

# The next decade of paper converting: Automation, AI and flexibility

*Carlos Muriel, Sales & Marketing Director, Pasaban S.A.*

## INTRODUCTION:

**A Decade That Will Redefine Converting;** The paper and board converting industry is entering a decisive and transformative decade. After years shaped by global disruptions, changing consumption patterns, and increasing environmental and regulatory pressures, the sector is now facing a new and more complex challenge: evolving from highly efficient production environments into intelligent, adaptive, and fully connected industrial ecosystems.

Traditionally, competitiveness in converting processes—particularly in sheeting and winding—has been driven by three fundamental pillars: productivity, precision, and reliability. Over decades, machine manufacturers and converters have worked relentlessly to improve these aspects, achieving remarkable results. High-speed sheeters capable of processing a wide range of substrates with extreme cutting accuracy, and winders capable of maintaining optimal reel structure under demanding conditions, are now standard in many advanced facilities.

However, the context in which these machines operate has changed dramatically. Market conditions are more volatile, product portfolios more diversified, and customer expectations significantly higher. Production runs are becoming shorter, order variability is increasing, and delivery times are tightening. At the same time, sustainability requirements and cost pressures are forcing companies to optimize every aspect of their operations.

In this new environment, traditional efficiency—understood as maximizing output under stable conditions—is no longer sufficient. The industry must evolve towards a new paradigm built on three interconnected pillars: automation, artificial intelligence (AI), and flexibility.

As Carlos Muriel, Sales & Marketing Director at Pasaban, explains: “We are entering a phase where efficiency alone is not enough. Machines must be capable of adapting, learning, and interacting within a broader system. The future of converting lies in intelligence, integration, and flexibility”

### From Mechanical Excellence to System Intelligence

The evolution of converting machinery has historically been driven by improvements in mechanical engineering and control systems. In sheeting technology, developments such as high-precision knife systems, synchronized cutting units, and advanced stacking solutions have significantly improved output quality and consistency. In winding operations, innovations in tension control, slitting accuracy, and reel handling have ensured high-quality end products with minimal defects.

These advancements have enabled mills, converters and printers to reach very high levels of performance. Format change times, which once required 15–20 minutes, can now be reduced to just a few minutes in highly automated sheeters.



**Image 1: Cross cut section with electronically driven control system.**

Similarly, winding systems have achieved remarkable stability, even when processing challenging substrates such as lightweight or recycled papers.

However, these improvements have also led to a certain maturity in terms of purely mechanical performance. While further optimization is always possible, the most significant opportunities for progress now lie beyond the machine itself.

The focus is shifting from individual machine performance to system-wide intelligence. This means not only improving how each machine operates, but also enhancing how machines communicate, exchange data, and contribute to overall production efficiency.

For example, a modern sheeting line is no longer an isolated unit. It is part of a broader production environment that includes upstream processes such as paper production and downstream operations such as packaging and logistics. The ability of the sheeter to interact with these processes—adjusting its operation based on real-time conditions—becomes a key factor in overall performance.



**Image 2: (Above) Decurling process prior to slitting, digitally driven.**

**Image 3: (Right) Automatic loading and unloading of reels**



### Automation: From Execution to Autonomous Performance

Automation has long been a cornerstone of productivity in paper converting. From automatic knife positioning and format change systems in sheeters to advanced tension control and reel handling systems in winders, automation has significantly reduced manual intervention and improved process consistency.

However, the next decade will see a fundamental shift in the role of automation.

Traditionally, automation systems have been designed to execute predefined sequences with high precision. While this approach is effective under stable conditions, it becomes less efficient in environments characterized by variability and frequent changes.

The new generation of automation systems is moving towards greater autonomy. Machines are increasingly capable of adjusting their behavior dynamically based on real-time process data and external inputs.

#### In practical terms, this evolution includes:

- Automatic optimization of slitting and cutting configurations based on substrate characteristics
- Real-time adjustment of machine parameters to maintain quality and efficiency
- Synchronization between different sections of the converting line
- Self-diagnostic systems with guided troubleshooting

For instance, in advanced sheeting lines, automation enables full coordination between unwinding, cutting, and stacking sections. This ensures that variations in reel quality or material properties are compensated automatically, maintaining consistent sheet quality even at high production speeds.

Similarly, in winding operations, modern control systems continuously monitor tension, reel geometry, and material behavior, adjusting parameters in real time to ensure optimal reel formation. This is particularly important when processing new-generation materials, which may exhibit greater variability.

At Pasaban, automation is developed with a strong focus on usability and reliability. As Muriel explains: “Automation must not only increase performance, but also simplify the operator’s role. The goal is to create systems that are intuitive, transparent, and easy to manage, even in complex production environments.”

This approach is essential in a context where skilled operators are increasingly difficult to find. By reducing dependence on manual adjustments and providing clear system feedback, advanced automation helps ensure consistent results across different operating conditions.

Organizations must invest in equipment capable of integrating advanced features that help make the operator’s role a less critical factor than it was in machines of the past, where personal expertise was essential.

