel's first machine workshop was in a barn in 1981, where Pesmel took its first steps as a pioneer in material handling. In the early 80s, wired relay technology was becoming obsolete with the arrival of the first programmable logic controllers. Hannu quickly learned about PLCs to get a head start over the competition.

One of the first deliveries with a modest logic was a stacking machine for Rauma-Repola in 1980. Slowly, the machine industry side expanded, with automation increasingly involved. The electrical department grew simultaneously.

The first notable delivery was an extensive waste handling system for Ekokem in 1984, which included an innovative Ex zone.

"There wasn't much knowledge of Ex zones in Finland. We investigated thoroughly and created one as part of the very first, very big waste material handling systems," says Jari Mäki-Rahkola. "The performance of the facility was our first real test."

On the electrical engineering side, the biggest project was at the Shemyakin Institute in Moscow, which employed 25 electricians for a year in 1988-1989.

"Compared to the Ekokem project's Ex zone and dirty surroundings, this was the opposite. Shemyakin is a bio-organic chemistry institute with cleanrooms. We always say that we take the most difficult projects," says Jari.

In the 80s, Pesmel had many big machinery projects in the Soviet Union. At the end of the 80s, Pesmel built a film wrapping machine for Metsä-Serla, and another for Rauma-Repola. After that, there was a break in deliveries – the innovation came too early.

"We were ahead of our time," says Jari. "Customers didn't believe that you could wrap paper products with anything else than paper. At the turn of the decade, we were like missionaries preaching about film wrapping. When the change happened, it was of course a benefit for us that we already had the solution ready."

In the mid-80s, Pesmel employed programmers, and Hannu and Jari focused on sales and running the company.

"In the 80s our 'engineering drive' was born. With the people we had, we felt that nothing was impossible," says Jari.

1990s: ECONOMIC DEPRESSION AND STRONG COMMITMENT

"Without the 80s boom, we probably wouldn't have survived the 90s," says Jari.

The financial crisis that Finland faced and the fall of the Soviet Union were tough for Pesmel: Hannu and Jari didn't pay themselves any salary, some people worked on partial salary, and others were laid off. These measures helped them through three hard years.

"We survived three years, but we wouldn't have made it through a fourth," says Hannu Mäki-Rahkola.

The first international contract was a film wrapping machine for the Aussedat Rey in France. After this, many more projects followed, for example the first wrapping machine delivery to East Asia in 1993.

After the recession, digitalization moved forward. Drafting tables were replaced when computer-aided design took off. Pesmel had already gained a position at the forefront of automation, and the increased use of automated process handling systems made it possible for the company to grow. Here, Pesmel also became aware of the possibilities of digitalization. Competitors had to outsource automation design, whereas Pesmel had its own resources.

"The principle has always been that we kept whatever we got, whether it was money or people," says Hannu. "Our people are extremely committed, which makes it possible for us to gain more experience, which in turn makes possible to develop new things."

"Our people are engineering-driven. That spirit has always been overwhelmingly in the development of technology," says Jari.

During the 90s, Pesmel made acquisitions. Pesmel AS is a production facility in Estonia, acquired in 1996. AWA Advanced Warehouse Automation delivered warehouses for the paper and metal industries, and later merged with Pesmel. Cimcorp manufactures automated robotic solutions for intralogistics in many industries, and Pesmel complements the deliveries by building the needed conveyors.



Aussedat Rey 1992

2000 & 2010: TRUE GLOBALIZATION

In the 2000s, Pesmel's quality system was certified. Projects for the metal industry started to grow and expand to Europe, with warehouse projects for Outokumpu strongly influencing this. There were many deliveries for the parceled goods industry, and exports grew to 80% of sales. Also, the IT design department developed in huge steps.

"The financial crisis of 2008 hit sales, and Pesmel had to rethink its position in the world," says **Tony Leikas**, CEO of Pesmel. "We reorganized the company: the core remained, but functions were renewed."

In 2011, Pesmel renewed its strategy considerably, selecting the customer branches in which they wanted to operate: paper and metal.

"We are at our best in highly automated systems: internal logistics, packing and warehouse solutions. In these we are competitive; they are demanding, and that suits Pesmel well," says Tony.

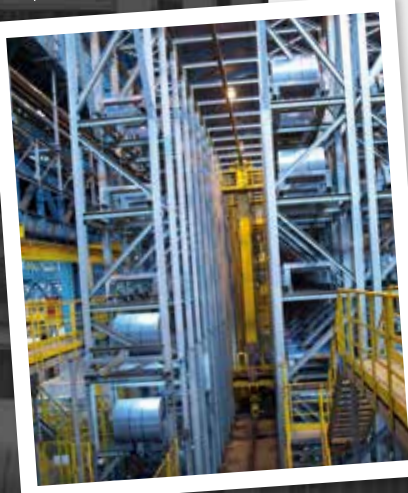
In the early 2010s, Pesmel's focus was on Asia. In 2014, 75% of the turnover came from India and China.

"We have moved from machinery and small production lines to comprehensive systems thanks to digitalization and our ICT knowhow. We have succeeded in genuinely integrating machines and ICT, because we have all the needed resources and knowledge in-house," says Tony.

Pesmel has been growing strongly since 2013, and in 2017 the company's turnover exceeded EUR 50 million.

"Currently we deliver to the Americas, Asia and Europe. We have become truly global." •

CSC Taiwan 2010





Tony Leikas

THE FUTURE OF PESMEL

Over its 40 years, Pesmel has evolved from a machinery workshop in a barn into a global company leading the way in automation. *NewsFlow* talked with CEO Tony Leikas about the future of the company. Where is Pesmel headed?

Pesmel is a global company with affiliates around the world. We are a Finnish company and Europe is our home market, but it's important for us to have a presence in the big markets: the US, China and India, and their neighboring areas. We already have affiliates that we are actively developing in all these markets, so it is safe to say that Pesmel is well prepared for the future.

