Material FlowHow

2026

PULP & PAPER

Mondi Štěti
Shipments organized by automated warehouse

METAL

Intralogistics for aluminium
A smooth and gentle warehousing concept for aluminium coils

TIRE

Smart storing without pallets
Automated storage handling individual tires or tire sets

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Spotlight on warehouse automation and in-mill logistics

Welcome to the world of warehouse automation and in-mill logistics. By exploring Material FlowHow, Pesmel's renewed customer magazine, you will gain up-to-date insights and references on factory logistics and material flow.

The magazine has been refined to cover a wide range of topics and solutions in warehouse automation, while maintaining a strong focus on the industries we serve. As in-mill logistics remains at the core of our offering, our customer focus continues to center on the pulp and paper, steel and aluminium, and automotive tire industries.

We approach warehousing not as a standalone function, but as an integral part of a mill's end-to-end material flow. This shift is driven by advanced software that goes beyond operational control to include simulation, forecasting, and decision support—both before and after implementation. The growing role of intelligence in warehouse automation, and its broader implications, as explored in our top story by CEO Tony Leikas.

You will find engaging articles that illustrate how automation enables a more proactive supply chain by eliminating inefficiencies across shipping and warehousing operations. How automation helps bridge the gap between production and logistics by reducing costs, increasing throughput, improving safety, and ensuring consistent quality.

Enjoy the read!

Kaj Fahllund
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Material Flow How® empowers intelligent warehouse automation

At Pesmel, we have spent decades solving a familiar challenge in heavy industry: How to move, store, and ship products that are bulky, heavy, and often difficult to handle. What has changed over the years is not the nature of the products, but the scope of the solution. Our strategic focus – and a warehouse management system WMS with built-in digital twin – are helping turn heavy-industry warehousing into a predictable, data-driven part of production.

A business that once started with conveyors and handling equipment has evolved into something broader and more integrated. Today, we see warehousing not as a separate function, but as an essential part of any mill's end-to-end material flow. That shift has been enabled by software that does more than control operations. It simulates, forecasts, and helps customers make better decisions – before and after systems going live.

Our customers operate across industries, yet many of the challenges they face – throughput, predictability, safety, integration – are shared, regardless of whether the product is paper, metal, tires, or something else entirely. I wanted to open this issue with a story that explains how we think about logistics today, what has shaped that thinking, and what we believe will matter most going forward: predictability, integration, usability, and long-term support.

Evolving to ensure we provide full coverage

Our roots are in heavy-duty material handling. From the beginning, our customers have operated in demanding industrial environments where reliability, safety, and throughput are non-negotiable. Those fundamentals remain unchanged.

"Reliability, safety, and throughput are non-negotiable."

Tony Leikas, CEO

What has changed is how tightly warehousing is now connected to production planning, shipping schedules, and customer service. Material handling alone is no longer enough. As transparency requirements increase and response times shorten, software has moved from a supporting role to the heart of logistics operations.

Today, when we talk about warehouse automation, we mean a complete system: high-bay storage and handling technology, seamless integration with surrounding equipment and IT systems, and a centralized control layer – Material Flow WMS – that optimizes internal logistics and provides a real-time view of inventory and material flow across the site. The entire delivery is built and validated utilizing our digtal twin technology.

Strategic focus for customer driven development

This transformation did not happen by accident. Years ago, we recognized that warehouse automation, supported by strong software capabilities, would be the area where we could create the most value for our customers in the long term. Over time, that understanding turned into a clear strategic focus.

This desire to deliver tangible value has ultimately influenced how we invest in development, how we organize our expertise, and how we communicate what we stand for. Most importantly, it sharpens our customer promise – Material Flow How®. Warehouse automation is not an isolated system tucked away at the edge of the plant. Done properly, it has a positive impact on production continuity, shipping accuracy, turnaround times, and service levels across the entire operation.

> “Our payback times are measured in years, while positive cash flow lasts for decades.”
>
> **Tony Leikas, CEO**

A foundation built on information and insight

Everything starts with concept work and simulation. Before steel is ever cut or equipment is installed, we validate our solutions in a virtual environment. What matters here is not simulation for its own sake, but simulation based on the same logic and data foundations that will later run the real system. By modelling the system accurately from the outset, we can identify issues earlier, train operators sooner, and significantly reduce uncertainty during commissioning.

Of course, automation in heavy industry is never just about the automated storage itself. The reality is found somewhere in the middle: conveyors, transfer cars, special handling devices, and integrations between systems from multiple suppliers. Making these elements behave as one reliable flow is often where projects succeed or fail. This is also why industry-specific solutions matter. A warehouse that works beautifully in one environment may struggle in another if product characteristics, packaging, or process logic differ. Our approach is to design applications that are fit for purpose – grounded in a deep understanding of each industry’s realities.

The core of a solution that delivers value over the lifecycle

At the center of it all sits Pesmel’s Material Flow WMS. It is the system that controls and optimizes material flow inside the mill environment, integrating with ERP, MES, and surrounding automation. Beyond control, it provides operational transparency: a reliable, real-time view of inventory that reduces human error and supports traceability, accuracy, and fast retrieval. Just as importantly, it turns operational data into decision support, helping customers understand performance, utilization, and future constraints.

Finally, there is the lifecycle perspective. Warehouse automation systems are long-lived investments, often more comparable to buildings rather than machines or pieces of equipment. That makes service, modernization, and support an integral part of the solution. Reliable systems rarely demand attention, but when something does require support, speed and competence matter. Long-term value is created by keeping systems productive, maintainable, and adaptable over decades, not just years.

Building trust on every level – company, technology and people

Across projects and industries, customer expectations tend to be aligned. Even when investments are significant, they must make sense both financially and operationally. Our payback times are measured in years, while positive cash flow last for decades. Logistics processes become faster, more accurate, and easier to manage. Safety is improved as manual handling is reduced, and improvements in efficiency support sustainability goals as well. Proven performance is the basis for trust in our solutions

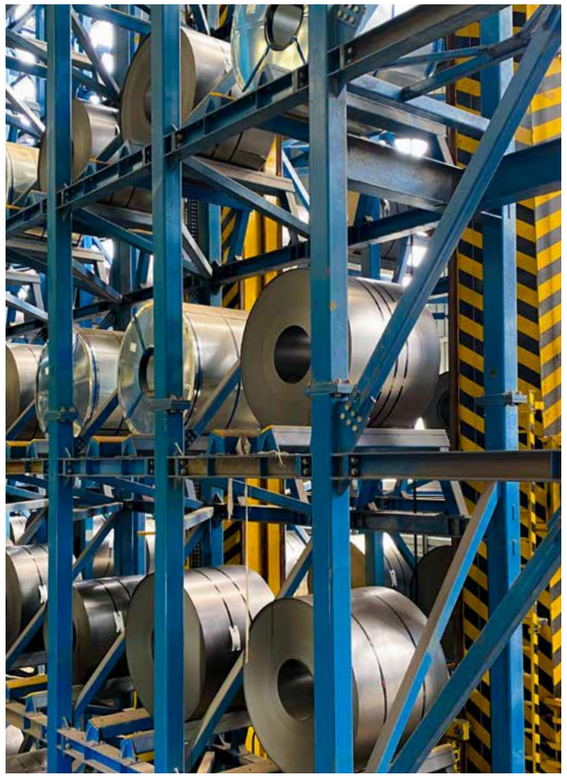
Equally important is how trust is built between companies and people. We have always preferred open and honest communications. We tend to shy away from bragging – even if there would have been a reason for it. Letting performance speak for itself can be considered both a strength and perhaps also a weakness. In our experience, credibility grows when words align with actual results.

Working for intelligence and predictable industry logistics

Where we are today is not a destination reached, but a direction chosen. Going forward, we continue developing Material Flow WMS as a centralized material flow layer, deepen forecasting and decision-support capabilities, and expand industry-specific applications and integrations. At the same time, we remain committed to the human side of technology: being accessible, responsive, and straightforward to work with.

> **“When material flow becomes predictable, production becomes more stable, deliveries more reliable, and decisions easier to make.”**
>
> **Tony Leikas, CEO**

To summarize the lasting idea of this article: Intelligent warehouse automation is about making industrial logistics predictable. When material flow becomes predictable, production becomes more stable, deliveries more reliable, and decisions easier to make.



The WMS Digital Twin – one tool, multiple benefits

Customer solution **WMS Digital Twin**

If there is one technical element worth remembering, it is this: our Material Flow WMS includes a built-in WMS Digital Twin that follows the system throughout its entire lifecycle.

