Material FlowHow

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Danieli
Keeping wire rod coils in shape

Tata Steel
Material Flow How® in action

Pesmel services
Prevention is better than cure

PESMEL

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Automated material flow boosting plant efficiency

Digitalisation and automatization are profound trends that prevail despite economic uncertainties as they have the potential to contribute towards increased efficiency in industrial operations over the business cycles. On a process level they offer opportunities for improving operational performance, particularly in the area of logistics. Whether factories, warehouses, port operations or goods in transit, there is great potential for boosting the flow of materials.

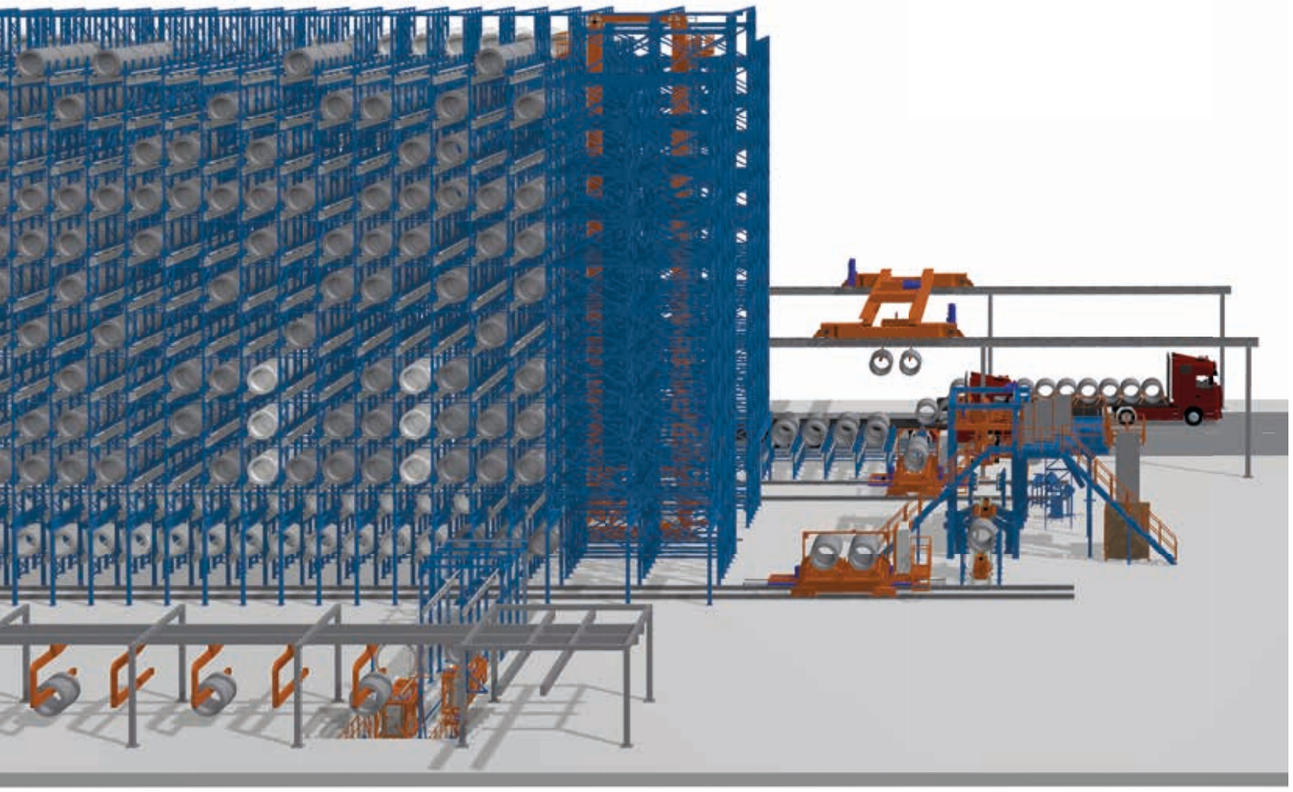
As specialists in material flow solutions we at Pesmel focus on enhancing our customers' logistics chain by introduction of fresh ideas and innovations, and tailoring customer-specific competitive solutions. With this approach in mind, in this magazine we have highlighted some of our new solutions as well as recent references of cooperation with our metal industry customers. Benefits of automated wire rod packing are discussed in two industry cases, namely Acciaierie Bertoli Safau, a subsidiary of the Italian plant builder Danieli, and a major Japanese steel manufacturer. In both cases the drivers for automated packing include comprehensive protection against mechanical damage and rust in storage and transportation, elimination of waste of packing materials, efficient capacity utilization and increased overall safety.

Another article presents TATA Steel, a world class industry benchmark, as a front running applier of industry 4.0 in their new Kalinganagar plant. It discusses the unmanned operations of the entire scope of coil logistics, packing lines, storing and retrieving as well as a comprehensive warehouse management system, all part of the Pesmel delivery at the Kalinganagar plant.

The future of metal industry logistics looks promising. As production volumes grow whilst delivery schedules and quality demands keep tightening, there is increasing potential in enhancing overall plant efficiency through automatization of material flows. Could we give you a hand in rethinking and renewing your logistics operations, or supporting your operations with our dedicated customer service team?

Pesmel – the Material FlowHow® company

Juha Suksi
VP, Metals



Every coil counts

Material Flow How® for wire rod

Pesmel's unique Material Flow How® concept for wire rod producers is a logistics solution that goes far beyond traditional storage and warehousing. It turns intermediate storage facilities into a highly-automated distribution center that can improve throughput times and the efficiency, accuracy and quality of material handling.

The wide range of end uses for wire rod, which require accuracy and precision also set high quality requirements on the material itself. Pesmel's solution for the packing, storage and logistics for wire rod coils also minimizes the risk of mechanical damage and corrosion caused by moisture during storage and transportation. Pesmel wants to ensure that when the customer's coils reach their final destination the quality of each one is as high as when it rolled off the production line.

A complete solution

The Material Flow How® concept covers the entire automated journey from receiving coils for packing and storage to delivering them for loading and transportation. The intelligent automation software behind the solution ensures the ease, accuracy and efficiency of the entire process. The customer always knows the status and location of every single coil at all times, from the moment they are first delivered from production into the Pesmel carriage that takes them onto packing, or directly into storage depending on the customer's needs.

