Revolutionizing Lamination: IOCCO Sets a New Standard with Vacuum Bag Technology

The automotive glass sector is experiencing significant growth, driven by increasingly stringent safety regulations, the spread of electric and premium vehicles as well as demand for comfort and sustainability. In an industry characterised by growing cost pressures and an increasingly complex market, IOCCO has recently achieved a milestone that is truly revolutionising the world of automotive glass de-airing and lamination. This achievement is the result of more than two years of intensive research and development, during which the company has integrated advanced digital twin technologies and powerful artificial intelligence algorithms, radically optimising the operating parameters of the Vacuum Bag Furnace (VBF).

AUTOMOTIVE GLASS MARKET TRENDS

The global automotive glass market is estimated at USD 36.48 billion in 2024 and is expected to reach USD 48.02 billion by 2034 (Grand View Research), with a compound annual growth rate (CAGR) of 4.5 percent. The segments driving this growth include:

- Smart glass (electrochromic, PDLC, SPD): compound annual growth of 12.8 percent until 2030, driven by light modulation, privacy and display integration features.
- Panoramic roofs and sunroofs: CAGR of 10.2 percent until 2030, thanks to adoption in premium and electric vehicles to improve aesthetics and interior lighting.

The main market drivers include:

1. Safety regulations and ADAS: the requirement for laminated windshields and shatter-resistant glass is increasing demand for high-performance glass.
2. Lightweighting: thin multilayer glass reduces weight, improving EV range and reducing emissions.
3. Electrification and thermal comfort: large glass surfaces with thermal coatings limit the cooling load, optimising electricity consumption.
4. Flexible and just-in-time supply chain: OEMs require suppliers capable of handling variable batches and fast deliveries to minimise inventory and storage costs.

This market environment requires technologies that combine high performance, energy efficiency and opera-

In today's volatile automotive glass market, IOCCO's Vacuum Bag Furnace stands out as the only truly viable solution, proven through tangible results. Combining outstanding stability, resilience, and economic sustainability with AI, digital twin technology and advanced automation, it revolutionises de-airing and lamination – delivering superior efficiency, energy savings, and unmatched flexibility to meet the industry's evolving demands.

tional flexibility.

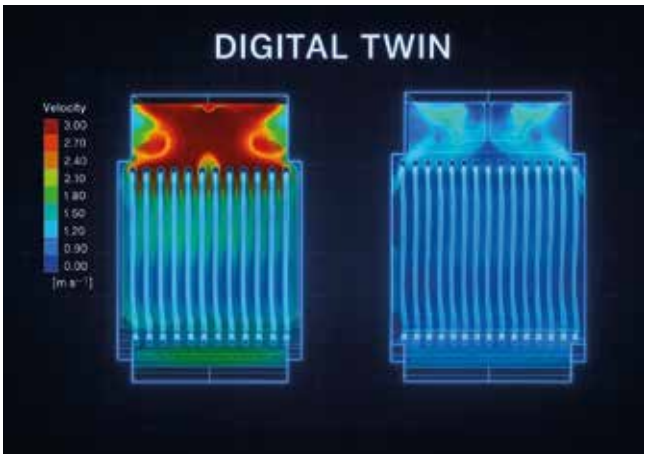
VACUUM BAG FURNACE TECHNOLOGY: THE IOCCO SOLUTION

To respond to these trends, IOCCO has transformed its VBF by integrating:

- Digital twin and AI: continuous monitoring of five plants operating at 100 percent production capacity (windshields and moonroofs) for six months, with parameter optimization leading to a 30-35 percent reduction in energy consumption.
- Advanced automation: user-friendly interface and almost fully automated processes, drastically reducing labour dependency and ensuring significant cost savings.
- Backup devices: backup devices in critical areas of the thermodynamic process to ensure operational continuity and resilience in the event of anomalies.
- Intelligent software: support for operators during setup with suggestions for optimal parameters and automatic interventions to recalculate settings and maintain the set process curve.

These innovations make IOCCO's VBF an extremely reliable, efficient and flexible system, capable of handling complex lamination cycles, from ultra-thin multilayer glass to smart glass with integrated sensors.