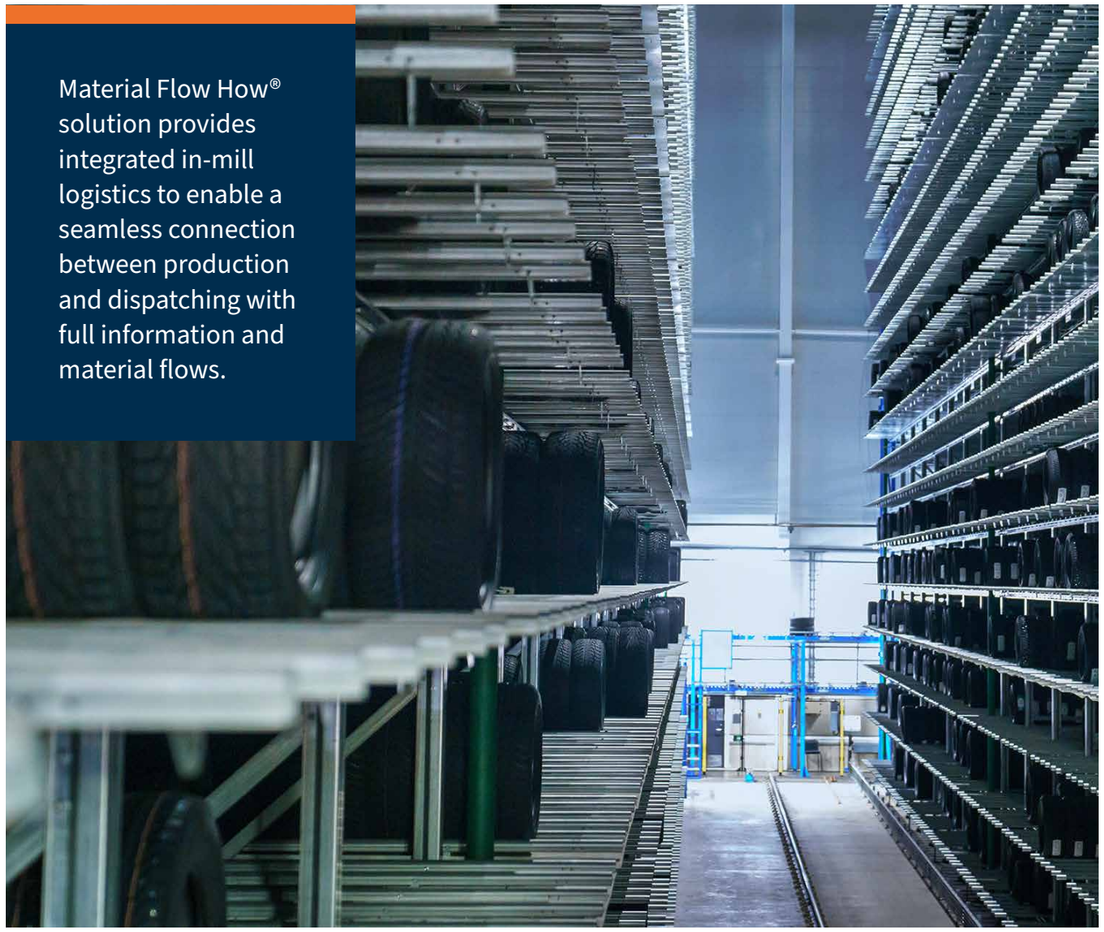
It begins at the concept stage, where logistics solutions are validated through 3D visualizations and simulations, ensuring that decisions are based on accurate operational logic rather than assumptions. During development, the same digital twin is used for virtual commissioning, software testing, and operator training, allowing changes to be made safely before they affect live production.

Once the system is operational, the digital twin continues to run alongside production. By simulating future scenarios based on real production and shipping data, it helps forecast performance, identify potential bottlenecks, and support day-to-day decision-making. Over the long term, it also supports service and modernization by enabling preventive maintenance planning and proactive system development.

In short, the WMS Digital Twin is not a one-time model. It is a permanent part of the operational environment.

Optimizing the supply chain with Material Flow WMS

A new era of proactive warehouse automation



Material Flow How® solution provides integrated in-mill logistics to enable a seamless connection between production and dispatching with full information and material flows.

Proactive warehouse automation, enhanced with an in-built digital twin, is becoming essential for companies aiming to meet modern supply chain demands. The need for short delivery times, flexibility in order size, and better inventory control are the primary drivers for adopting warehouse automation. To compete in the market, producers must be able to respond efficiently to customer demands. Pesmel Material Flow How® solution is a fully automated high-bay and logistics concept designed to meet these challenges.

Key technology: The Pesmel Material Flow WMS and WMS Digital Twin

Material Flow How® concept provides integrated in-mill logistics to enable a seamless connection between production and dispatching with full information and material flows. The technical advantage of the concept is its high level of warehouse automation, overall performance and flexibility. The system is managed by the Material Flow WMS (Warehouse Management System), which controls the flow of products and optimises storage and logistics functions. This enables the efficient handling and collection of complex orders with hundreds of different SKUs (Stock Keeping Units) on time.

A key component of the Material Flow WMS is the WMS Digital Twin, which is a software solution that simulates a real-world warehouse setup in a digital environment. Unlike traditional models that rely on calculations, this digital twin is in-built into the WMS, allowing for accurate simulations based on real-time data. The digital twin provides valuable information for day-to-day decision-making, updates, and service operations, and it supports operations across the mill's entire lifecycle. Its models and estimations enable informed and optimised operations from system deployment through active operations.

The digital twin's role across the operational lifecycle

The WMS Digital Twin performs several key tasks throughout the life of the material handling solution:

Concept validation

The implementation process begins by building a simulation model of the customer's warehouse to analyse material flows and identify potential bottlenecks. This provides concept validation with 3D-visualisation and simulations to identify the optimal logistic solution. The concept is modelled in the WMS Digital Twin to ensure 100% accuracy. This systematic approach allows for pre-construction testing and verification of large and complex configurations. The detailed information from the simulation notifies the engineering and design of the logistics concept, including mechanical, electrical, PLC, and ICT components.

Software development and virtual commissioning

In projects with significant capital expenditure (CAPEX) time is of the essence. Integrating digital twin technology from the beginning drastically reduces start-up costs and time while improving efficiency. Data from inputs to shipping is fed into the WMS Digital Twin from the start, and its analysis helps to illustrate an optimised physical configuration for the warehouse.

The digital twin allows the facility to become virtually operational even before it is built. This makes implementing large warehouse projects fast and reliable. Unlike traditional setups that may take months to streamline after start-up, optimisation is performed during the implementation phase with the digital twin.

After the facility is operational, the virtual environment remains available, allowing for safe testing and optimisation without interrupting production. A key feature is the ability to run the model at a much higher speed than in real life, simulating a ten-day operation in just a few hours.

Forecasting and decision-making parallel to production

While many applications of digital twin technology are limited to simulations used for the initial design and planning of warehousing solutions, the full potential of the WMS Digital Twin is realised when it operates in parallel with a running mill. By using real-time data, it enhances predictability and optimises material flow performance on a day-to-day basis. The key role of a digital twin integrated into a live environment is to support the development of operational efficiency through accurate predictions and simulations.

The WMS Digital Twin provides a safe, simulated digital environment to model outcomes, which supports informed decision-making with minimal risk to the ongoing process. All results generated by the digital twin can be accessed through the WMS user interface, enabling warehouse operators, maintenance personnel, or production planners to make necessary decisions regarding their daily work and operations.

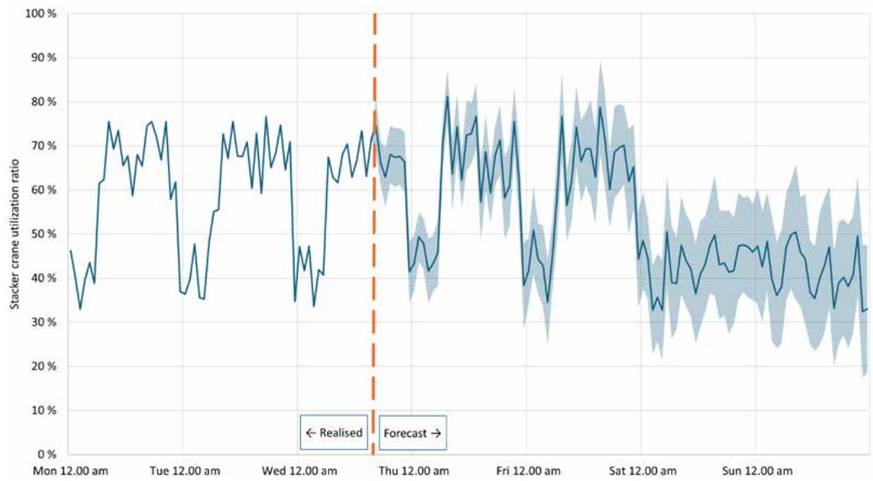
The WMS Digital Twin enables advanced planning and trials. For instance, it allows for simulation-based planning of stock optimisation. It can be used to accurately model scenarios to optimise the smooth flow of products through the warehouse and determine the required minimum volume of existing stock for all various product variants in inventory. The stock optimisation data can include information such as the warehouse fill ratio, fill percentage, or the number of empty storage channels.