The solutions we deliver are increasingly comprehensive and feature integrated data systems. Our customer relationships are changing from projects with a clear start and end into long-term relationships, as the data systems allow us to develop and modify our tailored solutions according to changes in our customers' business.

We strive to further develop our skills and knowledge in the customer branches we operate in: paper, metal, and our latest market – the tire industry. We want to understand our customers and their line of business thoroughly so that we can offer them added value.

The Internet of Things may change the field in the search for added value. Our products will continue to be investment goods, but in future our customers will be

able to refine their investments using the data that the equipment collects. The IoT will be used to improve the equipment, making it able to control itself. With the IoT, some phases of the process can be omitted, and the process itself can be optimized. The IoT might change the earning logic, meaning that the money may not come from the machinery or program, but from data, with the added value being in optimization.

Our strengths have always been our flexibility and agility, which will continue to be characteristics that customers value. We are not tied to a standardized product or solution, and we are able to adapt according to the needs of each customer case.

Our people are the company's resource and competitive edge. We are a growth company – and we want to maintain this in the future, too. We will continue to cultivate Material FlowHow through close cooperation with colleges and universities. And we are continuously looking for talented people to join the Pesmel team. We are building our own "FlowHow Academy," which will help people find their own career paths at Pesmel. We want to be a great place to work. •



TransRoll deep channel rack storage:

Great capacity and faster customer deliveries for Saica Paper

With Pesmel TransRoll's high capacity to handle large roll sets, unparalleled storage density and easy upgrade potential, Saica's customer deliveries reach a new level of efficiency.

Saica Paper's El Burgo de Ebro mill complex is located between farmland and parched Spanish hills, in the narrow valley of the Ebro river, which gave its name to the entire Iberian peninsula. In this ancient landscape, the three powerful paper machines and the brand-new coating line are very much part of today's world and the modern circular economy, producing paper for cardboard manufacturing from recycled raw materials. The combined annual output of the mill is more than one million tonnes. Building commercial success from reducing its customers' environmental footprint with highly ecological products, Saica is a pioneer in its field.

Streamlined deliveries from stock, with optimal TCO

Pesmel's TransRoll storage concept, developed specifically for the heavy rolls of paper mills, has attracted much interest in recent years. The system is able to handle roll sets that weigh up to 8.4 tonnes and are up to 5.1 meters wide. The handling capacity reaches 1,000 tonnes per hour.

Originally, Saica intended to expand its old warehouse using clamp trucks. However, an update of their production strategy from make-to-order to make-to-stock set high requirements for the roll handling capacity and storage volumes: with four production lines pushing a multitude of different rolls to storage, Saica needed a genuinely smart and reliable automated storage system. After investigating options, Saica found that the TransRoll storage system was able to offer the best total cost of ownership.

"Total cost of ownership is the single most important factor when making industrial investing decisions. Pesmel offers supreme technology, but it's not enough for our customers; top-of-the-field TCO is what makes us the best choice," says **Kaj Fahlund**, vice president at Pesmel.

Construction amid full production operation

The production start-up of Phase 1 of the new storage facilities is scheduled to begin in the first quarter of 2019. During the sales process, Saica's representatives visited reference mills and Pesimal's own facilities. The project required extra-careful planning, as it soon became evident that the new warehouse would have to be built to replace the old storage facilities – while full production operations continued at the mill. A temporary storage and conveyor system was designed to manage the roll flow during construction. As the new facilities reach completion, the material flow will be gradually redirected to the new storage.

All this set great challenges for project planning. The extremely complex process was made easier by the fact that Pesimal could handle the complete delivery: from conveyors, cranes and the actual buildings, all the way to the control system software. This, together with Pesimal's long experience of holistic system deliveries, allowed efficient project coordination.

"TransRoll storage systems are inherently flexible and easy to expand, which also makes them well suited for construction while production operations continue," product manager **Jani Matikainen** from Pesimal points out.

Each roll in the right place at the right time

TransRoll is a deep channel rack storage system: the rolls are stored in a horizontal position in a 16-level, high-bay storage facility. After the completion of both construction phases, the facility will be 240 meters long and have 12 loading docks. The complete system is optimized for the mill and is carefully tested by simulation before delivery. All tailoring has been done in close cooperation with the customer.

"Our simulations are based on actual production data from the mill. We build a complex model of the mill's output and storage operations, and we tweak it until it reaches the optimal level. For example, the stacker crane capacity is designed to exactly meet the needs of the mill," Fahllund explains.

"You could say that simulation is where the diamond is cut to perfection," Jani Matikainen adds.

The sheer size of the facility imposes extremely high demands for the operating automation. The TransRoll storage system has three automation levels. On top of the basic sensor and PLC levels, there is the warehouse management system (WMS), which is the brains that ensure the optimal organization and operation of the storage system. With 150 rolls of many different types and sizes flowing in from production lines every hour and up to 250 trucks reporting at the mill gate every day in random order, confusion in the storage facility is not an option.

"With the new high-bay storage and the made-to-stock production strategy, Saica's delivery process will reach a whole new level. We are very proud to help streamline operations for a company such as Saica – with its recycled raw material and top products, Saica is setting a new standard for the circular economy," Fahllund says. •



Saica (S.A Industrias Celulosa Aragonesa) is a major European producer of recycled cardboard packaging and a pioneer in the circular economy with operations in most Western European countries. In addition to paper and cardboard packaging mills, the company operates its own recycling system, gathering waste cardboard to be used as raw material for new quality packaging products. SAICA El Burgo mill nominal production capacity is 1.3m tonnes a year.

Juan Antonio Meler,
Project Manager



What were Saica's key drivers to do this project?

- The objectives for developing this project were: To increase the storage capacity at Saica's El Burgo el Ebro paper plant. The aim was to transform Saica's supply change model from made-to-order to made-to-stock. This means effective use of land, improvements in storage efficiency, and reduced costs.
- To reduce costs related to using external warehouses and transporting our paper rolls.
- To reduce costs from rolls being damaged by clamp trucks with traditional handling.

