

IPM: automated packaging systems in extrusion lines

IPM unveils an automated packaging system for PVC, PE, and PP pipes that transforms extrusion lines through robotics and artificial intelligence. The solution aims to boost efficiency, safety, and sustainability by seamlessly integrating human labor with advanced automation.



While highly automated, the system is designed for collaboration rather than replacement. The optimal scenario remains one in which human operators and intelligent machines work side by side, leveraging their respective strengths.

Detailed functional overview

The featured system offers full automation of the pipe palletizing and packaging process, with a particular focus on safety, customization, and modularity. Specific capabilities include:

- Automated tube handling: pipes are collected directly from the extrusion line. Parameters such as diameter, number of layers, offset alignment, and socket orientation are configurable. Non-compliant tubes are automatically ejected. A rotational locking mechanism ensures safe han-

IPM, specialized in extrusion technology, has developed an advanced automated packaging plant designed for compact and corrugated PVC, PE, and PP pipes with outer diameters up to 800 mm. This system marks a significant industry milestone, offering a comprehensive solution to the challenges of labor shortages, workforce safety, and process inefficiencies.

Capable of replicating and, in many cases, surpassing human performance in terms of precision, speed, and durability, the system automates repetitive, heavy, and potentially hazardous tasks. In doing so, it addresses critical pain points shared across the global extrusion sector, where the demand for fully automated end-line solutions continues to grow.

These are the core drivers that led IPM to invest in the research and development of this new generation of packaging systems. The outcome is a complex, high-performance automation platform integrating robotics, artificial intelligence (AI), advanced imaging, and sensor technologies.

Key system capabilities

The IPM packaging system is composed of multiple machine-robot units orchestrated by AI-driven software. Its principal features include:

- Computer vision & object recognition: high-resolution cameras and sensors allow the system to identify and classify pipes in real time.
- Fully automated process flow: the system per-



forms pipe selection, assembly, inspection, and packaging with minimal human intervention.

- Scalability: designed to function efficiently across increasingly large production areas, ensuring high throughput and operational consistency.
- Smart quality control: each item is individually inspected, with defective or non-compliant components automatically rejected.
- Predictive analytics & machine learning: continuous monitoring and self-optimization capabilities reduce downtime, enhance reliability, and lower operational costs.

dling at all stages.

- Intelligent frame placement: a robotic unit, guided by AI, identifies and handles wooden frames of pre-defined dimensions. It places them precisely into preset guides on the pallet trolley. Frames not conforming to dimensional tolerances are automatically discarded.
- Spacer insertion (optional): upon request, polystyrene spacers can be inserted between tube layers to improve transport stability. The number, size, and placement of spacers are fully customizable.
- Final palletization & securing: an anthropo-

IDENTITY CARD

Name: Automated Packaging Plant in Extrusion Line for Compact and Corrugated PVC, PE and PP Pipes

Manufacturer: IPM S.r.l.

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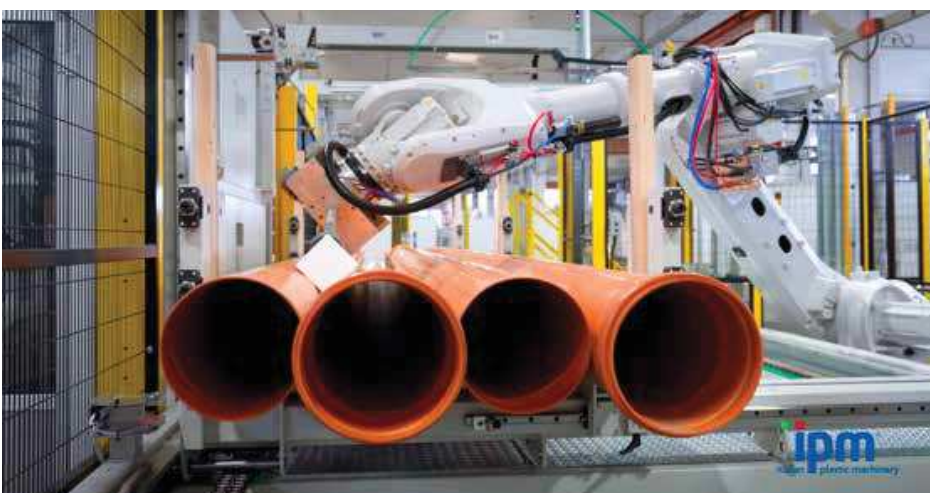
Website: www.ipm-italy.it

Model: APP 800

Maximum Outer Diameter: 800 mm

The packaging systems designed and manufactured by IPM can be fully customized to meet specific production requirements and seamlessly adapt to the layout and constraints of any industrial facility.





morphic robot arm positions the top wooden strip. Strapping and nailing are then carried out automatically, resulting in a fully secured and stable pallet, ready for automated transport to the warehouse.

- Custom layouts & flexibility: all IPM packaging systems are modular and can be tailored to suit specific production layouts, volumes, and process requirements.