Additionally, it can accurately predict dispatching times. By setting specific limit values, users can receive notifications of needed reactions well in advance. The statistical probability of shipment cancellations or the appearance of unplanned shipments can also be modelled to predict possible material shortages or warehouse capacity issues.

Proactive service and future updates

The digital twin enables accurate modelling and planning of scheduled maintenance. Simulations that consider upcoming customer deliveries and production plans can identify the optimal time to take specific stacker cranes offline for preventative maintenance, ensuring the mill can still fulfil anticipated orders. The digital twin can also simulate how the system will behave during maintenance breaks and how operations will return to normal afterwards. This proactive support is crucial for maintaining continuous operations and efficiency.

WMS Digital Twin forecasts equipment utilization ratios to support decision-making.



Shipments organized by automated warehousing

Pesmel's customized automated sorting buffer has been installed at Mondi's new 210,000 metric ton per annum kraft paper production line in Štětí, Czech Republic.

Purpose in every step

"Every warehouse has its own purpose. In the case of Mondi Štětí, it is not to store but to organize," says **Jani Matikainen**, Sales Manager at Pesmel. The new production line is intended to meet growing demand for paper-based, flexible packaging and has started up production in December 2024. The system supplied by Pesmel includes an automated roll warehouse (ARW) with a 3,000 metric-ton capacity for buffering sack kraft paper rolls. The incoming roll flow is first pre-sorted on sorting channels, from where stacker cranes pick-up and store rolls on storing channels. This two-step flow ensures high flexibility, along with full redundancy and re-routing capabilities.

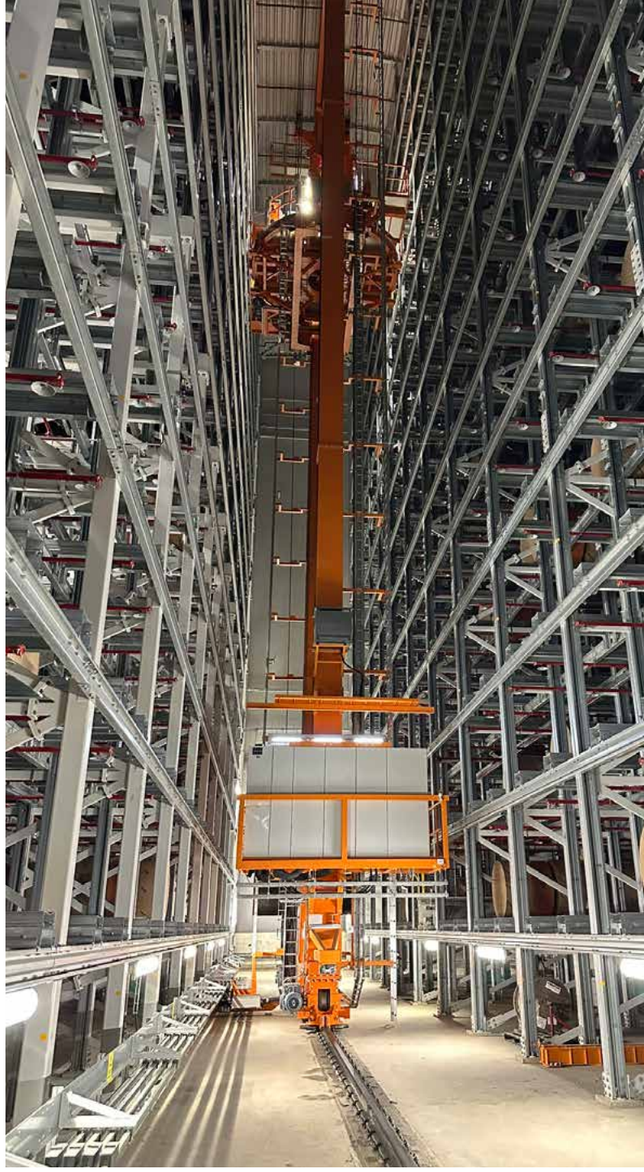
"Daily production is about 600 tons per day, so with five days' worth of storage this has a shorter turnover rate compared to some facilities we have worked on," continues Matikainen, "and it fills a need that would be almost impossible to meet manually or with other alternatives within such a limited space."

"This kind of rack storage solution was a new idea to us, and we were bit skeptical at first, but the benefits it offered compared to alternatives were overwhelming. We got interested – it would be perfect fit for our needs."

Helmut Riesenberger, Senior Project Manager, Mondi

A 32-meter-high deep-lane rack warehouse serves as shipment storage, operated by two stacker cranes enable a high storage density crucial in an area with limited space but with very high roll flow. Rolls with different characteristics are constantly produced, so the ARW must organize inventory SKUs (Stock Keeping Unit) according to product type, receiving them in random order and send them out as required.

Dispatch loads are automatically retrieved from the warehouse and transported to the loading area via two outfeed lines. The dispatch area is designed for both efficiency and flexibility, allowing simultaneous loading of trucks and trains. "Traditional clamping can damage the products," Matikainen explains. "In this system, rolls only needs clamping once as they are loaded onto transport. This essentially eliminates 'broke' from the equation."



Adaption and customization are key

Pesmel's proprietary Warehouse Management System (WMS) ensures fluid and optimized operation by controlling the warehouse, pre-sorting and dispatching functions, enabling inventowry management, product identification and product traceability.

"This kind of rack storage solution was a new idea to us, and we were bit skeptical at first," admits Helmut Riesenberger, Mondi's senior project manager, "but the benefits it offered compared to alternatives were overwhelming. We got interested – it would be perfect fit for our needs. The reference visit to see the Saica mill in El Burgo de Ebro, Spain finally convinced us. I have long relationship with Saica and when they gave us a strong recommendation, we were convinced."

The project confirms Pesmel's ability to provide efficient, cost-effective solutions for storage, handling, sorting, or any combination. "Adapting and customizing Pesmel's Material Flow How® concept is a key benefit that enables us to efficiently meet our customers' needs," Matikainen concludes.

MM Kotkamills' new 30-million-euro Sheeting Center includes Pesmel's TransRoll™ solution at its heart for speed, safety, and productivity.

Kotkamills new Sheeting Center has Pesmel at its heart

In August 2024, MM Kotkamills' new Sheeting Center with two sheet cutters in Kotka, Finland was inaugurated. Pesmel's next generation in-mill logistics and warehouse automation is a core part of this 30-million-euro investment.

Lean, automated processing from production to sheeting

Previously, MM Kotkamills relied entirely on external third-party companies to provide cartonboard sheeting to their customers. With the investment, the majority of this sheeting can now be done in-house at the mill site, providing an efficient process with no unnecessary or unproductive handling.

Photographer: Jukka Koskinen Copyright: MM Kotkamills

"Our new Sheeting Center with its modern technology enable automatic processing of cartonboard reels from production to sheeting," says **Marko Pekkola**, Managing Director of MM Kotkamills.

"We are able to serve our customers faster and ensure even better quality of the cartonboard as the sheeting takes place in parallel with the production and the cartonboard reels do not need to be transported outside the mill for sheeting," continues **Kalle Mäkelä**, Production and Maintenance Director at MM Kotkamills.

Meeting Intermediate reel storage requirements

The space available for this Sheeting Center and its 6,500-ton IRS (Intermediate Reel Storage) was very limited. Traditional floor stacked reel storage was too cumbersome and required too much space due to the heavy reel handling equipment needed to turn the reels from a horizontal to a vertical storing position and back again for the sheeters.

With Pesmel's rack storage, the warehouse reels can be kept in a horizontal position all the way from the slitter winder through the IRS to the sheeter unwinding.