This is not about diminishing the value of the operator’s experience, but rather about enabling operators to dedicate time to other value-added tasks within their organization. It also allows another person to replace them relatively quickly in the event of absence or leave, without causing major operational difficulties for the company.

This is also closely linked to workforce turnover and the changing values of newer generations. Therefore, as machine manufacturers, PASABAN has the responsibility to develop practical and efficient solutions that support the owners of our machines in addressing these new operational realities.

From PASABAN’s perspective, such limitations ultimately represent a loss of opportunity — in other words, production capacity and efficiency that could have been achieved if the right decision had been made from the beginning.

Having said the above, Muriel states “the purchasing decision becomes a far more complex equation in which price will always remain a relevant factor, but the other aspects already mentioned are also extremely important considerations. These factors can generate either significant benefits or important limitations throughout the lifetime of the equipment if they are not properly considered”.

## Artificial Intelligence: From Data to Value

If automation defines how machines operate, artificial intelligence defines how they learn, adapt, and improve.

Modern converting lines generate vast amounts of data. Every aspect of the process—speed, tension, temperature, vibration, cutting parameters, and more—is continuously monitored. Historically, much of this data has been used only for basic monitoring or troubleshooting purposes.

Today, AI technologies are enabling a much more advanced use of this information.

One of the most immediate and impactful applications of AI is predictive maintenance. By analysing historical data and identifying patterns associated with wear or failure, AI systems can anticipate potential issues before they occur. This allows maintenance activities to be planned proactively, reducing unplanned downtime and improving overall equipment effectiveness.

### Beyond maintenance, AI can significantly enhance process optimisation. For example:

- Identifying optimal operating conditions for different substrates
- Detecting subtle deviations that may affect product quality
- Recommending parameter adjustments to improve efficiency
- Reducing waste through better process control

In sheeting operations, AI can be used to optimize cutting strategies, minimize trim loss, and improve stack quality. By analyzing production data over time, systems can learn which configurations deliver the best results under specific conditions.

In winding processes, AI can improve tension control strategies, ensuring more consistent reel structure and reducing defects such as wrinkles, telescoping, or edge damage.

Perhaps most importantly, AI enables a shift from reactive to predictive and even prescriptive operations. Instead of responding to problems after they occur, systems can anticipate them and either recommend or automatically implement corrective actions.

Muriel highlights this transformation: “The real value of AI is not just in analyzing data, but in transforming it into actionable knowledge. It allows us to move towards more intelligent, data-driven operations that improve both efficiency and reliability.”

However, the adoption of AI also presents challenges. Data standardisation, system integration, and cybersecurity are key considerations. Additionally, companies must ensure that AI applications deliver clear and measurable benefits.

### Flexibility: The Core Requirement of Modern Converting

While automation and AI are powerful enablers, flexibility is arguably the most critical requirement in today's converting environment.

Market dynamics are evolving rapidly. The growth of e-commerce, changes in packaging formats, and increasing demand for customised products are driving a shift towards shorter production runs and greater variability. At the same time, sustainability trends are introducing new materials, including recycled and lightweight substrates, which can be more challenging to process.



**Image 4: Electric cabinets for automation control.**

### In this context, converting lines must be capable of:

- Processing a wide range of materials with different characteristics
- Switching quickly between production orders
- Maintaining consistent quality across varying conditions
- Adapting to future requirements without major modifications

Flexibility must be built into every aspect of the system—from mechanical design to control architecture.

In sheeting lines, this may involve modular configurations that allow different cutting and stacking options, as well as fast and automated format change systems. In winders,

flexibility may require adaptable slitting systems and advanced control strategies capable of handling different substrate behaviors.

A key enabler of flexibility is the use of open and scalable systems. Rather than relying on closed, proprietary solutions, converters increasingly demand equipment that can be integrated into broader production environments and adapted over time.

At Pasaban, this philosophy is central to our approach. As Muriel explains: “Flexibility is not just about handling different products—it is about being prepared for the future. Our systems are designed to evolve with our customers' needs.”

### Integration: Connecting Machines, Data, and Processes

While automation, AI, and flexibility are essential, their true value can only be realized through integration.

The converting line of the future is part of a connected ecosystem in which machines, software systems, and human operators interact seamlessly.



**Image 5: Slitting section with automatic positioning.**

### This requires integration at multiple levels:

- Between different machines within the converting line
- Between converting equipment and factory management systems (MES, ERP)
- Between production data and decision-making processes

For example, a sheeting line may receive production orders directly from an MES system, automatically configure itself, and provide real-time feedback on performance and quality. Similarly, winding operations may be synchronized with upstream and downstream processes to optimize material flow and reduce bottlenecks.

Integration also enables advanced analytics and continuous improvement. By collecting and analyzing data from multiple sources, companies can identify trends, optimize processes, and improve overall efficiency.

Achieving this level of integration requires not only advanced technology, but also collaboration between equipment manufacturers, converters, and software providers.

### Implications for Converters

The transition towards intelligent and flexible converting operations has important implications for converters.

Investment decisions must go beyond immediate performance considerations and take into account long-term adaptability. Equipment should be evaluated based on its scalability, openness, and compatibility with future technologies.