Throughput time is the key to efficiency

Dealing with continuously growing production volumes and heavy products, logistics solutions need to be both agile and robust. The average wire rod line can produce up to 60 coils/hour, with each coil weighing 2-3 tons. Efficient and well-organized logistics can ensure smooth throughput with no bottlenecks. The intelligent Pesmel solution does not just store coils in the unique and space-saving vertical deep lane storage, but it has the ability to pre-sort outgoing orders for easy pickup well in advance. With an output capacity of 90 coils/hour and smart automated pre-sorting, the Pesmel solution can help reduce the turnaround time for a truck picking up a scheduled load to about 10-15 minutes in total. In a world where time is money, these types of improvements in efficiency are extremely valuable.

Pesmel's TransRoll™ solution allows for coils to be stored up to a height of over 30 meters in storage lanes that can hold up to ten coils each, depending on their dimensions. This means that a greater storage capacity can be achieved with a much smaller footprint than in traditional storage solutions or a typical storage yard. Stacker cranes can run between shelves and pick up coils from either side. All Pesmel cranes and carriages are designed to handle multiple coils at a time to ensure maximum efficiency and throughput. The intelligent Warehouse Management System (WMS), the brains behind the entire operation, always knows exactly which coil is where. The order pickup process is guaranteed to be both fast and accurate.

Packing that protects product quality

For many wire rod applications pristine quality is a high priority. Avoiding dings, dents and scratches during storage and transportation can often be a matter of great importance. Many coils are stored and shipped without packing, in which case they can easily bypass the packing process and be moved into the high bay storage. The coils requiring protective packing are treated with the utmost care and efficiency by Pesmel's automated packing line.

Before each coil is packed, it passes through a measurement station where lasers are used to measure and check each coil's dimensions and check that there are no sharp coil ends protruding into the eye of the coil where they might cause tears during the Through Eye Wrapping (TEW) and result in unscheduled maintenance shutdowns and bottlenecks. The measurements also help optimize the use of packing materials and minimize waste in packing. This is a matter of both optimizing costs and minimizing the environmental impact of process waste.

Dealing with continuously growing production volumes and heavy products, logistics solutions need to be both agile and robust.

Each packing line is built based on the customer's needs and specifications. Typically wire rod coils are wrapped using Pesmel's patented Through Eye Wrapping Machine in two layers; first with a durable fabric layer, followed by a film wrapper, which provides a good seal and barrier from both mechanical damage during handling as well as moisture during storage and transportation. The wrapping process may also include extra wrapping and protection over the outside or ends of coils depending on the wire rod material's specific attributes and transportation modes. Before storage, each coil is labelled using Pesmel's automated labelling solution. The only manual operation throughout the entire packing, storage and sorting process is restocking the label machine and the packing line once or twice per shift.

Full-service partnership

Each Pesmel Flow How® solution is designed and built to match the customers needs using proven technologies and components. A combination of high-quality hardware and intelligent software is the basis for each automated logistics solution. The entire journey and process between production and transportation can be automated to ensure high-quality material packing and handling, optimized use of storage space and highly efficient material flows.

Each Pesmel delivery is supported by comprehensive expert services, ensuring that assistance is always at hand. Experts provide extensive training for operators and on-site support during commissioning. Pesmel also offers its 24/7 Helpdesk service to each customer thereafter. As a company Pesmel is committed to quality in terms of both solutions and services. They want to be the preferred intelligent logistics partner for the wire rod industry.

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Keeping wire rod coils in shape at Danieli's steelmaking division ABS

In a greenfield wirerod mill in Northern Italy, a new high bay storage system handles premium quality wire rod coils fully automatically day and night, seven days a week.

Udine-based Acciaierie Bertoli Safau SpA (ABS), a subsidiary of the Italian plant builder Danieli Group located in Northern Italy, is engaged in building an ultra-innovative wire rod that will set new standards in terms of production quality, technological innovation and 4.0 industry. The mill with a total of 200 million euros investment will serve as a state-of-the-art showroom for Danieli's rolling mill equipment for their customers.

Investment driven by Industry 4.0 technologies

Upon start-up the 500 000-ton capacity mill produces wire rod from steel billets of which roughly 150 000 ton will be smaller high-end products destined for use in end-user sectors, like the automotive industry, which rely upon the use of high quality, critical components for use in car manufacturing. According to **Stefano Scolari** CEO of ABS, the main objective of this new investment is the production of smaller dimension products ranging in diameter from 14mm down to 5,5mm that have not been produced by ABS earlier. The plant, which relies heavily upon Industry 4.0 technologies is located in front of ABS's Cargnacco headquarters and occupies roughly 150 000 square metres. The new wire rod storage is capable of accommodating 3 800 wire rod coils, each weighing three tonnes. In total the Pesmel system accommodates 11 400 tons of wire rod representing roughly three to five weeks' production at the plant.

Pesmel's Warehouse Management System enables smooth material flows and storage efficiency.

State-of-the-art solution for wire rod handling

The aforementioned high bay storage system, supplied by Pesmel of Finland, is designed to handle 150 000 tons per year of high-quality wire rod coils. The structure is controlled by the company's proprietary Warehouse Management System (WMS) that enables smooth material flows and high storage efficiency. The storage system functions both as an intermediate store for coils going to annealing as well as despatch storage for customer deliveries using trucks and trains. **Tony Leikas,** CEO of Pesmel, commented: "My view of this project is that Danieli and ABS were brave enough and of the correct mindset to try something new that is reliant upon new technology. They wanted to implement new technology for wire rod handling."

The core of the Pesmel system – the brain – is the WMS that is used to control the stacker cranes and the warehouse logistics. It manages material flows between processes, optimizing storage and logistics functions, increasing the total system capacity and decreasing operational costs. The high bay storage system at ABS is a six-storey structure of racking for individual coils, dissected down the middle to accommodate three key items of equipment: sorting cars, stacker cranes and channel vehicles. According to Pesmel, deep lane type high bay warehousing is cost-efficient because it needs fewer cranes than multi-aisle systems; typically two stacker cranes operate along a single aisle and transfer coils to racking on its left and right over the six storeys of available space.

Full traceability and gentle handling through automation

Steelmakers producing critical products for sectors like the automotive industry need to maintain product quality throughout the internal handling process at the plant and this means that gentle handling and full traceability are pre-requisites where in-plant logistics are concerned. In car manufacturing, having full traceability from billet through to end product is important from a safety perspective where critical components are concerned.

Full traceability can be secured more easily with a fully automated system.