One vertical stacker crane on the side of the rack slides and lifts reels into a 14x9 array of horizontal storing channels. Reels are transferred in from production and out onto conveyors that feed them one at a time to the sheeter unwinds. The whole process is fully automated according to production schedules.

Pesmel's TransRoll™ enable the Sheeting Center's location at mill

Intense data-driven cooperation between MM Kotkamills and Pesmel was required to complete the dimensioning process and to fit the IRS between the PM hall and the Sheeting Center. Firstly, the physical dimensioning of the reel warehouse and its connections was carried out. Secondly, the equipment and control system were customized to ensure the required handling capabilities. This meant running simulations with actual and target production data.

The production mix and volumes, and their impact on equipment utilization rates, were analyzed. The actual simulation was carried out using the Pesmel WMS Digital Twin, which was later also used to train operators in running the system virtually. The WMS (Warehouse Management System) is the key element in integrating the information systems in the mill and the Sheeting Center to track the material flow and manage the online IRS inventory control.

"We chose the TransRoll™ concept because Pesmel was able to tailor an ideal solution for our specific needs," says **Teemu Nikkonen**, MM Kotkamills' Strategic Development Manager. "The available space was very limited. As the reels are moved and stored horizontally all the way, we were able to keep the system simple. The stacker crane, the only moving element in the system, handles the reel movements inside this intermediate reel storage."

Material flow with flexibility and innovation

Pesmel's WMS is the link that connects the entire material flow process. "Our technology is enabling something bigger," says Kaj Fahllund, VP, Sales & Marketing. "We play a vital part in optimizing the entire process stream and improving the customers' cost efficiency."

For both Pesmel and MM Kotkamills, the Sheeting Center project was an example of exemplary cooperation and forward thinking on both sides. "MM Kotkamills' investment was a great opportunity to provide the next generation in-mill logistics and warehouse automation to one of our many valued customers," Fahllund concludes. "The project has been a perfect match between two innovative and unique companies."

Automating roll flow at one of Europe's biggest corrugating facilities

At De Jong Verpakking, since 2023 part of Stora Enso, in De Lier, Netherlands, Pesmel's automated Warehouse Management System (WMS) controls the entire roll flow from raw material reception to corrugator roll feeding.

Making light work of heavy material

De Jong Verpakking, founded in 1996, now operates one of Europe's largest and most modern corrugated packaging facilities in De Lier. This state-of-the-art facility, which was officially opened in early 2024, covers a significant expansion in production capacity. Spanning over 100,000 square meters, the new addition, constructed adjacent to the existing plant, was achieved through vertical construction on a footprint of just 55,000 square meters. The implementation of Pesmel's WMS at the second facility has revolutionized the roll handling process. Unlike traditional manual methods, which can be time-consuming and pose safety risks, this automated system ensures efficient roll flow management, significantly enhancing productivity and safety standards.

One critical aspect of the solution is the nine-level high fully automated board roll warehouse which acts as a raw material buffer for the corrugators. These machines make corrugated fiberboard for cardboard box manufacturing, necessitating careful handling of the rolls to prevent damage that could disrupt operations.

"We wanted to find a way to automate the roll handling in our new plant," explains **Dick Schep**, VP Operations of BU Western Europe. "The automated high-bay rack storage has been tailored according to our specific needs and with the centralized flow management system it provides a complete solution."

Furthermore, given the diverse range of products offered by De Jong Verpakking, precise identification and sorting of raw materials are essential for efficient production. The Pesmel Warehouse Management System plays a crucial role in managing the material flow, ensuring accurate and timely delivery to the appropriate machines.

> "The automated high-bay rack storage has been tailored according to our specific needs and with the centralized flow management system it provides a complete solution."
>
> **Dick Schep, VP Operations of BU Western Europe**

Complete reliability for customer and end-consumer satisfaction

At the core of Pesmel's solution is the state-of-the-art WMS. The system monitors and controls material flow between raw material buffers, corrugators, the conveyor system, and automated guided vehicles which feed rolls to and from the corrugator pockets. "Performing manual operations in a plant of this size and type isn't really an alternative," says **Kaj Fahllund**, VP, Pulp and Paper at Pesmel. "Instead, our automated flow solution provides the required accuracy, safety and performance."

The Pesmel WMS manages raw material incoming to the automated roll warehouse, its sorting and storing, transfer to conveyors, and delivery to corrugators. In fact, there is hardly any part in this material flow that is untouched by it. The Manufacturing Execution System (MES) and Enterprise Resource Planning (ERP) submits the tasks for production and inventory control via Pesmel's WMS, which communicates these plans to automated roll warehouse and third-party equipment, tracks status, controls schedules, and provides alarm and error information in case of any problems. Data that can be later used for analytics is constantly tracked and used for continuous process improvement and optimization.

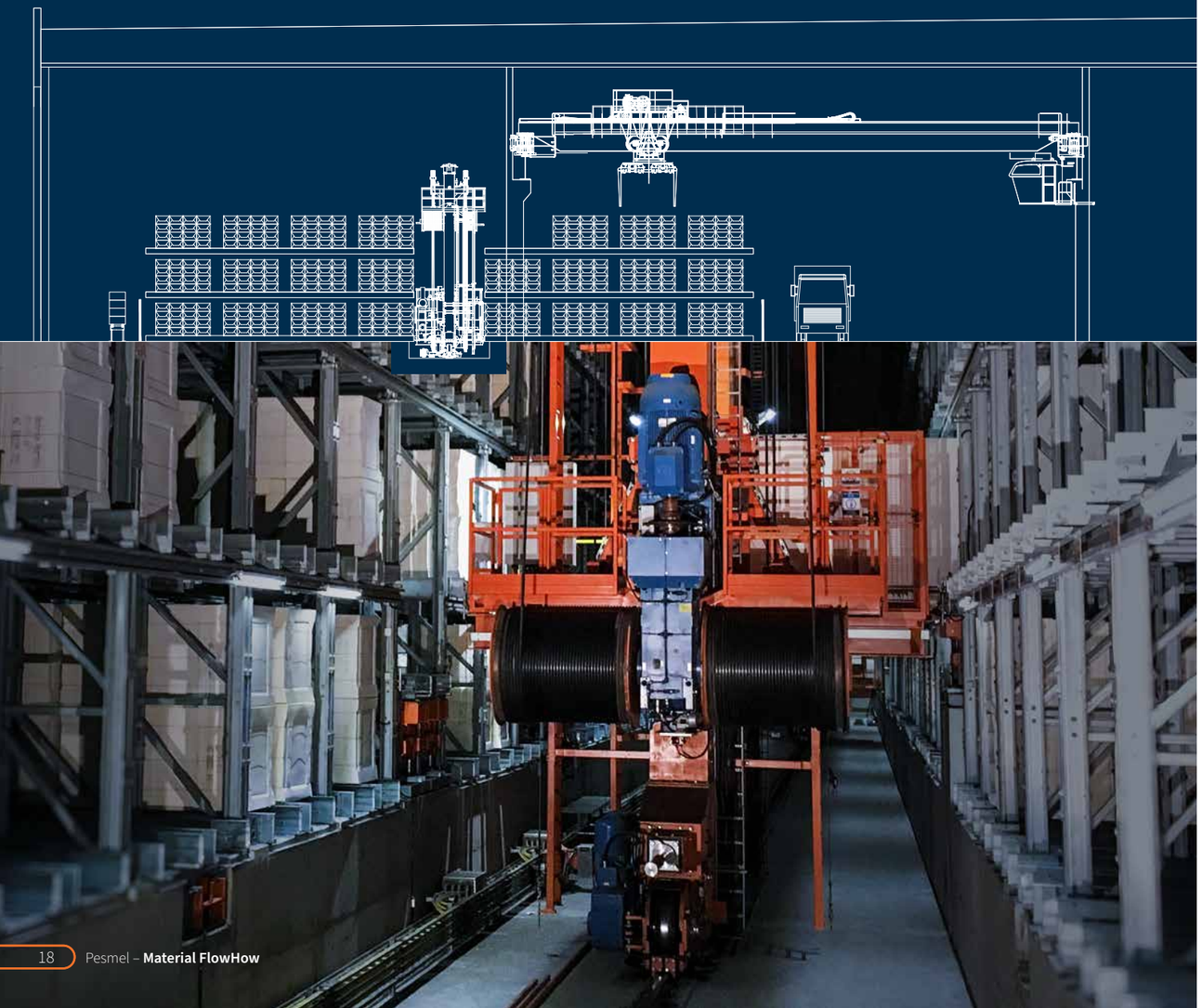
Pesmel's WMS architecture for software and hardware removes the need for many overlapping system integrations and the plant's roll flow is available via one user interface. User operation is simple and intuitive, and the system's design makes maintenance and future expansions easier to implement. For De Jong Verpakking, the system makes fulfilling their customer promises possible. "We promise a lot to our customers," Schep says, "from deliveries within 24 hours to having 30 million items permanently in stock. To meet these guarantees, we need a completely reliable and highly efficient operations and logistics network in place, in which Pesmel's WMS and automated roll warehouse plays an important role."