What are the benefits of the TransRoll concept for Saica as a customer?

The TransRoll concept allows increases in capacity and flexibility. The TransRoll system works equally well whether the width of the paper machine is divided between three rolls or eight rolls. It takes the same number of movements to move the full width of the paper machine.

What made the Pesimal approach stand out from the competitors?

When we selected Pesimal, we evaluated their experience with the paper and metal industries. We also analysed their capabilities not only in terms of cycles per hour and storage capacity, but also the capabilities of the warehouse management system, i.e. the system functions, monitoring, optimization and problem diagnosis. This project has achieved excellent results.

Why did a leading board mill change its roll packing method?

In spring 2012, a leading board mill was rebuilt to substantially increase its production capacity. Whilst the board machine was being rebuilt, the roll finishing system, slitter winder and roll packing line also had to be moved and updated.



Paper roll packing methods: stretch film (left) and kraft paper wrapping (right).

Phased production line rebuild to avoid interruptions in production

The production capacity of this line was originally 50,000 tonnes a year. By the time of the rebuild, this had been quadrupled through continuous process improvements and system upgrades, without making any changes to the dimensions of the main machine hall. With this upgrade, the wrapper had to be moved backwards to make more space for parent reel handling and for the new slitter winder. The customer wanted increased capacity and full automation of the finishing operations, as this would markedly improve operational efficiency. However, all this threatened to push the roll wrapper out through the back wall of the machine hall, which would cause a significant jump in the cost, severely limiting the return on the overall investment.

From the beginning, this mill had been wrapping its rolls in kraft paper, but its semi-automatic kraft paper wrapper (installed in 1988) was

approaching a respectable quarter-century service life. For this machine, the wrapping was done in one station, with wrapping phases controlled by a full-time operator, who had to manually place both the inner and outer heads. The labelling, automated in an earlier rebuild, was carried out by an industrial robot at the exit station in front of the ramp to the warehouse.

Rebuilding this existing packing machine was not financially viable, and was also operationally too complicated to execute. The modifications to the finishing area had to be done without

disturbing the ongoing production. The plan was to install and start up the new wrapper behind the existing one, and then to convert the roll stream from the original winder to the new wrapper. After that, the existing wrapper could be dismantled and the new slitter winder installed in its place. In the third phase, the old winder could then be dismantled, and the new parent reel-handling and board machine upgrade could then be completed with the shortest possible production break.

The old wrapper had served them extremely well, so the most obvious choice for the mill's project team seemed to be a new fully automated kraft wrapper from the same supplier. But after the first layout sketches for the new finishing area were completed, it was noticed that the BM building needed extending by two column spaces (2×6 m) to accommodate the new, fully automated kraft packing line. At this point, the project team understood that they should investigate all of today's available alternatives as a part of their feasibility study. This posed the question: are there acceptable alternatives that both fulfill pre-determined quality requirements and take up less floor space?

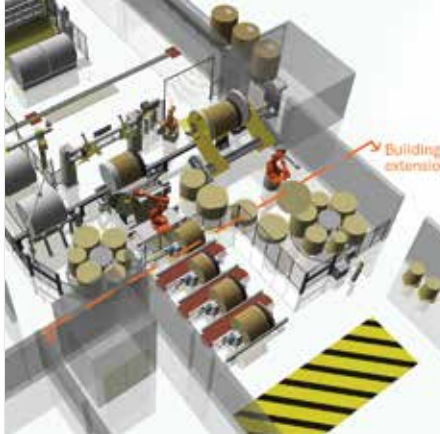
The existing semi-automatic system was replaced with a "one station" structure.



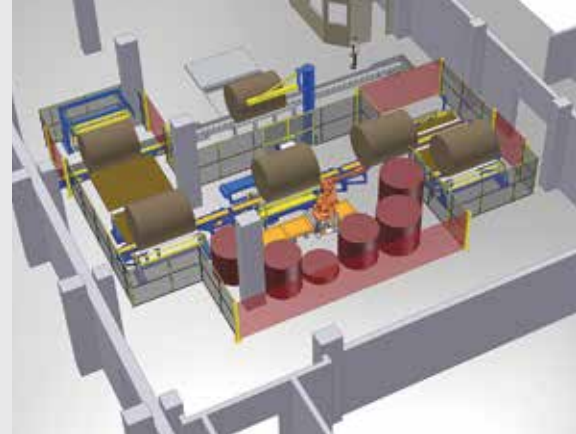


Axial wrapping

Radial wrapping



New slitter winder location shown with new fully automated kraft wrapper.



The stretch film wrapper fitted in the existing hall without building extensions.

Finding the best alternative

For good reasons, kraft wrapping has been the dominant packing method in paper mills for printing grades. The boundaries of stretch wrapping have expanded in recent times, though, due to the improved packing materials, machines and handling systems that can be found today along the entire supply chain. The modern business environment in which the paper industry operates has given an extra push towards finding more cost-effective operational solutions, including roll wrapping and handling. Stretch wrapping tends to enable simpler, space-saving layouts compared to kraft wrapping.

The polarized “for-or-against” thinking that surrounds the stretch vs. kraft debate is both outdated and unnecessary nowadays. The fundamental question is: What is the best protection in the specific transportation chain, and what is the most economical way to achieve it?

The belief that stretch-wrapped rolls cannot tolerate clamp truck handling like kraft-wrapped rolls is not accurate. It is a myth that stems from comparing plain axially or radially wrapped rolls, the film being too loose or simply wrong type of film being used. The main benefit to axial wrapping is to seal the roll ends; radial wrapping both seals and strengthens the roll body whilst providing corner protection.

In this case, the client was quite ready to accept stretch-wrapped rolls without any extra testing due to their previous experience at another mill, where board rolls had been wrapped with a radial stretch wrapping for the past few years. In both cases, the transportation chain was relatively short. Two further points should be noted: First, the space available for the wrapper at the

other mill was limited, and secondly, the stretch concept had been shown to provide sufficient protection for the rolls whilst offering considerably lower investment costs compared to kraft wrapping alternatives.