Leikas claims that a fully automated system enables easy access to all coils regardless of storage position. Furthermore, a manual system reliant upon forklifts is always rougher on the product. When wire rod coils are stacked up to four high, there is pressure on the coils at the bottom; operators don't have immediate access to the lower coils and the traceability element of the process is questionable when compared with what a fully automated system can offer. The system's full traceability function means that individual parts can be traced back through the process to the billet originally used to manufacture the wire rod.

Close cooperation in reaching joint goals

For ABS, the Pesmel system represents the future. It was optimised for the mill using simulation during the design phase. "The software we write knows where the coil has to go and this is all programmed," said Leikas, explaining how the system is unmanned, making the software a crucial element of the offering.

Danieli initially approached Pesmel to discuss the possibility of implementing a high bay storage system at the ABS wire rod mill based on knowledge gathered from Pesmel's steel customer references. Pesmel has supplied Danieli with packing lines before, notably for aluminium projects. Looking ahead, Leikas believes the next steps for Danieli/ABS could be both in the packing field to secure quality and in the development of auto-loading functions. "On the software side the traceability exists, so adding functions to make the physical handling easier would make sense," said Leikas.

"We believe that the new facility at ABS Udine represents the new normal of wire rod storing and logistics and, hence, will work in close cooperation with our customer to make it an excellent reference," concludes Pesmel's CEO Tony Leikas.

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Improving the productivity, efficiency, accuracy and quality of packing.

Pesmel's solution delivers

- protection from mechanical damage
- efficient moisture barrier
- optimized use of packing materials
- reduced manual labor and risk of human error

Adopting new technologies in material packing has become top priority for the steel industry, the main drivers being operational costs, safety and customer demands. This article will focus on:

High-quality wire rod packing through automated solutions

Shifting focus towards automated packing

Pesmel's fully automatic solution is actively shifting the focus towards automated packing in order to achieve the best possible process efficiency and accuracy and to ensure the highest possible safety standards. The solution is based on proven designs and technologies using a modular concept approach to create the layout.

The key to efficiency is not in the individual machines themselves but in the expertise creating a complete layout that works and pairing it with the automation intelligence, both provided by Pesmel. The introduction of automation improves everything from packing accuracy and speed to true traceability and predictability. The reduction of manual processes also decreases the potential for human error.

Packings minimizing mechanical damage

When speaking about improving the quality of packing in wire rod applications, the most important aspect is protection from potential mechanical damage taking place during shipping and transportation. Considering the precision required in many of the final applications for wire rod, ranging from riveted bolts and the wire mesh used to strengthen car tires, dents and scratches in the coil can be critical and costly. Depending on the grade of steel and end use, also the ability of Pesmel's packing to create an efficient moisture barrier that minimizes rust during storage and transportation can help reduce the need for pickling and have a positive environmental effect with less use of acid.

End-to-end packing solution

The solution delivered includes the full packing line, which starts from the in-feeding stands and coil carriages. At the first stage you find the unique coil profile measuring and eye checking functions used to measure the width and diameter of coils and ensure an unobstructed path for the through eye wrapping (TEW) machine down the line. These accurate measurements help optimize the use of wrapping materials, eliminating material waste and delivering considerable savings. Ensuring that the eye is clear also minimizes the risk of bottlenecks and expensive downtime in the process.

The packing phase itself consists of a wrapping machine that provides extra protection for coil ends and the TEW machine that provides all-around protection from both moisture and mechanical damage. The through eye wrapping process consists of two layers. The first is a layer of polyethylene cloth followed by stretch film wrapping. Before out-feeding, the packed coils pass through the automated labelling equipment.

The quality wrapping materials will be carefully selected each time based on packing requirements. Together the machines and materials create the high-quality packing Pesmel is committed to delivering to its customers. The high-quality wrapping materials used in this application are provided by Pesmel's partner in Japan, Horitomi Commercial & Industrial Inc.

Enjoying the benefits of automation and customer care

The high degree of automation means that the only manual functions left in the packing process are related to re-stocking the labelling machine and the wrapping machines a few times per shift. Overall safety has improved as the delivered system is divided into different safety areas and the automatic functions ensure that operators are able to stay a safe distance away from any potential danger. The Pesmel solution helps customers to reduce the number of operators involved with the packing process at the same time improving the productivity, efficiency, accuracy and quality of packing.

Pesmel offers service support across the solution life cycle, which includes the fast online 24/7 Help Desk that enables service in the local language, and when necessary grants Pesmel remote access over a secure connection to address any potential issues. The customer know that Pesmel is committed to delivering on its promises, and that the partnership does not end when the system is up and running.

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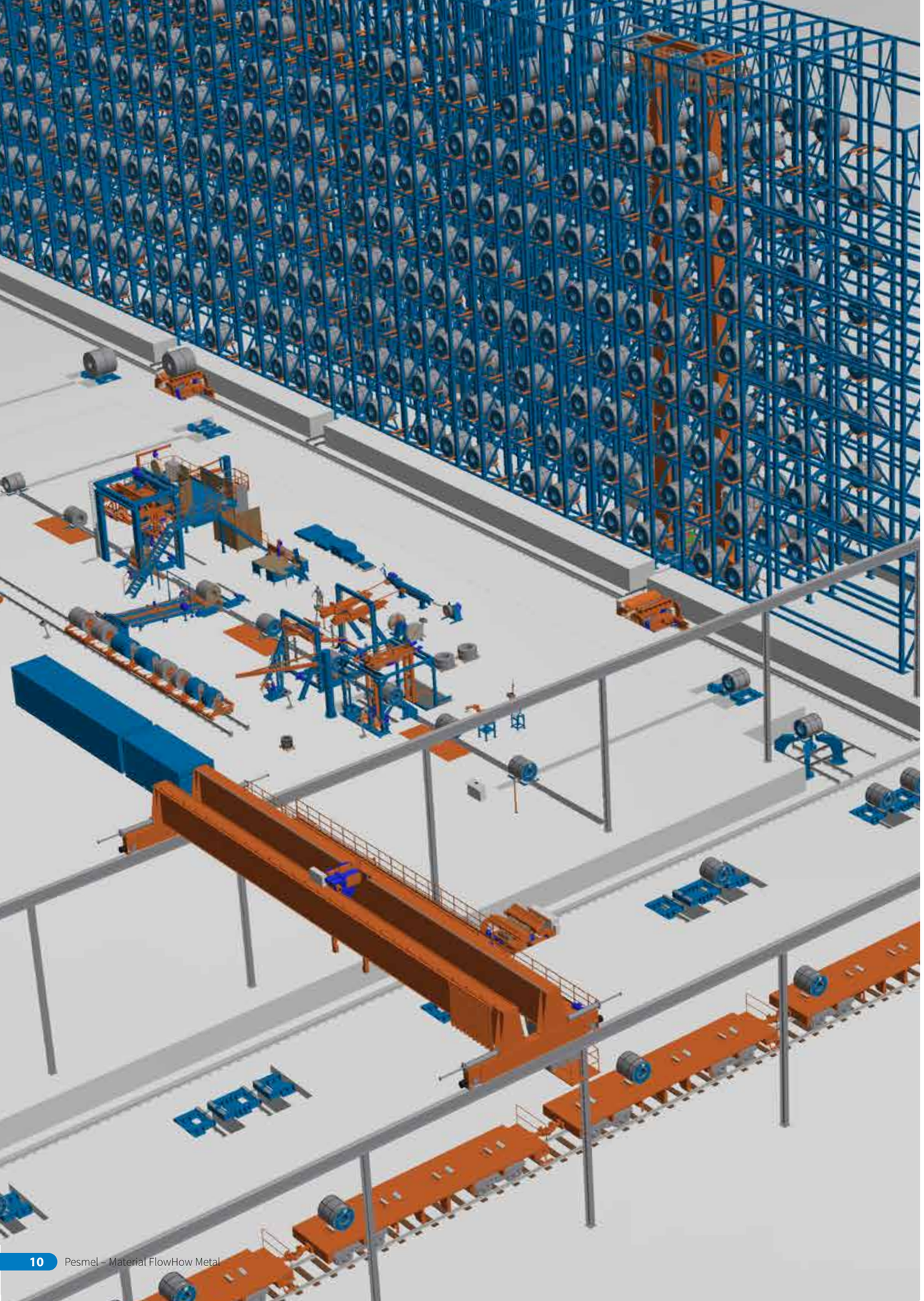