For Pesmel, installation of the WMS and automated roll warehouse has been an important breakthrough in the paper converting segment. This is the first corrugator plant to which we have fitted the automated roll flow management. "The De Lier project shows that our solution provides efficient operations in really any industry or business that relies on automated warehousing and logistic solutions to fulfil their customer promises and maximise the efficiency of their storage and production ecosystems," Fahllund concludes.

How automation is reshaping global pulp logistics

Keep the pulp moving!

The global pulp industry faces a significant challenge. New mega-mills are producing at a scale that traditional logistics struggle to support. The solution is a quiet revolution happening in the warehouses of leading producers: advanced material flow automation. This strategic shift bridges the gap between non-stop production and global shipping, delivering notable improvements.



For today's pulp producers, automation is far more than a simple logistical upgrade. It is a critical component of competitiveness.

The bottleneck in modern production

South America's modern pulp mills are highly efficient, designed for continuous, round-the-clock production of thousands of tonnes of eucalyptus pulp daily. This continuous flow cannot be ramped up or down quickly, creating a logistical challenge. Any disruption in the outbound logistics chain results in a critical bottleneck that threatens the entire operation.

Traditionally, large buffer warehouses have been managed by manually operated clamp trucks. For a modern mega-mill, this manual approach is inefficient. The scale of the warehouse floor makes manual handling slow, introduces safety risks, and is a common source of damage to pulp bales. Manual warehouses cannot sustainably keep pace with today's high-volume output.

Intelligent material flows as the solution

The answer is automated pulp buffer warehouses, a concept closely tied to our Material Flow How® philosophy where modular, scalable systems replace labor-intensive manual processes with a fully integrated, automated solution.

"Our automated system can load a 48-tonne truck trailer in just 5 minutes –a significant reduction from the 13 minutes required with clamp truck loading."

Kaj Fahllund, VP Sales & Marketing

This means a compact buffer storage that automatically receives production, sorts it, and loads trucks or rail cars with precision and speed, all within an enclosed, protective space. The remaining floor space serves as a redundant back-up to ensure uninterrupted pulp flow through mill or rail/port terminals under all circumstances. The entire inventory and equipment control is orchestrated by Pesmel's Warehouse Management System (WMS), which integrates with the mill's resource planning (ERP) and information systems (MIS) to provide real-time data tracking and execution of planned shipments.

A range of transformative benefits

Automated warehousing unleashes numerous benefits, starting with increased throughput. One concept for a Brazilian mill shows automation cutting truck loading times by more than half. This faster turnaround optimizes the entire transport chain.

The financial case of automated warehousing is also strong, with a typical payback period of under five years. A primary driver is reduced operational costs. One project, for example, estimates eliminating over 12 loading vehicles per shift, cutting more than 60 drivers and their associated costs. Automating these functions also reduces risks associated with human error, thus greatly improving on-site health and safety.

Beyond speed and cost, automation improves quality. Our gentle, precisely controlled handling eliminates damage from manual operations. Optimized, fully electric automated systems are designed for energy efficiency, and by replacing diesel-powered machinery, they also eliminate carbon emissions within the warehouse.

Automation in South American mega-mills

Automated warehousing technology is a core component in planning the newest South American mega-mills, where the scale of production makes efficient logistics essential. This can be seen, for example, in cases where the normal ten-day operational buffer requires +80,000-metric tons of warehousing to handle the daily flow of up to 100 railcars, each carrying 96 tons of pulp. At space-constrained ports, the buffering requirements easily exceed 100,000 tons. For projects like these, space-efficient warehouse automation is a necessity.

With outbound logistics representing around 10% of total product cost, the efficiencies from automation directly impact the bottom line. It is the key to ensuring the massive output of these global mega-mills can reach its final destination reliably, cost-effectively, and in pristine condition.

Pesmel's slit coil warehouse to Hitachi Energy, Finland

Hitachi Energy has selected Pesmel as the supplier of a slit coil warehouse for their new state-of-the-art transformer factory under construction in Finland. The new factory is part of Hitachi Energy´s investment in a new production and technology center and will double the company´s transformer production and testing capacity in Finland. Production at the factory will start in spring 2027.

Automated high-bay storage is equipped with an intelligent WMS (Warehouse Management System), which oversees and controls material flows between production and process lines ensuring real-time inventory management, full traceability and on-time coil feeding to further processing. The solution includes special coil car systems in the storage infeed and outfeed area. The same coil cars handle the raw material returning process to the storage, in case it is not fully used by the process lines.

The WMS is fully integrated into the production software. With pre-planned production schedule it automatically re-organizes the coils to ensure accurate serving of the following processes.

Automated functions guarantee an error-free and smooth operation without bottlenecks.

"We are delighted to provide our advanced warehouse automation technology to Hitachi Energy", says **Juha Suksi**, Pesmel's Vice President, Metal Industry. "Hitachi Energy appreciated our experience in material handling as well as our earlier references, and the fact that we are a near-by domestic supplier enables fluent interaction.

The new transformer factory is part of Hitachi Energy´s $180 million investment in a new Hitachi Energy Park production and technology center in Mustasaari, Finland to support the clean energy transition. The 40,000 square meter center will feature state-of-the-art production and testing lines for transformer manufacturing, along with modern office facilities for company´s professionals in electrification projects, automation and software development The investment will double Hitachi Energy´s current transformer production capacity in Finland and expand the existing product range to include larger transformers.

More information:
Juha Suksi, Vice President, Metal
juha.suksi@pesmel.com

The new slit coil high-bay warehouse works as a raw material storage having 354 storage places with a maximum weight of 3 500 tons. The technology is tailored to this delivery, specifically capable of maneuvering narrow coils, whose dimensions present limitations and challenges for the handling and storing processes.

Pesmel's automated warehousing and logistics for Nucor Steel

Nucor Steel has contracted Pesmel for the supply of integrated mill logistics, packing lines and an automated high-bay coil storage solution. The delivery is a part of Nucor Steel's new galvanizing and color coating line. Integrated logistics help enhance productivity and shipping throughput for new production lines.

Pesmel's solution includes a logistics system, high-bay deep lane storage, two packing lines and palletizing line for galvanized and color coated steel coils. The logistics system is based on 2-way and 4-way coil cars, capable of safe and gentle coil handling. They integrate the process lines with the packing, storage, and loading areas. This will increase the mill's efficiency and capacity utilization providing flexibility and shortened lead times.

The high-bay pallet storage for color-coated coils is a deep lane solution. It stores 4,500 pallets in a 6,398 square foot (1,950 m^2) area, resulting in maximized storing density compared to traditional forklift-operated pallet storages. Pesmel's storage is CO_2-friendly with its fully electric functions and regenerative drives, which feed the stacker cranes' braking energy back to the main grid.

Automated material handling means damage-free product handling and a significant increase in operator safety. Only one to two operators are required for overall supervision and packing material re-filling.