Data management becomes a strategic capability. Companies must develop the ability to collect, structure, and analyze data effectively, turning it into actionable insights.

Workforce skills must also evolve. Operators and technicians will need to interact with more advanced systems, requiring training in digital tools and data interpretation.

Finally, strong partnerships with technology providers become essential. As systems become more complex, the ability to rely on experienced partners is a key factor for success.

**Image 6: (Below) Remote connection for technical issues.**

**Image 7: (Below Right) High precision design and commissioning**

### Practical Applications: Bringing Intelligence to Real Converting Environments

While the concepts of automation, artificial intelligence, and flexibility are often discussed at a theoretical level, their real value becomes evident when applied to day-to-day converting operations.

In sheeting processes, for example, the combination of advanced automation and data analysis is already enabling significant improvements in productivity and quality. Modern sheeters can automatically adjust knife positioning, cutting speeds, and stacking parameters based on production requirements and material characteristics. When this is combined with data monitoring and analysis, it becomes possible to identify patterns that affect performance—such as variations in reel quality or environmental conditions—and compensate for them proactively.

Many aspects related to efficiency that were previously not even questioned and were handled through operational adjustments — requiring a certain amount of setup time with the machine stopped or running at limited speed — are now being analyzed in depth.

Through extensive programming and automation taken to the highest level, the machine availability time is maximized, and downtime is reduced to the minimum possible.

Parameters and operational settings are now optimized automatically to ensure the highest productivity and efficiency.

In practical terms, this means fewer interruptions, more stable production, and improved consistency in sheet quality. Operators are supported by systems that provide clear information and recommendations, reducing the risk of human error and improving overall efficiency.

Similarly, in winding operations, intelligent control systems are transforming how reels are produced. By continuously monitoring parameters such as tension, nip pressure, and reel geometry, modern winders can adjust their behavior in real time to ensure optimal reel structure. This is particularly important when processing recycled or lightweight materials, which tend to exhibit greater variability.

The integration of data analytics further enhances these capabilities. By analyzing historical production data, it is possible to identify optimal operating conditions for different materials and applications, reducing trial-and-error adjustments and improving reproducibility.





**Image 8: CL-165 Sheeter: Modular design for a cost-effective solution**

### Pasaban's Vision: Partnering for the Future

At Pasaban, we have spent decades developing high-precision sheeters and winders for a wide range of applications, including paper, board, banknote and security paper and pulp. This experience has given us a deep understanding of our customers' needs and the challenges they face.

Today, our focus is on supporting our customers in their transition towards more intelligent, flexible, and sustainable operations. Our machines are designed with open architectures, advanced automation, and user-friendly interfaces, ensuring high performance, minimum waste and ease of integration.

We are also actively exploring the integration of AI and advanced analytics into our systems, with the aim of providing new tools for process optimization and decision-making.

Muriel summarizes this approach: "Our role is not only to provide machines, but to support our customers in their evolution. "We aim to be a long-term partner, helping them adapt to a changing environment and remain competitive"

### Conclusion: From Machines to Intelligent Ecosystems

The next decade will redefine the paper and board converting industry.

Automation will evolve towards greater autonomy. Artificial intelligence will transform data into knowledge. Flexibility will become a fundamental requirement.

However, the real transformation will come from the integration of these elements into intelligent, connected ecosystems.

For mills, converters and packagers, this represents both a challenge and an opportunity. Those who embrace this transformation will be better positioned to compete in an increasingly complex and demanding market.

As Muriel concludes: "The future of converting is not only about producing more—it is about producing smarter, with greater adaptability and a deeper understanding of the process. That is where the real value lies.

As Muriel explains: "What we are seeing is a transition from reactive operation to controlled and optimized processes. The machine becomes a tool that supports the operator, rather than depending entirely on their experience."

These developments are not limited to high-end installations. As technology evolves, many of these capabilities are becoming more accessible, allowing a wider range of converters to benefit from intelligent systems.

### Sustainability and Efficiency: Two Sides of the Same Coin

Sustainability has become a central topic in the paper and board industry, influencing not only material choices but also production processes and investment decisions.

In this context, automation and artificial intelligence play a crucial role. While their primary objective is often to improve efficiency, they also contribute directly to reducing environmental impact.

For example, optimized cutting strategies in sheeting processes can significantly reduce trim waste, improving material utilization. Similarly, more precise control of winding parameters can reduce the number of defective reels, minimizing waste and reprocessing.

Energy efficiency is another important aspect. By optimizing machine operation and reducing unnecessary stops and adjustments, advanced automation systems help lower energy consumption. AI-driven optimization can further enhance this by identifying the most efficient operating conditions.

At the same time, the ability to process a wider range of materials—including recycled and lightweight substrates—supports the industry's transition towards more sustainable products.

Muriel highlights this connection: "Efficiency and sustainability are closely linked. By improving our processes and reducing waste, we are not only increasing competitiveness but also contributing to a more sustainable industry."

This alignment between operational performance and environmental responsibility is becoming a key factor in decision-making across the sector.



**Image 9: High precision manufacturing processes.**