Material Flow How®
in action at Tata Steel, Kalinganagar

Pesmel, Finland's fifth largest exporter to India, is in the process of delivering a state-of-the-art automated coil storage and retrieval system to Tata Steel's new 2.2Mt/yr cold rolling mill at Kalinganagar. The order represents one of the largest projects the company has undertaken and is regarded as the first of its kind in India.

We are delighted that Tata Steel Kalinganagar had fully embraced the world of Industry 4.0 – the fourth industrial revolution – and would be using it to achieve maximum steel output with minimal carbon footprint. Tata Steel's state–of-the-art steel mill, located in Kalinganagar, Duburi, Odisha on India's eastern coast, is pushing the boundaries and using high-tech production and storage techniques to serve the environment and achieve greater plant efficiencies.

Last year, Tata Steel Kalinganagar not only celebrated its fourth anniversary, it also became the first and only Indian manufacturing facility to be recognised by the World Economic Forum, becoming one of 44 'Manufacturing Lighthouses' globally recognised for showing leadership in Industry 4.0.

The Kalinganagar mill is part of the massive 27.5Mt/yr Tata Steel empire, which operates manufacturing sites in 26 countries, employs over 80,000 people and produces a wide variety of products including iron, soft iron, cast iron, alloy steel, bearings, pipe and precision tubes.

Tata Steel recently embarked upon a 6 million tons (3 Mt+3Mt) expansion program at Kalinganagar including the development of a state-of-the-art 2.2Mt/yr cold rolling mill (CRM) complex producing steel coils correspondingly in the first phase.

In-plant logistics

In keeping with its hi-tech credentials the new CRM will incorporate three automated coil storage and retrieval systems (ASRS), one Yard Management System (YMS) and two automated robotic coil packaging lines, all supplied by Pesmel, Finland's fifth largest exporter to India in 2019.

The Kalinganagar project is one of the largest orders Pesmel has received and it is unique in India. "This type of line configuration with automated storage retrieval system and automatic robotic packing line is the first one in India," excitedly remarks Pesmel's Vice President, Metals, **Juha Suksi.**

Pesmel's involvement with Tata Steel Kalinganagar's new CRM is rooted in a long-term and close commercial relationship between the two companies, and their shared belief in the power of automation as a means of achieving ultra plant efficiency and safety.

"Tata was aware of our in-depth knowledge of the Kalinganagar plant and on modern logistics with automation and chose us to design, configure and build the entire automated storage and retrieval system for them, which we are executing in collaboration with their very co-operative project team," states Managing Director of Pesmel India, **Jagannathan Rajagopalan.**

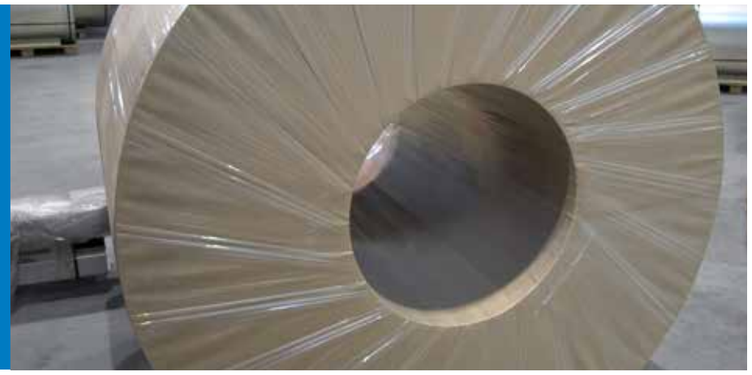
Having an automated in-plant logistics and storage system is nothing new for Tata Steel Kalinganagar. Handling coils automatically is far better an option always, and especially during this highly contagious pandemic situation, assuring total safety and the benefits of virtually manless operation are clear.

Automated Material Flow

Pesmel's automated storage and retrieval system needs just one operator per packing line, according to Suksi, and invariably that person will be the line supervisor. This is where the company's proprietary Material Flow How® technology concept comes into play.

Material Flow How, the concept illustrating Pesmel's way of harnessing the potential of Industry 4.0 and digital manufacturing, has always been Pesmel's core competence and primary focus; its strength lies in its uniqueness and the fact that all installations are custom-built accordingly.

The mill uses high-tech production and storage techniques to serve the environment and achieve greater plant efficiencies.



The Material Flow How concept digitalizes the logistic chains at the mills. It is an intelligent solution that reduces cycle times and the utilisation of main process lines by automating logistics. This gives full control over material flow between raw material, semi-finished and finished production processes including shipping.