Simple solution – clear savings

Compared to the alternative kraft wrapping layout, the simplicity of the stretch wrapping concept is striking. The required wrapping capacity for 1.8 m diameter board rolls was 60 rolls per hour. There are three key points here: First, the number of head stacks and head robots required can be cut by half, as only corrugated heads are used with stretch film wrapping. Secondly, kraft wrapping requires four times as much wrapping material to be kept in stock than radial stretch wrapping. This gives clear savings with wrap material costs. Hot-melt glue consumption is also higher with kraft wrapping. Thirdly, the heavy-duty head press station is not needed with stretch wrapping. It should also be noted that roll labelling was the same for both alternatives.

The total investment cost, including the civil engineering, at the mill for the

stretch wrapping system was one-third of that of the alternative kraft wrapping concept. Half of the cost savings result from the much simpler structure of the stretch wrapping system. The other half is down to the stretch solution not requiring any building extension work – the kraft wrapper would have needed two extra column bay widths. Across its whole life cycle, it is estimated that the total cost of operating the stretch wrapping solution will be around half that of a comparable kraft paper wrapping system.

Any feasibility study should always be approached with an open mind to fully evaluate the need to provide adequate protection against transportation and storage issues. Stretch wrapping is certainly not suitable for every application, but there are surely many more paper mills around the world that would likely benefit from its installation. Suppliers should be challenged to present alternatives that are accompanied by clearly articulated pros and cons of each system. The key to an optimally functioning finishing system is an intelligent, well-engineered layout. As is always the case: the better the information available at the investment planning stage, the better the result. •

The selected method was radial stretch film layers to protect the roll body and corrugated head disks for the roll ends.



Fully automated stretch film packing in the mill.



Pesmel's manufacturing in Estonia: agility, efficiency and a strong quality culture

Pesmel's engineering workshop in Estonia operates in Saue, near Estonia's capital city Tallinn. The region is rich with industrial subcontractors for global top technology companies, which makes it an optimal location for Pesmel to develop its own networks and manufacturing operations.

"Our Estonian organization is very quality-conscious, and it has both the will and the ability to continuously develop its operations. The number one goal that we all share is to ensure that our products keep our customers' valuable processes running with supreme performance," says **Tero Manner**, Managing Director of Pesmel's operations in Estonia.

From metalwork to tuning complete systems

Pesmel's own manufacturing operations cover work phases all the way from cutting and welding basic metal components, to building whole production lines and testing them. The scope of projects varies from single devices to huge lines with a hundred different pieces of equipment.

Efficient production of large-scale warehouse and wrapping systems requires a combination of internal and outsourced operations. The focus of Pesmel's own operations is on assembly, which keeps two-thirds of the personnel busy; the remaining third are employed in the metalwork. Pesmel actively develops and expands its global subcontractor network with unwavering attention to technical quality, and sets high requirements for manufacturers' internal processes and safety level.

Subcontracting is an agile solution for increasing the production capacity and for managing highly specialized work phases that require task-specific



Sourcing and purchasing team
Oleg M., Tarmo, Oleg I. and Sven

Quality and technology team
Karina, Kristjan, Heiko and Urmet



machinery and expertise. Components such as motors, variable-frequency drives and instrumentation are also procured from top suppliers, who may be Pesmel's own preferred brands or those selected by the customer to match their mill policies and existing spare part programs. With the right network of subcontractors and suppliers, Pesmel is able to focus on managing the whole and assembling the final systems, tailored to the customer's needs.

Quality assurance and testing

Pesmel controls quality at many levels, starting from certified raw materials and extending to the verification of subcontractors' quality processes and testing of final product quality. As the systems form critical parts of customers' delivery processes, the absolute quality of each component, machine and system must be assured.

The Estonian subsidiary and the Finnish parent company have their own quality organizations, which work as independent units, separate from production operations.

The quality specialists focus on ensuring uncompromising quality at Pesmel's own workshop as well as in subcontractors' operations: all applicable quality parameters and standards must be met.

Testing of each delivery follows a testing plan and the procedures agreed with the customer. While Pesmel always verifies the functionality of its products, customers also have their own quality processes and requirements that must be complied with. Sometimes, not only the individual machines but also the entire assembly is built and tested at Pesmel's facilities, then taken apart to be rebuilt at the customers' premises; in other cases, the customer is happy with only testing key sections of the system before delivery.

"Practically all Pesmel's deliveries are tailored to customer specifications. This does not pose any particular challenges for quality assurance, though; even the most ingenious applications are built on reliable components that have been thoroughly tested and that are known to work well together," says Manner.

Pesmel welcomes customer visits

The project manager keeps the customer up to date throughout the manufacturing process. In addition to the agreed reports and scheduled meetings, customers' representatives often visit the manufacturing facilities to monitor the construction of their systems and to verify the agreed production schedule. Many want to witness the factory acceptance testing of their whole system or some critical parts of it. As final assembly approaches, contact usually becomes more frequent. According to Tero Manner, new customers naturally tend to be more active than long-time partners, who already know Pesmel and its quality level well.

"Customers like to visit us, and we are very happy to have them. We have received good feedback from the visiting representatives of leading global companies. Our customers are always welcome to observe our processes in action during manufacturing as well as testing," Manner says. •

Efficiency throughout the pulp logistics chain

Metsä Fibre's new bioproduct mill in Äänekoski, Finland, is more than just the biggest wood processing plant in the Northern Hemisphere and the center of a bioproduct ecosystem. It also represents the first large-scale installation of Pespel's TransBale high-bay storage system. What makes TransBale special, and what does the future hold?

The Äänekoski mill can produce 1.3 million tonnes of pulp a year, in five product types with over 20 different quality criteria.

Of this, 800,000 tonnes is transported by train to Helsinki for export by ship, another 100,000 tonnes by train for domestic use, and about 400,000 tonnes by truck to other domestic customers or for internal use. Metsä Group decided that for these kinds of volumes, the traditional handling and storage methods simply were not sufficient. They had already had good experiences with Pespel's TransRoll system for paper rolls, and Pespel were keen to suggest their latest innovation: TransBale.