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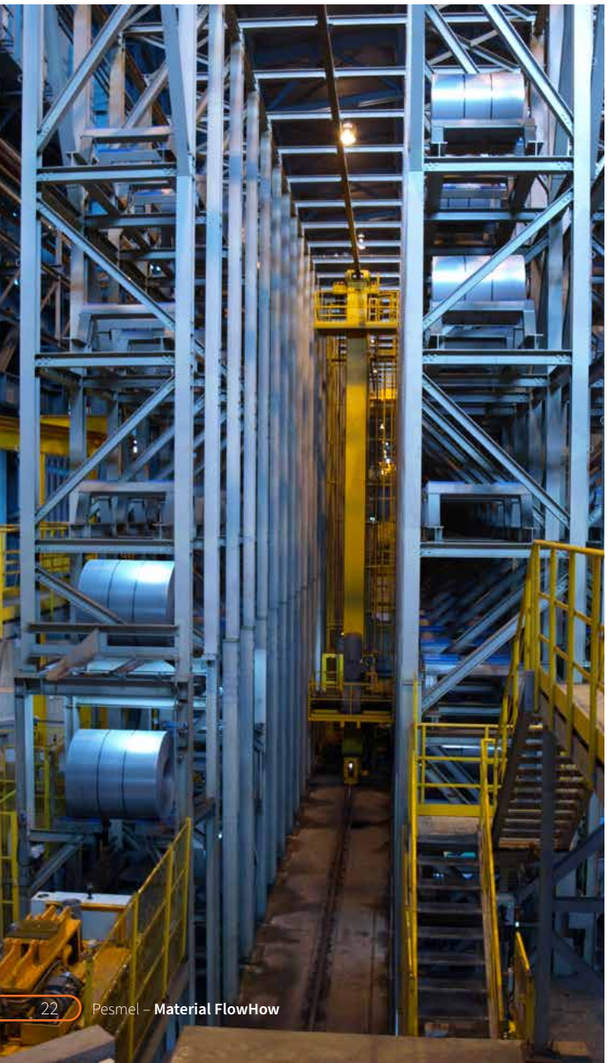
Handle with thought and care

The Pesmel approach to aluminium intralogistics

The global aluminium industry is characterized by continued growth in demand and supply. As a cornerstone of modern manufacturing – vital to automotive industry, construction, packaging, and electronics – its efficiency is dependant on the flawless execution of every step in the production and supply chain process. However, the very properties that make aluminium so valuable, its softness and malleability, also present significant logistical challenges within the rolling mill.



Aluminium coils are highly susceptible to surface damage. Scratches, dents, and deformations can easily occur during transport, compromising the value of the final product. Furthermore, coils emerging from hot rolling at temperatures of 300 to 400 °C require precise, controlled cooling before they can be processed further. Traditional handling methods, which often rely on manual crane and forklift operations, struggle to meet these demands, leading to potential product damage, production bottlenecks, inefficient use of space, and even safety hazards on site.

Pesmel's offering is particularly well suited for aluminium processing following hot rolling. The mid-stream processes can benefit from efficient and uninterrupted material flows between the functions, where the high-bay warehouse acts more like an internal logistics hub or buffer for materials in different phases of production.

A new paradigm – more than just storage

We offer customers a comprehensive, automated material handling and storage solution engineered to be the intelligent heart of the aluminium rolling mill. By positioning a high-bay warehouse as a central work-in-progress (WIP) storage buffer, the system seamlessly integrates the cold rolling mill's subsequent processes, such as annealing, degreasing/tension levelling, brushing, polishing, slitting, cutting, and packaging.

The one-stop-shop concept is built on 50 years of material handling expertise and is designed to solve the core challenges of aluminium production. Our solution both respects the material and ensures the accurate continuity of operations.

Gentle handling ensures quality

Preserving the integrity and surface quality of every coil is a priority. Pesmel's system eliminates the risks associated with conventional handling. Coils are managed by automated cars and stacker cranes that provide gentle, damage-free transport and support from underneath. This automated approach is crucial for maintaining perfect coil shape and preventing costly surface defects, scratches, and edge damage.

Optimized space, safety and throughput

Floor space is a premium asset in any production facility. The vertical design of the high-bay warehouse optimizes the facility footprint by taking storage skyward. This is valuable for confined mill environments in both brown and greenfield projects where space is limited.

Engineered for high throughput, the system ensures all process lines are fed in a timely and accurate fashion for uninterrupted production. The automated environment drastically improves personnel safety by removing the need for staff to work in close proximity to moving coils and heavy machinery.

Controlled and individualized cooling

A key innovation in Pesmel's solution is the advanced coil cooling system integrated into the warehouse. It offers an improved alternative to traditional forced-air systems where the cooling of individual coils cannot be adjusted. With targeted cooling provided for each individual storage position, the system manages and affects the temperature of individual coils to a higher degree of accuracy.

Targeted cooling allows the system to avoid significant energy wastage and the risk of condensation forming on coil surfaces – both issues associated with indiscriminate aggressive cooling. This controlled cooling process ultimately results in a more consistent, predictable, and higher-quality final product.

The intelligence behind the muscle

The entire system is orchestrated by Pesmel's proprietary Warehouse Management System (WMS), the brains behind the operation. It is linked to the customer's ERP, MES and other mill control and information systems. This software platform provides full traceability in real time. It knows the exact location, status and cooling data for each individual coil from first contact to final dispatch. In addition, the solution supports advanced production optimization. The WMS manages storage and cooling times, directs all material flow, and intelligently feeds coils to the correct process lines in the requested order.

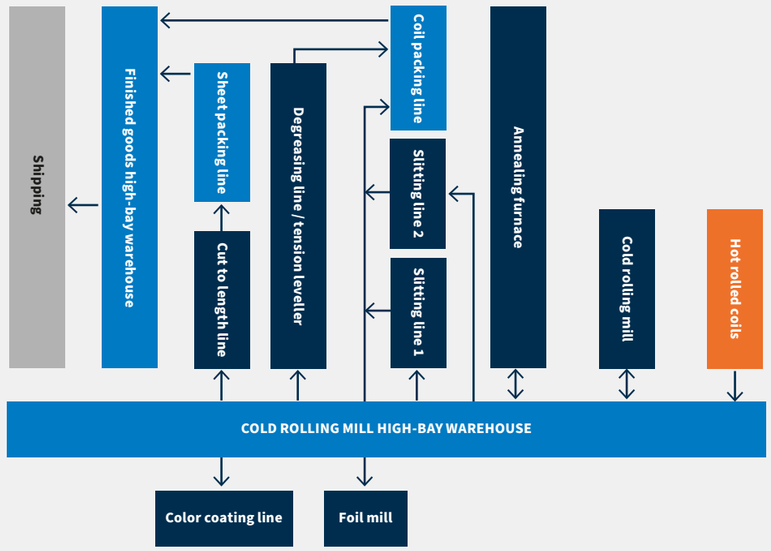
System simulation using WMS Digital Twin

The design and construction of a high-bay warehouse is in the core of the customer solution. However, before a single piece of warehouse shelving goes up, the entire system's logic, material flow, and performance are simulated and verified using our Digital Twin. This guarantees a smooth, predictable ramp-up and allows foconfident lifecycle management and predictive maintenance planning that maximizes process uptime.

Delivery based on understanding of the customer process

As a comprehensive partner, Pesmel delivers a complete, turnkey solution – from initial design and engineering to the physical warehouse, automation equipment, intelligent software, and full lifecycle services. By understanding the demands of the aluminium industry, Pesmel provides an integrated solution that not only protects the product but also boosts safety, efficiency, and throughput, future-proofing the heart of the modern rolling mill.

Typical aluminum rolling mill layout



Shaping the future of tire industry logistics

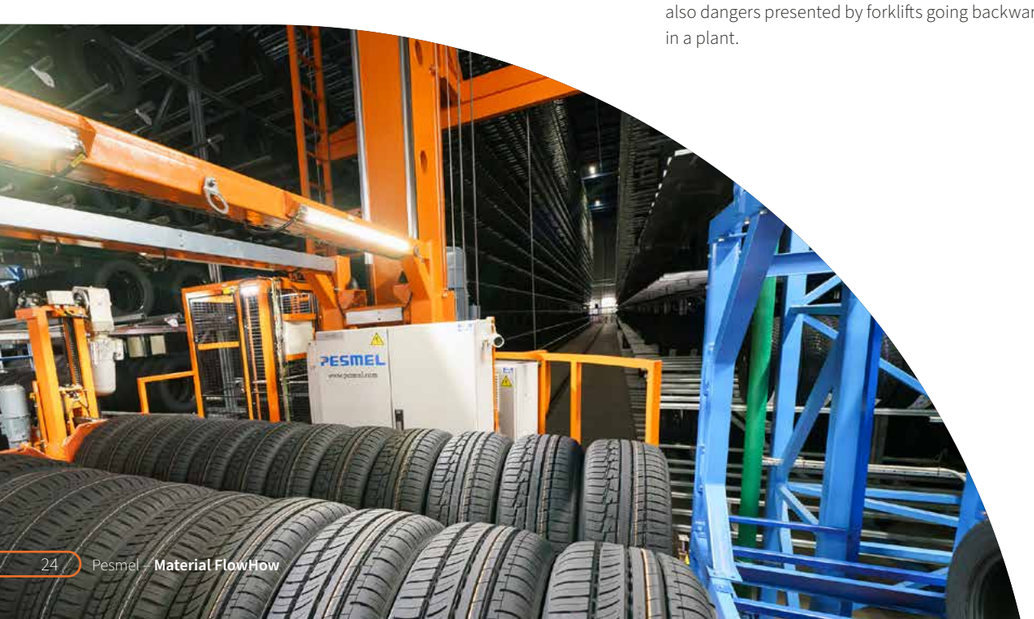
Tire producers manufacture billions of tires in a year. This means a lot of space, time, and manpower is dedicated to storage, movement, and delivery of each tire. Due to the evolution of the latest in digital technology, this is an area of the industry ready for a complete overhaul, and tire manufacturers to have more efficiency in their distribution operations.