Automated storing and retrieval of coils

The scope of the Kalinganagar project includes the supply of three automated storage retrieval systems (ASRS) based on coil cars and stacker crane arrangement. They transfer steel coils from the mill's Coupled Pickling Line and Tandem Cold Rolling Mill (PLTCM) line towards annealing, galvanising and, as required, recoiling lines and then to packaging, storage and onward shipping.

The ASRS1 acts as a storage for PLTCM coils. These coils would be further fed to the processing lines: Continuous Annealing Line (CAL) and two Continuous Galvanizing Lines (CGL).

ASRS 2 and ASRS3 transfer and receive coils from the plant's CAL and GCL and also transfer and receive coils to and from Recoiling Lines (RCL) and packing lines.

Automated coil cars and stacker cranes are responsible for the storage and retrieval of coils from three high-bay storage areas. Special tracks are positioned below floor level, enabling the coil cars to service the lower level of the storage bays, leaving all levels to the stacker cranes.

The entire automated in-plant logistics and storage system at Kalinganagar is protected by what Pesmel calls 'full redundancy'. "It means that if one stacker crane in the storage system is under maintenance, the second one could do all the needed tasks. "We have two stacker cranes on each high-bay storage unit. In the same way the coil car system also has redundancy," confirms Suksi.

Warehouse Management System

The entire system – logistics, storage and packaging – is controlled by Pesmel's Warehouse Management System (WMS), the heart of the configuration which tracks and tasks the coils from arrival to departure. There is also a Yard Management System (YMS) in place for coils stored at ground level.

With integrated WMS and YMS the various functions contained within the mill are integrated into one logistical entity. A state-of-the-art mill also needs a modern control structure. "We are able to integrate all levels of production and logistics control, from electrification to automation, monitoring, material flow planning & management and logistics into one full chain, comprehensive platform" concludes **Marko Nousiainen,** COO of Pesmel Corporation.

Packing lines

In addition to three automated ASRS storage facilities with logistics, the Tata contract includes two coil-packing lines for Continuous Annealed (CRCA) and Continuous Hot Dip Galvanized (Coated) coils. These lines can handle coils with a width of between 800 mm to 1 900 mm, an outer diameter of 800 mm to 2 200 mm and weight up to 45 metric tons.

The packing lines feature an impressive automated 'through-eye' packaging system that wraps crepe / VCI (volatile corrosion inhibitor) paper around the coil to protect against unwanted moisture, dust and oxygen and eliminate the risk of rust. The term 'through-eye' relates to the eye of the coil through which the packaging materials are fed automatically based on coil dimensions and packing code.

An automatic overhead 12-roll spool changing system and a 12-spool carousel magazine enable long periods of operation without the need to replenish during wrapping, meaning no need for additional downtime.

There are seven robots with six to seven axes operating and managing the entire packing operation configuring it as a state-of-the-art automatic packing line.

Automated inner diameter (ID) and outer diameter (OD) body-wrapping, side disc, ID and OD corner protection machines feed the correct amount of packaging material to the coil, providing essential mechanical protection. Systems for strapping, labelling and label reading are also part of Pesmel's delivery to Tata Steel Kalinganagar. Automation with in-situ preparation of packing materials enables optimal usage of materials according to coils size and packing philosophy, providing significant savings in material costs.

Where timelines are concerned, the packing lines are tested in Finland prior to shipping to Kalinganagar. "Testing the line in our own workshop will shorten the commissioning time at the customer's premises," states Suksi adding that if any modifications are required, it's quicker and easier to make changes in the workshop.

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"Tata Steel expects that the Pesmel internal logistics system with total automation will ensure highly effective material handling, tracking, packing, storage and shipping systems with maximum life cycle cost savings.

With this logistics solution the ramp-up should also be faster compared to the conventional methods. In this way, Pesmel solutions are not only be the backbone for processing the materials but also strengthen and improve the outbound deliveries in less stipulated time.

Secondly, the customization as assured by Pesmel engineers, has helped in adapting and nurturing the latest logistics solutions to our needs. Having witnessed Pesmel's modern logistics references Tata Steel is keen to adapt the same in other units and projects.

In fact, based on the various interactions and case studies, it can be inferred that the modern technology would become a significant force of change in conventional logistics. This in turn could become the promising success factor. Best efficiency is not any more an option for the steel industry today, rather, it is mandatory for it's survival and success."

Rajesh Ranjan Jha,
Vice President
Engineering and Projects,
Tata Steel Limited

Ajay Kumar Jha,
Chief Engineering,
Flat Products
Tata Steel Limited

Shaping the future of steel industry logistics

A senior executive of a large steel industry corporation said that companies like theirs have two big headaches – logistics and energy. Pesmel knows how investing in industry 4.0, especially intelligent automation, can help alleviate the first of those headaches.

It is becoming clear that as production volumes grow, and delivery schedules keep tightening, traditional storage, loading and transportation methods are no longer able to meet the needs of today's business. It is evident that many of the industry frontrunners are investing in bringing their supply chain logistics into the 21st century by investing in advanced automation. The potential to improved efficiency in logistics is great, yet still largely unrecognized.

Throughput up, no errors in deliveries

Companies that have taken the leap into industry 4.0 in terms of their logistics chain are reporting astonishing results. By improving the speed, accuracy and efficiency of logistics operations, many have significantly enhanced their business performance. Automated solutions regularly report zero errors in deliveries due to the elimination of the component of human error. In some cases, improved throughput times have helped boost annual sales by up to 15%.