TransBale is an intermediate, high-bay storage system for bales of pulp. In traditional pulp-handling facilities at mill and harbors, the units of pulp are handled by operators driving clamp

trucks in large warehouses. TransBale works in a very different way. It uses automated stacker cranes to move the bales with no operator involvement. With TransBale, the achievable storage density is three times higher than traditional methods, meaning that the same amount of pulp can be handled in a smaller footprint, or the facility can have the capacity to store far more in the same space.

Challenges and benefits

TransBale was developed from Pespel's TransRoll system, which handles and stores rolls of paper or metal. The main difference lies in the nature of the bales of pulp. Rolls of paper or metal are uniform in terms of dimensional tolerances. Bales of pulp have a more irregular shape and their dimensions vary due to a variety of production factors, such as the level

of moisture in the pulp. This makes automated handling particularly challenging, as the system has to cope with a degree of variation in size and shape. Many other automated systems are unable to cope with this aspect of pulp bales, but Pespel's engineers have developed a solution that works very well.

TransBale handles the pulp bales from the bottom, which allows it to cope with differently sized and shaped loads. The stacker cranes store the bales on racks, rather than stacking them on top of each other. With clamp truck handling, the maximum height of a stack of pulp bales is four or five units. With TransBale, this is increased to 15 units. TransBale's stacker cranes are highly efficient, very fast, and completely automated. One stacker crane has the same throughput as four or five clamp trucks, and it does not require an operator.

With TransBale,
the achievable
storage density is
three times higher
than traditional
methods.

A successful first project

The TransBale system can cope with first-in, first-out loading, and it can do sorting as well. It also features a number of sophisticated tracking and optimization features. At Äänekoski, the TransBale system serves as intermediate buffer storage between the mill's production units and the loading facility. It has the capacity for 25,000 tonnes of pulp – the equivalent of five days' production. Train loading is fully automated, and up to 1,400 tonnes of pulp can be loaded onto a train in only three hours.

The scale of the project at Äänekoski and the fact that it was the first of its kind made it somewhat challenging, but the project remained well within Pesmel's capabilities. From signing the agreement to the startup of the system was just 18 months, but of course there was a great deal of advance work and planning before this took place. The system has now been up and running for over six months, and it has met the requirements that Metsä Group had for it.

Pesmel's engineers have also used the practical experience of the installation to come up with a number of development ideas, and the flexible, extensible nature of TransBale means that further improvements will be easy to implement as well.

The future for TransBale

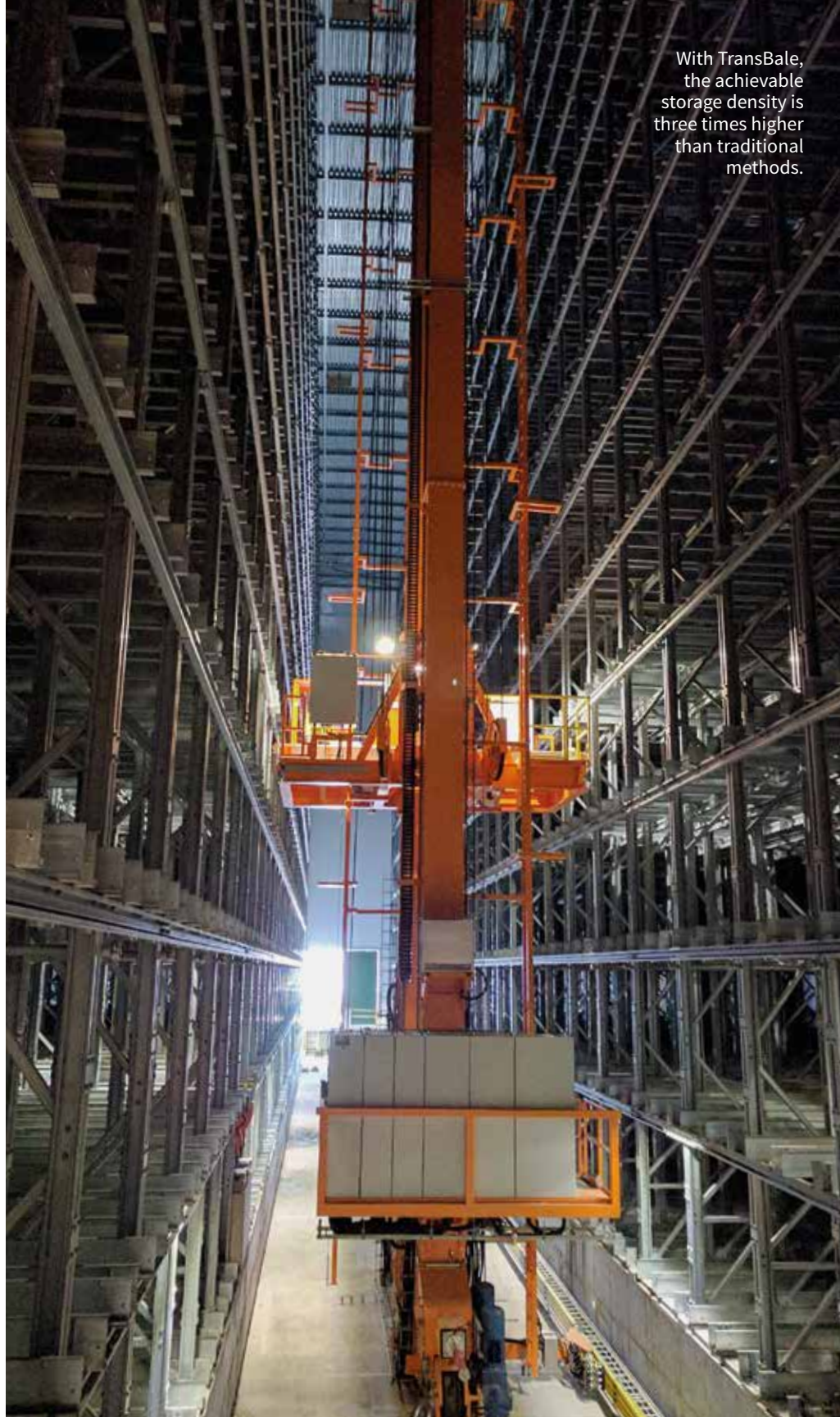
For Pesmel, the Äänekoski project has taught them a lot about pulp mill operations – and logistics. The potential uses of TransBale are not limited to the pulp mill: TransBale is not just an effective storage solution, it is also a cutting-edge logistics situation. It works as a key link in the logistical chain, wherever that may be. It can be utilized at mill sites as a link between production and transportation, synchronizing production with the logistics chain.