Pesmel has developed a dedicated, intelligent warehousing system for the tire industry that revolutionizes movement and storage of individual units. The key features of the solution are operation without pallets, reduction of storage footprint with high storing density, sorting at in-feed, a combination of storage and order picking, and simple layout with a minimal amount of equipment.

“The tire industry has generally seen palletization as the only solution for its warehousing and internal logistics needs,” says Pesmel CEO Tony Leikas, “but looking closely at various plants around the world and our successful projects in other industries, makes it clear to us that this is an area of the industry that could be much more efficient and run in a much safer and cost-effective way”.

Leikas adds that millions of Euros could be saved by investing in automated distribution and eliminating palletization completely, “Pallets and palletization equipment are expensive– our research tells us that millions can be spent on installing the machines. This can be simply avoided by using a smart warehousing system.”

Using pallets is also costly when it comes to warehousing operational efficiencies, with extra loading and unloading, bringing pallets in, and sending them back again. Palletization is also labor intensive, often involving manual loading and unloading. There are also dangers presented by forklifts going backwards and forwards in a plant.



Simplicity is the key to superior efficiency

Pesmel has spent time perfecting smart warehousing solutions and has come up with a unique Material Flow How® concept, which uses only four components to fully automate internal logistics and storage: a conveyor system, racking, stacker crane(s), and robots. The idea behind the concept is to arrange production and material flows so that production efficiency is maximized and the need for equipment minimized.

In the unique vertical storage the tires are stored on racks in vertical position without pallets. The height of the storage can be 35 meters having over 30 levels and 9 to 20 individual tires per storing location. High-bay storage gives a footprint reduction of 45%, with the highest storing density compared to traditional solutions using pallets.

Tire manufacturers have welcomed a solution that helps them keep up with demands on storage and logistics as mills increase their production in both quantity and product ranges. With Pesmel’s solution, storing and order picking is combined and done in the storage, which greatly improves warehouse logistics and reduces the time spent on receiving and shipping tires. In an automated high-bay warehouse, collecting a complex order containing tens to over hundred different SKUs (Stock Keeping Units), picking and dispatching time is reduced to one-third compared to a traditional warehouse. High level of automation also ensures error free deliveries which greatly improves customer satisfaction.

Flexibility and availability in tire distribution

The customer experiences state that the high-bay storage has pushed their flexibility and the efficiency of logistics to a new level. As well as an increase in outbound orders, they have also increased storage, which is a major benefit when it comes to seasonal variations. The high-bay storage units really help with the peaks they experience, as every tire in the storage is accessible and ready to be shipped. Another real benefit is that the system stores individual tires and not a whole pallet load or cages, which means just one particular tire or tire set is taken from the warehouse as needed, instead of the entire load. Customer experiences when it comes to maintenance are that the equipment is reliable, robust, and easy to maintain.

Investments in logistics automation will enhance the entire supply chain

Growing customer demands mean that an efficient and smooth supply chain has become one of tire mill’s significant competitive advantages. With added intelligence in storage, sorting, and distribution functions, tire mills can create a powerful and dynamic distribution center that can open opportunities for improvement all the way up to strategy and business models. Pesmel-delivered systems are proof of successful automated logistics projects that have enhanced the efficiency of the entire supply chain, while offering great returns on investment with a lower total cost of ownership.

Automation solutions are ushering in a new era in smarter logistics, tapping into great unrecognized potential for increasing efficiency across the entire supply chain.

The future of tire warehousing is carbon-neutral

Pesmel's automated warehousing solutions do not just increase efficiency and productivity. They are also an integral part of the company's comprehensive carbon-neutral solution for sustainable tire logistics.

For over 40 years, Pesmel has been providing customers with many benefits such as improved energy efficiency, shorter turnaround times, and space optimization. Today, the unique high-bay ASRS system also allows the establishment of carbon neutral warehousing, improving the overall sustainability of customer's operations. Because warehousing and distribution are a key element of any tire supply chain, creating carbon neutral distribution centers has a big role to play in reducing the environmental impact.

Examining the possibilities

To fully understand the contribution that can be made with sustainable distribution centers, Pesmel prepared a new climate impact summary examining the carbon footprint of Pesmel solutions. An ASRS system with a storage capacity of 660,000 tires, annual tire production of 4,000,000 units, eight stacker cranes and a lifecycle of 40 years was evaluated. The life cycle greenhouse gas emissions of this system were calculated at just under 22,000 metric tons of CO_2e, the majority of which comes from two sources – the steel required for manufacture and the operational energy consumption. The calculation includes product manufacturing, use of the system, and disposal.

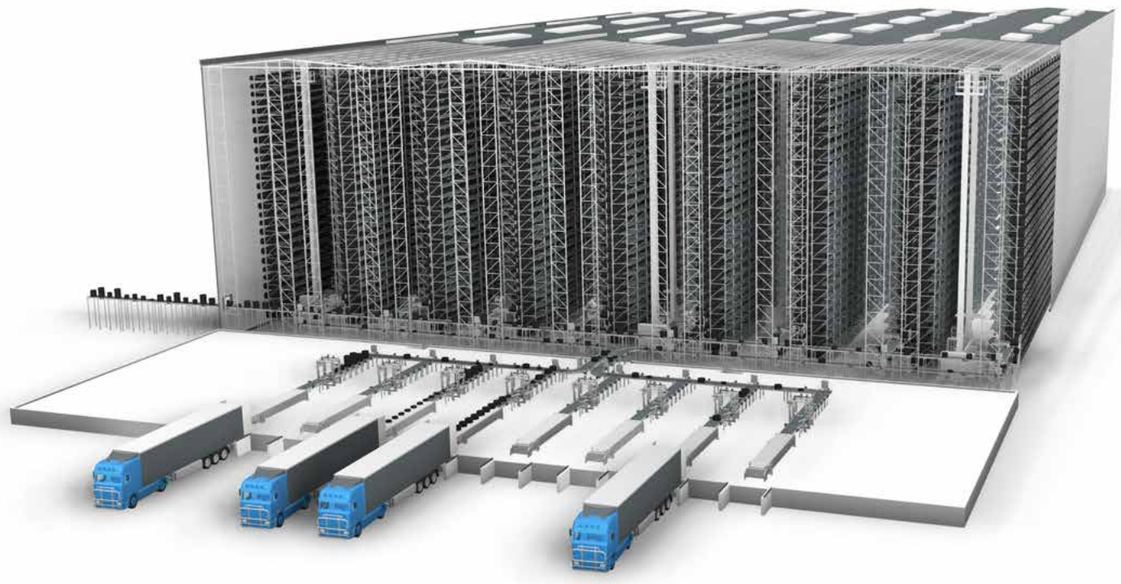
Steel is the main material used in ASRS, with the racking, cladding and stacker cranes all primarily using the metal. In our example, over 2,900,000 kg of steel is used in total, or 90.6% of all material. The remainder is mainly accounted for by mineral wool, fuel and oil, and zinc. Although the production of steel requires significant energy outlay, it holds an important position in the circular economy. It is the most recycled material in the world and is able to be recycled many times without reducing its quality while using only one third of the energy needed to make virgin steel. For every one kilogram of steel that is recycled over the product's life, a saving of 1.5 kilograms of CO_2e is realized. Therefore, the steel in the ASRS example represents a saving of about 4,360 tonnes of emissions and an equivalent reduction in carbon handprint.