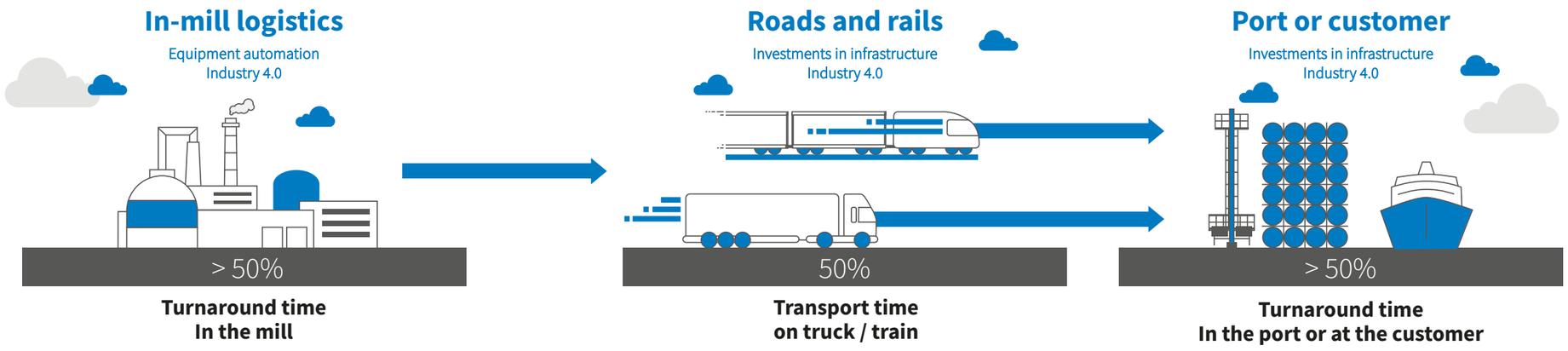
Storage footprint cut by two thirds

Pesmel's automated high-bay storage solution has allowed many steel manufacturers to reduce the amount of space required for storage by as much as 66%. But it is important to note that improvements in in-mill logistics will boost several areas of mill performance, finally reaching all the way through the entire logistics chain.

Train loading and turnaround times halved

Road or rail transport times often account for less than 50% of the total time from mill to customer. This means that there is little to no forward progress the rest of the time. This is where the improved efficiency of in-mill logistics and shipping functions can have a positive influence on the entire logistics chain. Reducing waiting and turnaround times at both ends through proactive and predictive operations and the smart sharing of information has the potential to really impact business performance.

Automation improves efficiency across the entire logistics chain.



0
errors in deliveries

50%
shorter loading and turnaround time

40%
less capital tied into products

Case: High utilization rate of rolling stock

In one exemplary case, Pesmel's automated logistics solutions helped a customer reduce the round trip time for a 320 km rail transfer from mill to port from 96 to 36 hours. The trains still run at the same 24-30 km/h speed using the state-owned rail network. These savings simply come from less time being stood still. Thanks to active networking and data sharing between the customer's business platform (SAP), Pesmel's Warehouse Management System (WMS) and the port systems, the outgoing loads are pre-sorted and ready for loading when the train arrives. Also, the automated loading process is much faster than traditional manual loading. Loading 1 500 tons of product only takes 3 hours in total. The scheduling information and tracking of the train cars combined with a detailed load list creates the same time savings when unloading the train cars at the port.

Case: Automated load formation cuts truck turnaround time to 20 minutes

Equally impressive improvements have been achieved at mill sites which exclusively use trucks for primary transportation. At one particular plant, which previously had anywhere up to 300 trucks pull up in random order each day for pickup, valuable time was being lost in shipment sorting and loading. By building an automated distribution center alongside the production facilities and increasing the level of automation and data utilisation, they were able to reduce the turnaround time for arriving trucks to a mere 20 minutes.

These remarkable improvements, which are estimated to allow for annual savings of around 3-5 million EUR, were the result of a highly organized 70 000 ton high-bay storage facility with four stacker cranes, four sorting carriages and 12 truck loading positions, all monitored and controlled by the Pesmel Warehouse Management System (WMS). The system also includes some of the mills business functions as well as predictive monitoring of in-coming truck traffic. Trucks are being followed by GPS as well as plate reading at the front gate to help predict arrival time and order. This allows for the efficient pre-sorting of outgoing loads and delivering them to the allocated loading point in advance.

Project validation through feasibility studies and simulation analysis

An investment into advanced logistics chain automation and industry 4.0 connectivity is just that – an investment into productivity and efficiency. Pesmel wants to ensure that each project they take on has what it takes to deliver the expected results. This is why they always start with an in-depth feasibility study before executing the planned automation of in-mill logistics and shipping functions and the desired industry 4.0 system integration and networking capabilities. A comprehensive simulation is a minor investment that justifies the overall investment and brings peace of mind for the customer.

Pesmel creates an actual 3D-simulation model of the entire production process and material flows based on real and planned operational data, also taking future plans into consideration. The simulation is run using the same exact WMS that will be in real use later. This process helps provide a realistic overview of what can be expected and validation for the project based on real data and analysis. The built simulation model also acts as a digital twin for the customer's process, allowing for future simulations and pre-implementation testing of new developments.

Investments in logistics automation will enhance the entire supply chain

Investments in automated logistics operations will boost the performance of the entire logistics chain. Added intelligence in storage, sorting and distribution functions means that companies have up to 40% less capital tied into products sitting in the stock yard or warehouse. With the right partner planning of automated logistics is carried out systematically, risks minimized and significant savings in time and money achieved. 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. To tap into the great unrecognized potential for increasing efficiency across the entire chain, automation solutions are ushering in a new era in smarter logistics.

Revolutionizing in-mill logistics through data

Industry 4.0

Using intelligence to improve efficiency

Digital manufacturing processes are driving the sophistication level of in-mill logistics systems. For our customers, this means improvements in plant efficiency, capacity and product quality.

Pesmel established its own ICT department already more than ten years ago and today it is a big part of the business. The company has since harnessed the potential of Industry 4.0 and digital manufacturing through the **Material Flow How** concept – the backbone of Pesmel's business. "Material flow how is our customer promise and core competence. It has been our primary focus from the outset, combining advanced digital systems, in-house engineering capabilities and extensive knowledge in material flow," says **Tony Leikas,** CEO of Pesmel.

According to Leikas, digital manufacturing is still relatively new to the steel industry. He recalls a client that wanted a system capable of pinpointing potential logistical bottlenecks. "The system constantly collected data, identifying bottlenecks and providing advice on how to optimize these sequences. This was more than ten years ago. We have since developed different areas of the solution, and it is now a standard function in our machines," Leikas explained.

Digitalization and customization give a competitive edge

Leikas strongly believes that the fourth industrial revolution, Industry 4.0 as it's often referred to, will continue to open up all sorts of new possibilities in the field of in-mill logistics. While there are many similarities between in-mill logistics systems, there are many unique aspects as well. This is largely due to each customer wanting to build their own competitive advantage. Typically, it is the software that makes the difference. For Pesmel, identifying the similarities is crucial in the development of an in-mill logistics system because the process is complex, and it is important to make the distinction between the run-of-the-mill and the more customized elements of the project. There is, therefore, a fine-tuning process at work, which gives Pesmel's customers a much-desired competitive edge.