But it works equally well in harbors, where trains arrive to unload bales of

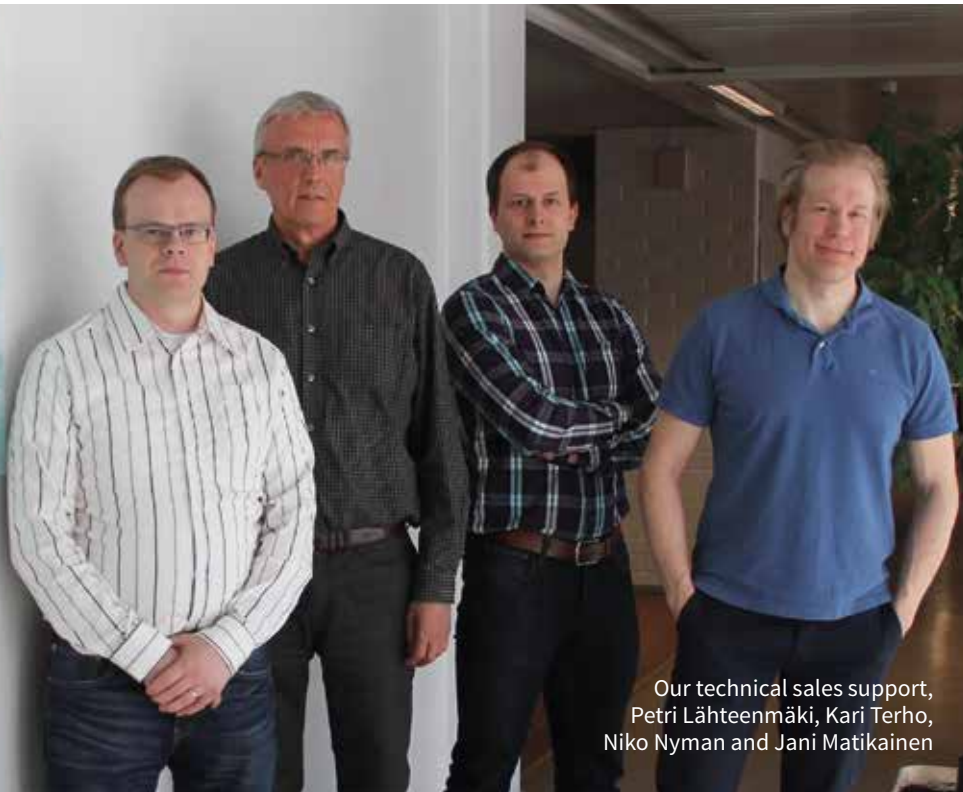
pulp for ship transport. TransBale is the ideal solution for the intermediate storage of the many bales of pulp which need to wait at the harbor to be loaded onto ships. Pesmel's engineers are already hard at work developing harbor handling systems to bring the same advantages to vessels and reduce the

amount of time ships spend in port.

Pesmel are hopeful that, in the future, TransBale will come to dominate the logistics chain for pulp, as mill owners and harbor operators come to realize the benefits of this cutting-edge, automated pulp bale handling and storage solution. •



Pesmel's expertise and the customer's specifications meet at technical sales support, where the optimal solution is compiled and documented during the tendering process. This is where the magic of Pesmel's storage and packing systems begins.



Our technical sales support, Petri Lähteenmäki, Kari Terho, Niko Nyman and Jani Matikainen

Technical sales support creates storage and packing solutions to fit the exact need

Working in technical sales support means staying tuned to all the latest technological advancements, having endless opportunities for learning about different cultures and meeting people from all over the world, and solving challenges and helping develop new agile innovations – and all this with the best team to watch your back.

These are some of the things that Pesmel's technical sales specialists list when asked what they enjoy most about their work. It is obvious that they take pride in the high technical quality of the solutions that they put together for customers. Pesmel operates at the top of its field, and exceeding the customer's expectations is practically part of the job description for these men. With the scrum working method, the expertise and support of each team member is readily available to others.

A wealth of technical information

The tendering documentation is an extensive package of technical information, usually including a 3D model of the solution. Pesmel's specialists analyze the customer's existing or planned production facility, pin down the required automation level and packing concept, and produce precise calculations of material flow capacities with the help of simulation tools.

Based on this detailed view of the project, an efficient, no-nonsense layout is created to fit the available premises, the best-suited standard or special machinery is selected, and technical specifications are provided. The costs are kept in check with flexible utilization of standard solutions

and by selecting just the right capacity, which can be later expanded on. Close cooperation with the customer throughout the process ensures that all needs are met.

In-depth understanding of the customer's operations

Attention to detail is key to a successful storage or packing concept, and experience, combined with state-of-the-art design tools, is what makes all the details fall into place.

An automated storage system that is seamlessly integrated into the production process gives an extra boost to all mill operations. To achieve the optimal result, Pesmel's product managers and specialists often join the process even before tendering begins, offering valuable insight into the vast potential of genuinely automatic storage and packing systems. •

"For a paper mill, renewal of systems may happen once in 20 years; for Pesmel, it's everyday work. It is only natural that we sometimes understand the customer's needs even better than they do, and are often able to offer solutions that the customer has not thought of," says product manager Veli-Matti Hirsimäki, a stretch film packing specialist with 37 years of experience under his belt.