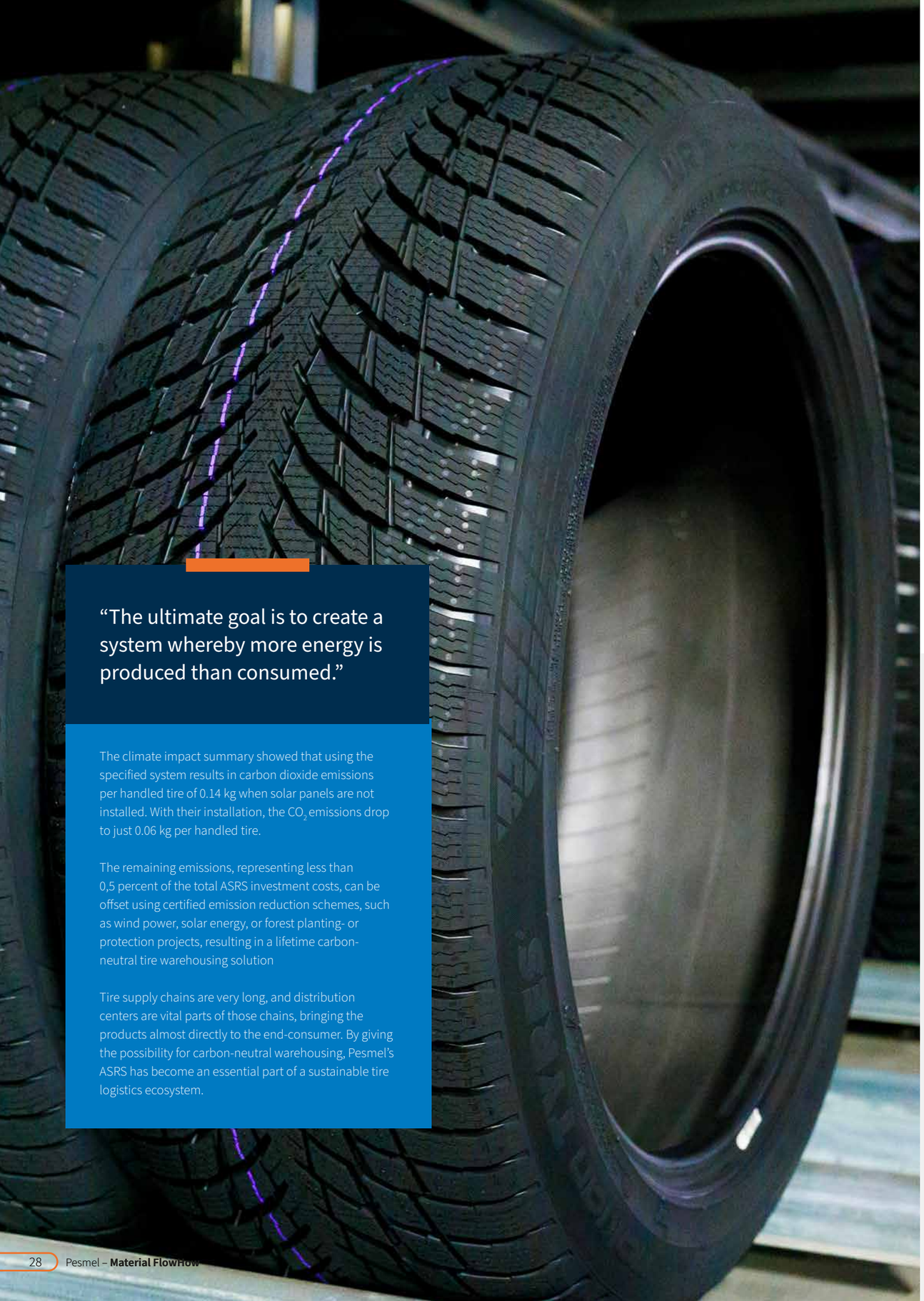
> Pesmel's unique high-bay ASRS allows the establishment of carbon neutral warehousing.

Sustainable stacker cranes and solar solutions

The other main way in which CO_2 emission reductions can be made is by increasing the energy efficiency of the ASRS. The ultimate goal is to create a system whereby more energy is produced than consumed. For many years, Pesmel has included regenerative drive technology in stacker cranes as a well-established and easy way to reduce energy use. Included in the standard offering, braking energy is collected and fed back into the power grid. This technology is paired with energy efficient operating devices that are optimized according to usage requirements.

To minimize carbon dioxide emissions, Pesmel recommends the use of rooftop solar panels. As shown on the accompanying graph, harvesting on-site renewable energy to supply power needs makes a big difference, more than halving the CO_2 emissions per handled tire, assuming average EU solar energy potential. The ASRS's electric infrastructure can also be utilized for rooftop solar power grid. The solar energy system can be included by Pesmel as part of the delivery.





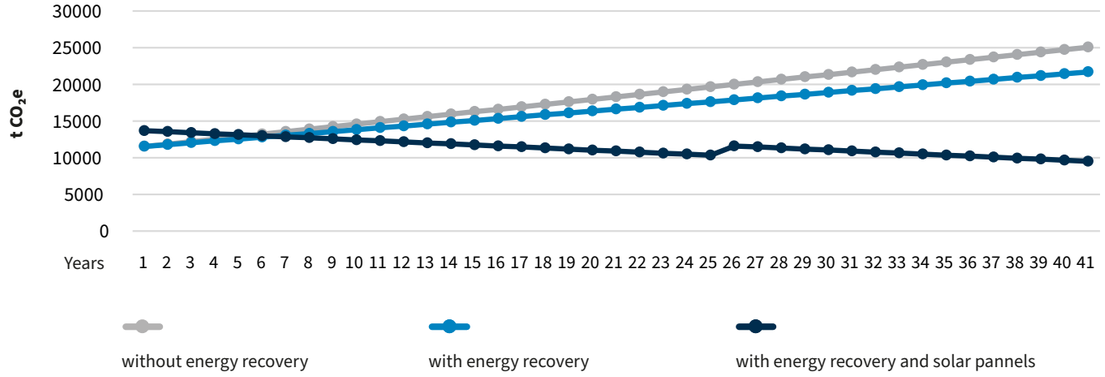
“The ultimate goal is to create a system whereby more energy is produced than consumed.”

The climate impact summary showed that using the specified system results in carbon dioxide emissions per handled tire of 0.14 kg when solar panels are not installed. With their installation, the CO_2 emissions drop to just 0.06 kg per handled tire.

The remaining emissions, representing less than 0,5 percent of the total ASRS investment costs, can be offset using certified emission reduction schemes, such as wind power, solar energy, or forest planting- or protection projects, resulting in a lifetime carbon-neutral tire warehousing solution

Tire supply chains are very long, and distribution centers are vital parts of those chains, bringing the products almost directly to the end-consumer. By giving the possibility for carbon-neutral warehousing, Pesmel’s ASRS has become an essential part of a sustainable tire logistics ecosystem.

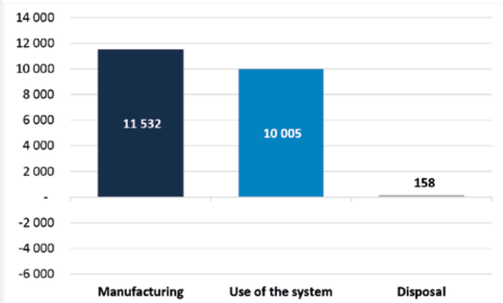
The CO_2 emissions can be only 0.06 kg per handled tire, mininizing the need for compensation in order to achieve carbon neutrality.



CO_2 emissions of the example ASRS over 40-years lifetime with different energy supply and recovery alternatives.*

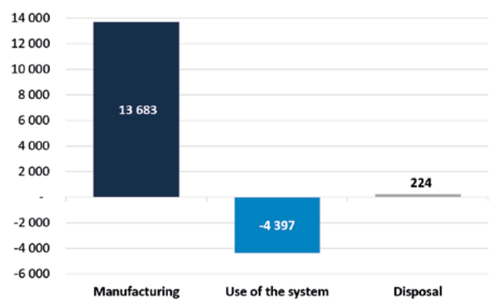
Pesmel ASRS with energy recovery

0.14
kg CO_2e per handled tire



Pesmel ASRS with energy recovery and solar panels

0.06
kg CO_2e per handled tire



Climate impact over 40-years lifecycle including manufacturing, system usage and disposal phases in alternative ASRS solutions.*

Realized customer KPI´s

Favourable total cost of ownership

4 years
payback time

16/5
shipping operations vs. 24/7 baseline

0%
roll damages / errors in delivery

60%
shortened truck turnaround time

80%
shortened delivery time

~0
CO_2 emission in operation

pesmel.com
Visit our website to find out more about Pesmel's unique Material Flow How® concept for the metal industry, and the technologies and processes behind it.

Contact us

If you would like to know more about the topics covered in this issue or have any other enquiries, our experts would be more than happy to help. We would love to hear from you.

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