The in-house developed control system is a core part of the Material Flow How concept. Pesmel Control provides comprehensive control on all levels of the control system. Pesmel Control consist both of standard software and customized modules in order to integrate flawlessly into the customer's own systems. This integrated control system covers automation levels ranging from basic equipment control to more complex production planning and execution. It includes both the Warehouse Management System (WMS) and the Yard Management System (YMS).

In addition to the control system, Pesmel offers its customers a remote supervisory and preventive maintenance solution called **FlowCare.** "This remote online tool can be accessed on any device and provides a comprehensive view into the performance of your Pesmel equipment," Leikas explains. "All key data is clearly visualized, and various reports are easily generated and sent off via email. The solution even offers interactive system support and access to an online shop for spare parts and services."

Companies are adopting data analytics to optimize operations

The combination of sensors, control systems and automated handling equipment is seen as the future of safety and efficiency. Data analytics are increasingly used to identify improvement areas to boost productivity and margins, whereas management software provides inventory information and improves the end-consumer experience through connectivity and real-time data. Automation solutions can be further optimized through programming for continuous process improvements such as dynamic storage, inventory management and overnight relocation of goods.

"In-mill logistics is Pesmel's speciality. Combining ICT with traditional machine making makes us unique and gives us an edge." Leikas says that steelmakers rely on sophisticated in-mill logistics systems to help them achieve greater capacities, enhanced efficiency and higher quality end products as well as being better placed to manage change. "Our systems provide exactly these kinds of possibilities," Leikas concludes.

Taking smart system integration beyond the mill

We are seeing a growing trend in the expansion of the scope of intelligent logistics. As systems communicate and interface with each other, it is becoming easier to share information between systems and use data for the management of entire logistics chains, starting from the mill and covering the transport of goods via road or rail, all the way to the shipping port or even the customer.

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Pesmel service

Prevention is better than cure

It's an old adage, but the phrase 'prevention is better than cure' rings true throughout all aspects of life and is never more relevant when applied to critical equipment operating in heavy manufacturing environments. In this article we examine how global steelmakers benefit from Pesmel's customer-centric support services.

Comprehensive customer support

Pesmel customer support provides services for material handling, packing and storing systems including mechanical and electrical works as well as PLC and PC based control systems, in order to guarantee productivity and safety over the life cycle of the process.

Pesmel's customer support programme embraces six key elements: equipment maintenance, a 24/7 helpdesk, ICT maintenance, a comprehensive spare parts provision, system upgrades and Flow Care. The aim is to minimize risk and expensive downtime, guarantee reliable operation and extend the life of supplied systems, keeping the total investment and operational costs in balance.

The preventive maintenance program ensures trouble-free operation of the process. Pesmel's service specialists have been trained to carry out routine checks per norms and manuals but also equipment specific repairs when required. In case the capacity needs to be increased or the process otherwise upgraded, Pesmel will submit relevant plans and designs and will implement agreed changes.

To support trouble-free operation on its deliveries, an 24/7 ICT help desk is available from Pesmel global support specialists. This service covers troubleshooting of PLC, WMS and YMS systems. We provide global service as a joint effort between the dedicated centers of technology and the local service points. This will ensure agile and know-how based customer care world-wide.

Preventive maintenance ensures trouble-free operations.

Experienced engineers and qualified service personnel make regular site visits for condition monitoring and adjustment of mechanical devices, sensors and electrical components. "We have a systematic approach in inspecting everything, replace spare parts where needed and make any necessary adjustments," said Pesmel's **Juha Mielonen,** Key Account Manager at Pesmel Service.

Spare parts provision is all part of Pesmel's service offering, as are upgrades for existing installations. The latter is designed to increase system capacity, modify equipment for handling different types of product and improve safety.

Most problems come when you don't take care of the equipment.

Pesmel's Industry 4.0-based Flow Care remote supervisory visualises data and is viewable on personal mobile devices. Flow Care is user-friendly and security conscious and offers customers valuable insight into the performance of Pesmel's in-plant logistics and storage solutions.

Maintenance means a longer life

The topic of maintenance is rarely mentioned without including the word 'lifecycle' and the reason is simple: Poorly maintained equipment has a very short lifespan. Conversely, regularly looked-after electrical and mechanical systems – especially those operating in harsh environments – can almost claim immortality. A bold statement, perhaps, but **Marko Heikkinen,** Chief Service Officer at Pesmel, speaks of stacker cranes built in the 1990s and still working today; electrical components upgraded 10 years ago and in action as I write this. There are paper factories in the darkest jungles working 24/7 with properly maintained equipment, and 20-year-old cranes in ice cream factories hard at it in freezing temperatures. "Most problems come when you don't take care of the equipment," he said, adding that greater performance and higher quality are only achievable if the equipment in question is regularly maintained and upgraded.