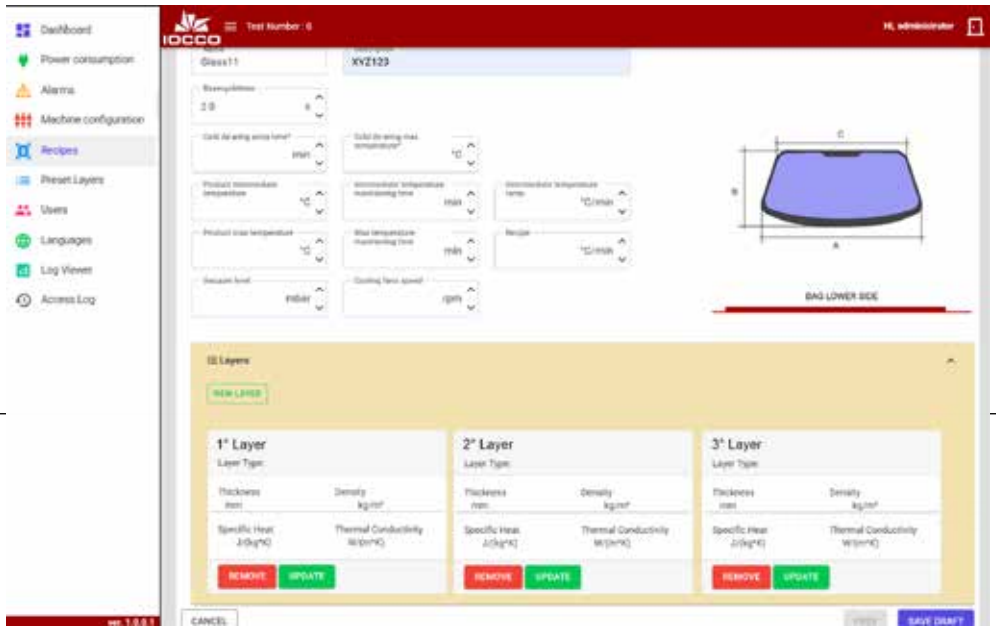
Thanks to this combination, IOCCO has been able to radically optimise the operating parameters of the Vacuum Bag Furnace (VBF), leading to a reduction in energy consumption of around 35 percent and labour costs of around 80 percent compared to previous versions. This has been certified by an analysis carried out by monitoring five plants operating at 100 percent production capacity, dedicated to the production of windshields and sunroofs, for a continuous period of six months. This result was



achieved not only through the technical optimisation of the process parameters, but also thanks to the system's extreme ease of use and the drastic reduction in labour dependency, which converts into enormous economic savings resulting from the total automation of the process, ensuring stable, repeatable operation that is immune to the variability typical of manual operations.

The new VBF also stands out for the presence of backup devices in the most critical areas of the thermodynamic process, which ensure operational continuity and exceptional resilience even in the event of anomalies.

Another key element of this evolution is the intelligent



software developed by IOCCO, which guides operators during setup, suggests the optimal thermodynamic parameters based on the characteristics of the glass to be laminated and, above all, intervenes automatically in the event of anomalies, recalculating and applying new parameters to ensure compliance with the initially set process curve.
The Vacuum Bag Furnace (VBF) is a concrete advancement toward a sustainable, intelligent, and human-centric production model, perfectly aligned with the principles of Industry 5.0 and the growing demands for Environmental, Social, and Governance (ESG) performance.

THE VACUUM BAG FURNACE

The Vacuum Bag Furnace comes as an immediate response to the technological developments required by regulations and automotive manufacturers. IOCCO's Vacuum Bag Furnace currently stands out conspicuously as a solution that allows laminated glass manufacturers to anticipate and quickly meet all new technological specifications imposed by regulations and car manufacturers with competitive advantages.
Thanks to this technology, it is possible to meet, without compromise, the market trends in automotive glass, which see the production of ultra-thin multilayer glass, with laminations that include PDLC (Polymer Dispersed Liquid Crystal), PVB, SPD, XIR and EVA: components that are now central to strategies for reducing vehicle weight, increasing passenger safety and comfort, and improving performance in terms of solar shading.