System upgrades step up profitability

Higher throughput and better safety, modern PLC systems, even completely new functions. Pesmel Service is more than maintenance: it also delivers upgrades for existing systems.

Pesmel offers upgrade options for all its storage and wrapping systems. New control logic or variable-frequency drives can substantially speed up operations, and more powerful crane motors and other machine components further enhance operations. A new generation of equipment with state-of-the-art features often means a new level of profitability. Systems can be adjusted to serve changing needs, and software can also be upgraded to improve functionality and optimize operating processes.

“Replacing the PLC or frequency converter is a typical example of an upgrade project. New regulations may also require more advanced safety features,” says technical sales specialist **Tiina Hämäläinen** from Pesmel’s Service unit. “We can recommend just the right upgrade to fit your systems and meet your needs.”

When should you upgrade?

All mill systems eventually come to the end of their feasible service life. Technological improvements bring new, more advanced products to the market, and older models become obsolete. Spare parts may become difficult to find, and old equipment may require more frequent maintenance. There comes a point when the cost of upgrading is actually lower than the cost of not upgrading.

In a typical Pesmel upgrade project, the customer is a long-time partner with a service agreement. Pesmel’s maintenance crew knows the customer’s systems inside and out, and stays tuned to potential ways of improving them. When upgrade needs are identified, you

can count on Pesmel’s ability to offer the best solution. Upgrades can even be provided for other manufacturers’ systems if they are compatible with Pesmel components.

Speed, reliability and economy

New components can enhance the operation of your storage and wrapping systems in many ways. They often also bring cost savings. A new piece of equipment not only works faster than the old one, but also needs less maintenance work, and the improved reliability keeps unplanned outages in check.

Sometimes, the degree of automation of the system can be boosted and operating personnel freed up for other tasks. Spare part optimization is another way of accumulating savings: the upgrade can be designed to use the same spare parts as the customer’s other systems, reducing the number of different parts that need to be kept available.

Modern variable-frequency drives can also save you cash. The drive’s regenerative braking function feeds power back into the grid; with powerful motors that lift extremely heavy rolls, substantial savings will accumulate, and the upgrade’s payback time may be just a couple of years.

Swift delivery with careful planning

Each upgrade project is planned to cause minimum disruption to the customer’s operations. Any planned outages are used to maximum benefit, and more extensive projects can be divided into several parts if there



are only very brief outages available. Christmas, Easter and other holidays when mills may be closed can be busy times for Pesmel’s upgrade crew.

If no suitable outages are planned or can be arranged, an interim storage facility is often used to bypass the systems that are to be upgraded. Full production operations can then be kept running while Pesmel’s specialists swiftly install new components in accordance with detailed installation plans.

Upgrade projects typically only take 4–6 months to complete, and they involve people from the Service unit as well as Pesmel’s technical design team. The sales specialist from the Service unit prepares the offer and defines the project scope and the specifications with the customer. A project manager then leads the execution, and a team is put together based on the needs of the project. Electrical and mechanical design is carried out by Pesmel’s experienced design professionals, field personnel install the components, and programmers see to any software that may be required.

When the installation crew finishes work, the programmer often stays behind for a few days to make sure that all the systems are running smoothly. At Pesmel, nothing is left to chance, and upgrades and new projects alike are performed with an unwavering focus on bringing benefit to the customer. •

Meet our



Kaj Fahllund

Vice President, Paper & Converting

My job is to lead Pesmel's Paper business. My biggest challenge is to adjust and direct our resources towards real customer needs that are within our reach. The most rewarding

moments for me are when, after months of comparing processes, revising proposals, and countless meetings, the customer selects us to be their trusted project supplier.

kaj.fahllund@pesmel.com



Pekka Jormanainen

Sales Manager, Projects and Rebuilds

I tend to work on paper roll handling and rebuild sales. The biggest challenge is usually to find cost-effective solutions that meet customers' needs. The best part

of working with customers is to collaborate with them to develop the solutions that they need. At Pesmel, I can work independently, but with support from my colleagues when I need it.

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Risto Lehtonen

Sales Manager, Paper and Converting

I've been working on technical sales and CRM at Pesmel since 2013. The best part of my job is winning the customer's confidence, then working with them to develop a new logistics system. Working at Pesmel gives me the chance to work

with great people on interesting projects.

risto.lehtonen@pesmel.com



Jagannathan Rajagopalan

Managing Director, Pesmel South Asia and Senior Consultant, Pesmel North America

I've been with Pesmel for 14 years promoting the business in

India and the USA. It's a positive company with unique modern logistics expertise and a great culture of teamwork. It's really rewarding to see the end results of all our work, when a customer's finishing operations are completely automated, improving safety and quality, and enhancing productivity.

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Jouni Räisänen

Sales Manager

I've been working on interesting sales projects at Pesmel for nearly 15 years, helping customers find the best solutions for their warehousing challenges. The biggest challenge is usually to develop solutions that are cost competitive, and

the most rewarding bit is working with customers as one team to find solutions.

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Ilkka Hiirsalmi

Chief Marketing Officer

A proud member and one of the latest recruits to the Pesmel Customer Team, my task is to promote our company's knowhow and capabilities to the senior management and

decision-makers in our customers' industries. I find this task extremely interesting, as I believe our customers will find cooperation with us rewarding and worthwhile.

ilkka.hiirsalmi@pesmel.com



Sanna Leikas

Marketing Communications Manager

My job is to take care of the marketing communication, and I have been involved with Pesmel's marketing for almost 20 years. The diversity of my work and the creativity required

make every day interesting. It is always inspirational to arouse interest in our solutions among customers, whether it is through media, customer events or something else. We truly are proud of our products.

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customer team

Marko Heikkinen

General Manager, Service

I've been at Pesmel for over a decade, and I lead the service department. The most rewarding part of my work is to have satisfied customers, and I enjoy meeting customers face to face and solving their problems. The atmosphere at Pesmel is good, and the work is challenging.