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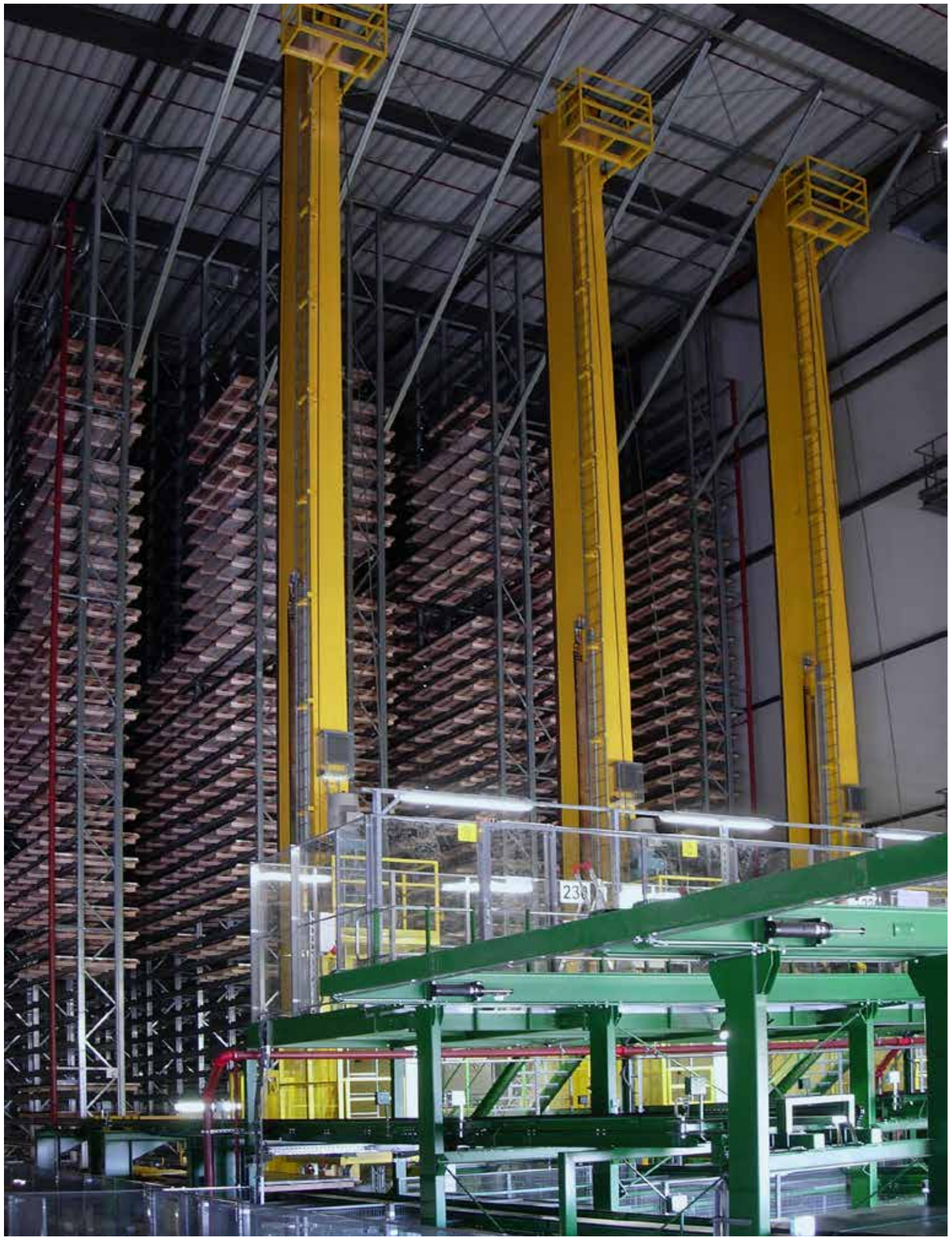

CASE: Outokumpu, Finland, Sweden and The Netherlands

Long-term cooperation as proof of performance

To penetrate any industrial sector, suppliers of critical equipment need a reference point in order to show other potential customers what they can offer. For Pesmel, a specialist provider of in-mill logistics and fully automated systems for moving, storing, buffering, sorting and despatching steel coils, that initial reference point was Finnish steelmaker Outokumpu.

When the two companies first connected in the early 1990s they established what would become a long-term, customer-centric relationship that benefited both parties and involved periodic maintenance and back-up along with small system upgrades handled through Pesmel's customer support programmes.

Pesmel's relationship with Outokumpu today is stronger than ever and based on a mutual understanding of the importance of ongoing maintenance and service assistance, which is critical for steelmakers operating within the harsh environment of a steel mill.

"Our experienced maintenance engineers possess an in-depth knowledge of their equipment and know instinctively if a problem exists," says **Marko Heikkinen,** head of Pesmel's Service Business.

Pesmel's longstanding contract with the Finnish steelmaker spans a number of production sites at Tornio in Sweden; Terneuzen in the Netherlands; and Degerfors in Sweden.

Tornio – pioneering advanced technology

The Tornio site is the world's only fully integrated stainless steel facility; it consists of two melt shop lines, a hot rolling mill, cold rolling plant, brushing, slitting and cut-to-length lines. In 1997 the plant took delivery of its first Pesmel high-bay coil and sheet storage system, which is served by three stacker cranes for the coil storage and a further eight in the sheet storage area. The facility acts as a shipment centre serving Nordic markets.

Tornio's RAP5 cold rolling, annealing and pickling line, operating since 2003, is integrated with a single long high-bay Pesmel delivered storage system running alongside the processing line. Measuring 500 m long, 30 m high and 7.5 m wide, it can store 2 000 coils with a total weight of 60kt and reduces the need for separate storage units dotted around the facility. Cushioned elevators replace cranes that could damage the coils, and no overhead cranes mean a safer working environment. Coils can move between storage and production several times and on to a packing line adjacent to the high-bay facility where they return to await delivery.

The Tornio site also features Pesmel delivered automated coil packing lines, inclusive of three through eye wrapping (TEW) systems. Both sheet and strips are also packed using Pesmel's automated packing systems.

According to Pesmel's Marko Heikkinen, the company pays six visits per year to Outokumpu's Tornio facility to fulfill its maintenance contract with the mill. Maintenance commonly revolves around electrical and mechanical issues, and where software updates are concerned, hardware often dictates what is required. It is also possible to upgrade the systems' programmable logic controller (PLC), but this is an infrequent task.

Terneuzen – improved operational efficiency

In 2005 Outokumpu invested 55 million EUR on a 12 000 tons fully integrated and automated in-plant distribution and high-bay storage system, a total Pesmel delivery concept, at its Terneuzen plant in the Netherlands. The aim was to improve operational efficiency and customer service. The mill has two packing lines - one for coils and another for strips. Coil packing features TEW system, the second to be delivered to Outokumpu.

Pesmel makes three annual service visits to Terneuzen. The plant is also supported by its own maintenance crew. Pesmel service contract covers maintenance of the coil crane, sheet cranes and sheet manipulators, the through eye wrapping machine and the conveyor system.

Degerfors – product throughput doubled

Outokumpu's Degorfors plant in Sweden produces stainless steel heavy plates, otherwise known as Quarto plates. The facility offers up to 60 different grades and 300 custom-made variations. In 2014 the plant was modernized. Up until that point, everything was handled manually: products were stored externally and exposed to the elements. Damaged plates and excessive use of packaging materials led to the purchase of a Pesmel automatic sorting, storing, packing and despatch system, including high bay storage and packing for heavy plates. The system doubled existing product throughput capacity and replaced time-consuming warehousing and logistics practices. The Degerfors set-up consists of one stacker crane, conveyors, top sheet application, palletizing, cross wood application and cross strapping.

Pesmel's service team calls the Degefors plant annually. The service contract covers maintenance of the sheet crane consisting of two combined stacker cranes together with integrated TransPallet vehicles.

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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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Customer reported results from Material Flow How® vs. traditional solutions:

15%
increase in sales due to shorter delivery times

7 day
reduction in invoicing times with integrated software

30%
savings in packing materials

65%
space savings compared to traditional storage

0
lost orders, shipment/ handling errors

10%
increase in mill efficiency

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.

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The Material Flow How® company