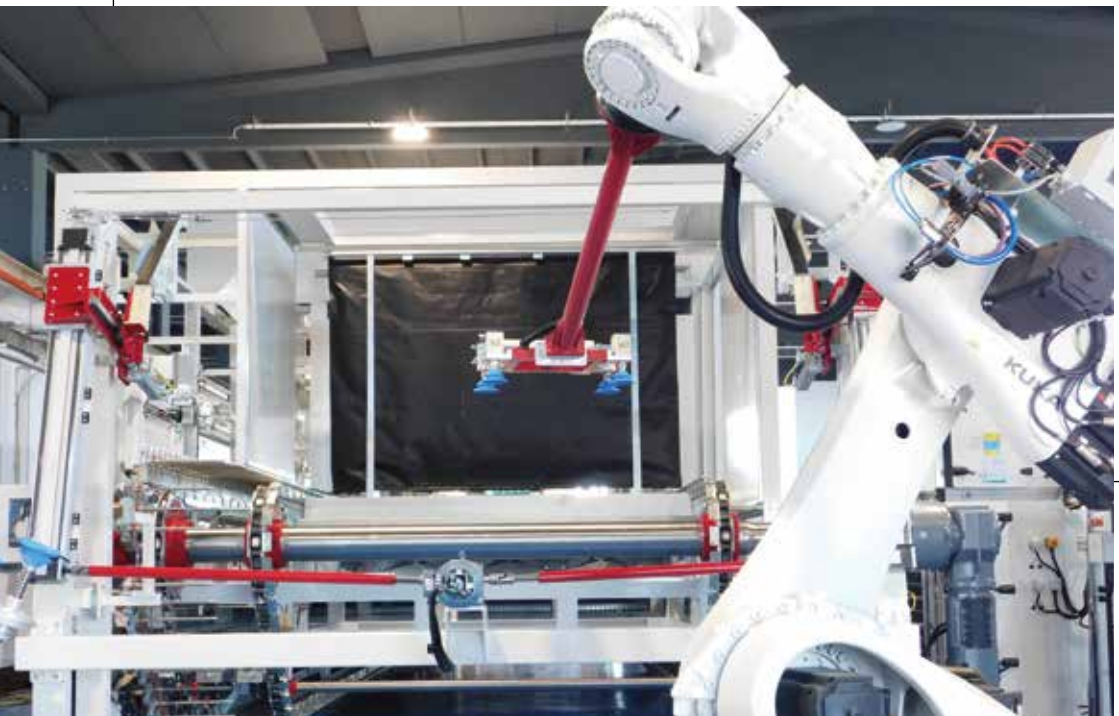
The Vacuum Bag Furnace, with its extremely stable, automated and flexible process, is therefore the ideal partner for addressing market trends that aim to reduce weight, increase passenger safety and comfort, and reduce internal thermal loads, thereby optimising the energy efficiency of vehicles. These are key factors that contribute to significantly extending the range of modern electric and hybrid vehicles, while ensuring the ability to respond quickly and competitively to the ongoing challenges of the automotive industry.