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Jani Matikainen

Product Group Manager, Storage

I work with automated storage systems, and I've been with Pesmel for ten years. My main duties are developing concepts, and providing support for sales and projects. Juggling many different tasks can sometimes be challenging, but it's very rewarding to collaborate with customers to develop the solution they need and then to see them satisfied.

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Ari Mäkinen

Account Manager, Service

I work mainly in after-sales service for customers in the paper converting business area, and I've been with Pesmel for eight years. Tight schedules can sometimes be tricky, but I'm surrounded by helpful and cooperative teams, there is a lot of in-house expertise, and we have a great product portfolio.

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Petri Lähteenmäki

Product Group Manager, Paper

My main roles are to be a conduit for cooperation between the sales, pre-engineering and engineering teams, and to manage our product portfolio and sales support. I've been with Pesmel for over a decade now, and I really enjoy the interesting and challenging projects we have. It's very rewarding when we manage to provide a solution that matches the customer's needs.

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Kari Terho

Product Manager

I support the sales team and manage kraft wrapping products. I've been with Pesmel for four years, and I'm surrounded here by innovative people. I find it very rewarding when we work together with a customer to find a solution to their needs that is competitive and reliable.

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Veli-Matti Hirsimäki

Product Manager

I work with layout solutions as well as pricing and have been with Pesmel for almost 37 years. I enjoy the challenge of competing among the industry leaders and constantly trying to think a couple of steps ahead. Interacting with new people and company cultures make each day different. I consider getting repeat orders as my reward for serving our clients.

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Niko Nyman

Product Engineer

I've been providing product support for sales, designing layouts in 2D and 3D, and managing our product portfolio for a couple of years. Other than having satisfied customers, the best part of interacting with customers is that you can see different cultures and production sites all over the world.

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Eero Perälä

Product Engineer

My main duties are creating simulations and animations, and lately I have been designing automated warehouses. I work on complex and highly automated projects that are almost always unique, and in almost every project I learn something new. It's very rewarding when my simulation or animation is helpful in closing a deal.

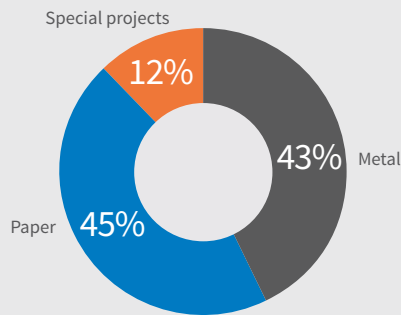
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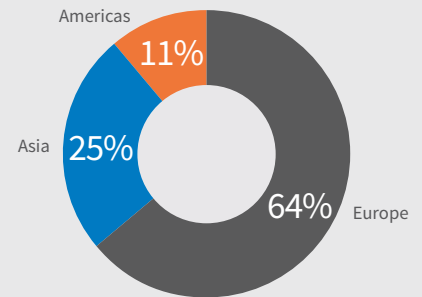
Pesmel is an international expert in material handling. The company's highly automated handling, packing and storage systems improve the mills' internal logistics as well as product quality. The company has two main customer groups: metal and paper industries.

Over the past four decades, Pesmel has delivered over 400 handling and packing projects and around 150 storage systems. The company employs over 180 professionals, of which approximately 110 are situated in Finland.

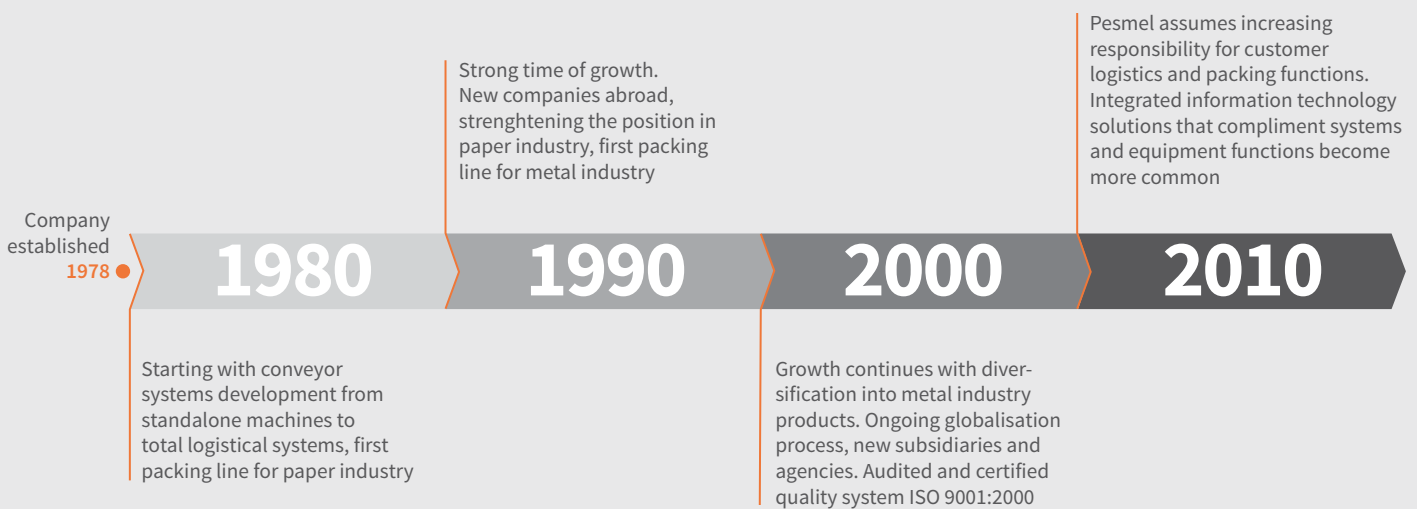
SALES BY BUSINESS AREA
2016–2017



REVENUE BY MARKET AREA
2016–2017



DECADES OF DEVELOPMENT



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