Case study: end-line automation for polypropylene pipes: centralized packaging station for PP pipes from six extrusion lines

To meet the complex requirements of high-volume polypropylene (PP) pipe production, IPM has implemented a centralized packaging station capable of handling pipes of variable lengths and diameters originating from six different extrusion lines. Key features include:

- Space optimization: the system maximizes the use of available floor space, both vertically and longitudinally.
- Integrated automation: sorting and packaging processes are centralized and fully automated, drastically reducing manual handling and associated risks.
- Versatile packaging: pipes are sorted and packed into cardboard boxes of varying sizes or

directly palletized, based on production needs.

Technological innovation: why automation is no longer optional

The increasing global demand for automated end-of-line solutions stems from multiple operational drivers:

- Labor shortages: automation addresses critical labor availability issues by performing essential tasks with high consistency and minimal super-

vision.

- Workplace safety: machines relieve operators from physically demanding or hazardous work, significantly reducing workplace injuries.
- 24/7 productivity: unlike human labor, robotic systems can operate continuously without fatigue, ensuring high output and process continuity.
- Enhanced accuracy: AI-driven systems perform tasks with higher precision and repeatability, particularly in object detection, classification, and quality control.

Robots and AI: enabling the factory of the future

Modern industrial robots, enhanced by AI, are increasingly capable of performing tasks traditionally handled by skilled operators. With continuous improvements in:

- Image recognition & classification
- Sensor accuracy
- Real-time decision making
- Remote monitoring & diagnostics

These systems have evolved into critical components of smart manufacturing plants.

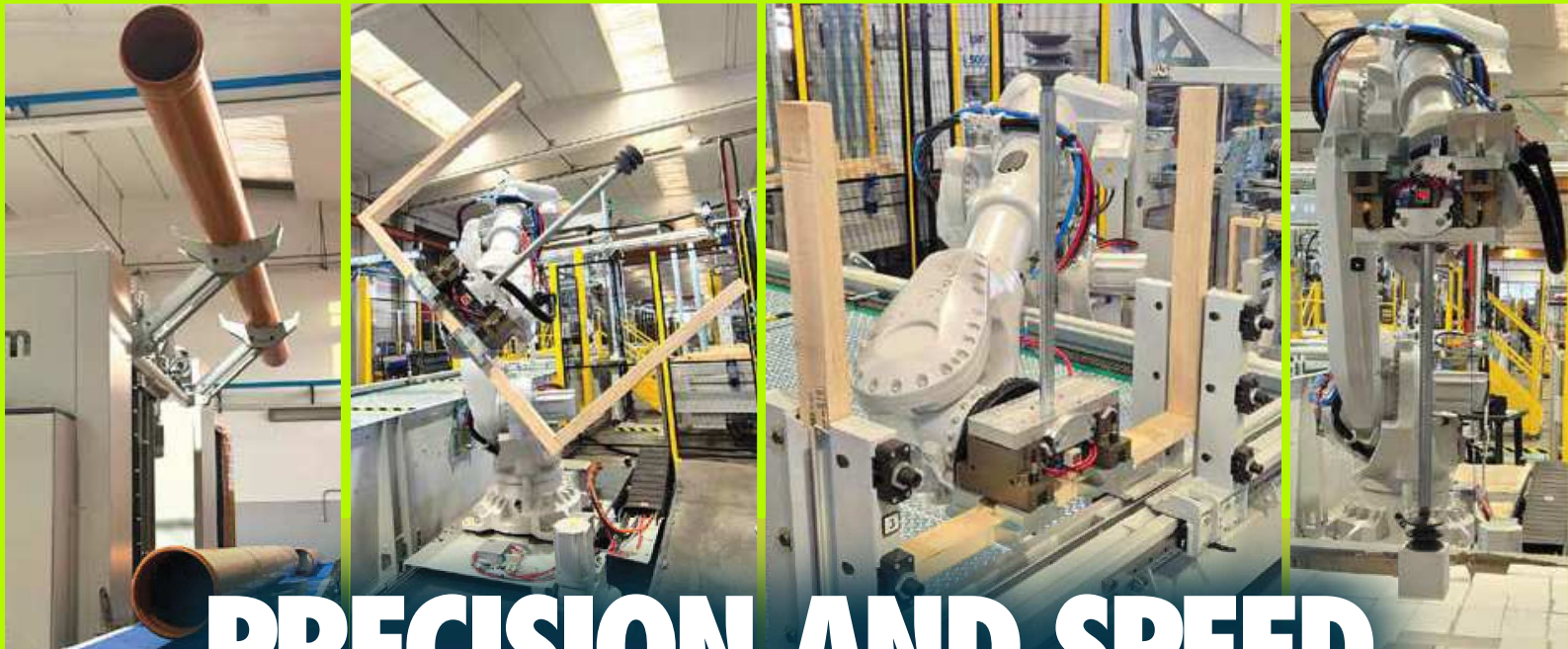
However, the vision is not to replace human workers entirely, but to integrate robotic systems into collaborative work environments. This human-machine synergy ensures both productivity and flexibility, combining human intuition and oversight with the precision and endurance of automation.

The advancement of automated packaging systems in extrusion lines represents a pivotal shift for the plastics industry. With AI, robotics, and predictive analytics now at the core of production, companies like IPM are not only enhancing efficiency and safety but also laying the groundwork for the next generation of smart factories. These technologies do not merely automate, they transform. As extrusion plants worldwide adapt to changing labor markets and increasing demand, fully integrated, intelligent packaging systems will become essential to maintaining competitiveness and operational excellence.

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