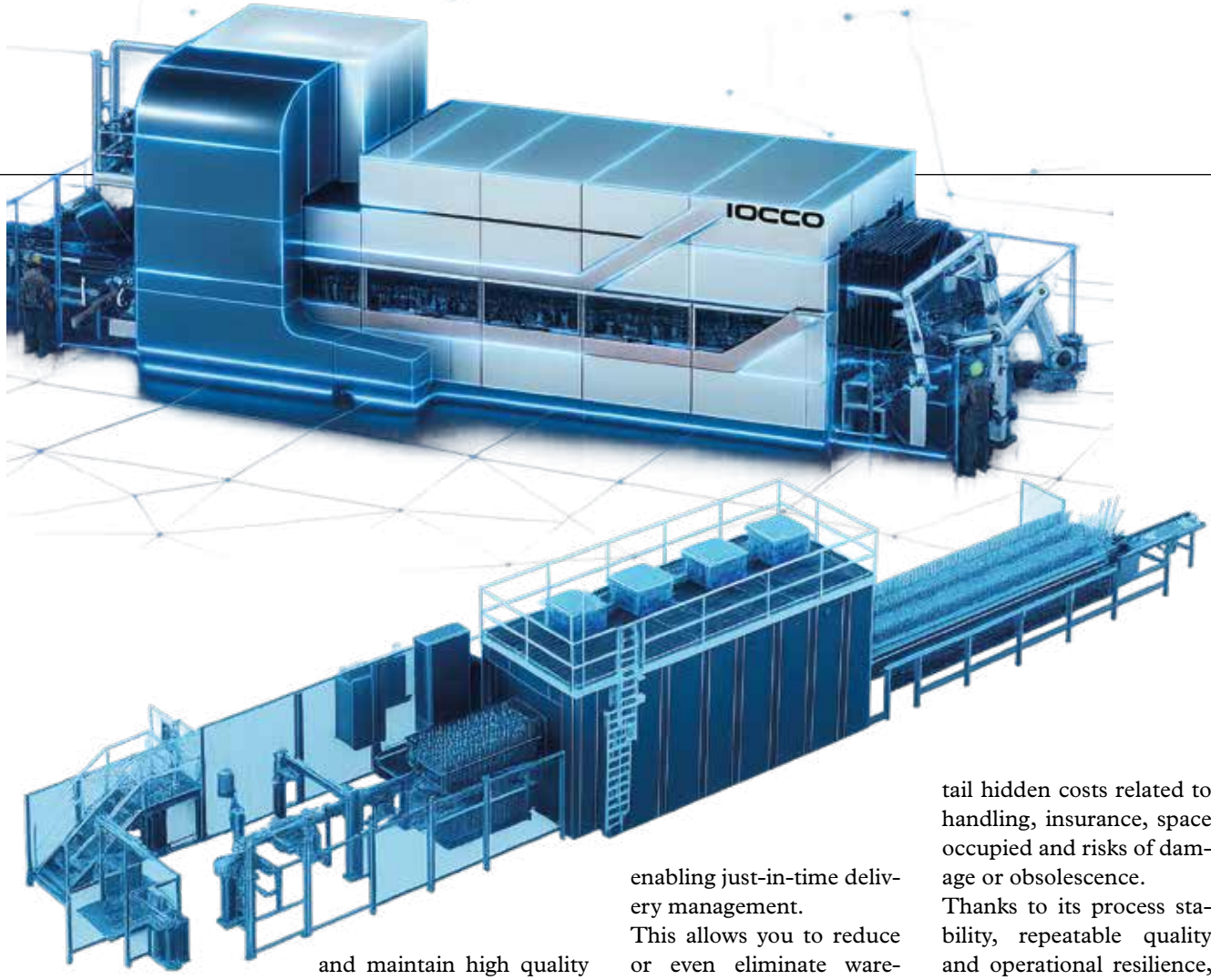
VACUUM BAG FURNACE VS VACUUM RING FURNACE: THE FUTURE OF AUTOMOTIVE LAMINATION IS ALREADY WRITTEN

In a direct comparison between the Bag Furnace and the Ring Furnace, the verdict is becoming increasingly clear: the Bag Furnace is a winning technology that's truly capable of meeting the needs of an industry which is looking for increasingly lighter, more complex and higher-performance glass. The Ring Furnace, on the other hand, remains anchored to traditional production methods, with higher operating costs, less flexibility and quality that is heavily dependent on labour, all of which make it increasingly uncompetitive in the current scenario.
The indicators confirm this: significantly faster return on investment, lower unit product costs from the very first production cycles and a unique ability to support just-in-time strategies that eliminate the need for costly inventory. In a global market where every percentage point of efficiency can mean the difference between success and failure, the Ring Furnace appears to be a technology of the past, destined to give way to advanced solutions such as the Bag Furnace, designed to ensure efficiency, resilience and competitiveness in an increasingly selective industry.

TWO BREAK-EVEN POINTS THAT SPEAK FOR THEMSELVES

Simulations based on a 20-year operating projection conducted by IOCCO highlight two crucial aspects: the first break-even point, relating to the total cumulative cost of the investment, shows how the VBF compensates for the higher initial CAPEX after just a few years, guaranteeing net savings over time compared to traditional VRF solutions. The second, referring to the average cost per single laminated glass produced, shows how VBF manages





to maintain a significantly lower unit cost right from the start, thanks to its superior efficiency and intelligent process management capabilities. The two graphs below show the two curves referring to the bag furnace and ring furnace, where the break-even point is clearly visible on the first and the product cost over 20 years on the second. It should be noted that the input data are deliberately conservative.

JUST-IN-TIME MANAGEMENT AND STOCK REDUCTION: A DIRECT COMPETITIVE ADVANTAGE

In a context that rewards flexibility, the ability to manage variable batches and maintain high quality standards, choosing IOCCO's VBF means investing in a system that also transforms production logistics, enabling just-in-time delivery management.

This allows you to reduce or even eliminate warehouse stock, avoiding tying up capital in finished products, which would entail hidden costs related to handling, insurance, space occupied and risks of damage or obsolescence.

Thanks to its process stability, repeatable quality and operational resilience, VBF allows you to produce to order with the certainty of meeting deadlines and specifications, drastically reducing safety buffers and freeing up liquidity for strategic investments. In such a complex market, this is indeed a most viable path for those who want to consolidate margins and competitiveness in the long term.