Towards environmental optimisation: IRIS shifts glass inspection paradigm

As was recently explained at ASEAN Glass' 45th Conference by Asia Technical Support Manager for IRIS Inspection Machines Asia Alexandre Tan, inspection was seldom highlighted as a linchpin of decarbonization within the world of glass manufacturing – until artificial intelligence quickly proved itself a game changer in the area.

A transformative technology, AI is not merely refining inspection processes. More significantly, it is orchestrating its own 'strategic dance' by which waste is being minimised while the carbon footprint of glass production is diminishing. The imperative to enhance environmental performance within the industry extends beyond commercial success - likewise resonating with the crucial need to conserve energy and curtail emissions. Non-saleable glassware, which is notoriously wasteful in time, money and resource terms -not to mention raw materials and energy- underscores the pivotal role of production efficiency. Here the metric of choice for efficiency assessment is the pack-to-melt ratio, widely embraced by glass manufacturers as the quintessential measure in refining environmental impact - whether the power source be renewable or finite. The entire glassmaking process from quarrying and raw material supply to batch mixing, melting, forming, transportation, pack-

ing and inspection generates carbon emissions. While it may seem that inspection machines indirectly contribute these emissions through electricity consumption -as compared to the hot end- further investigation shows a potential to catalyse decarbonization throughout the entire production process.

THE COLD END: PRECISION IN DEFECT REJECTION

Refinement in inspection processes goes beyond a mere superficial enhancement of reject rates. Instead it translates to a meticulous rejection mechanism - elevating the pack-to-melt ratio. This, in turn, facilitates swift responses at the hot end, the primary CO2 emitter - thereby enabling source-level rejection reductions. Here precision in rejection, driven by improved communication with the hot end, ensures that only bottles that meet the specifications will reach customers. It simultaneously accelerates changes at the hot end - resulting in the production of fewer unsaleable bottles from the outset. While the industry once prided itself in reusing factory cullet, false rejections impose the need to melt glass twice in order to produce a single flawless bottle. Nuances in the market further complicate the imperfection tolerance equation. Industries with stringent cosmetic quality requirements, such as perfumes, naturally expect higher rejection rates in comparison with sectors like food and beverages. Here, for IRIS, eliminating false rejection comes as a key objective as the company sets its sights on leveraging artificial intelligence to overcome such challenges.

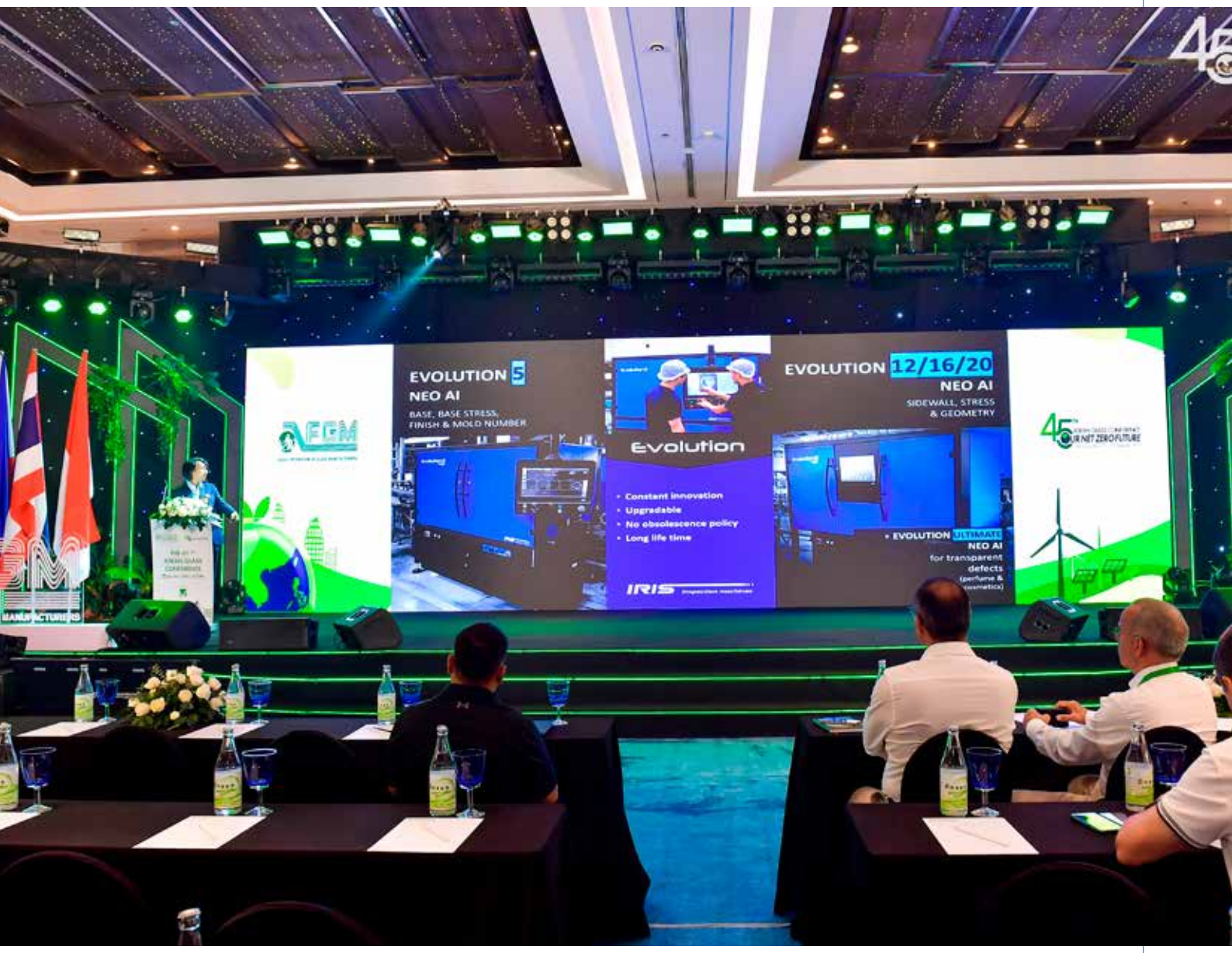
GLASS INSPECTION AND THE WONDERS OF AI

A stalwart in AI integration within its systems, IRIS has been at the vanguard of its development since 2018. Indeed the company's foray into empowering its technology through 'learning capacity' has masterfully revealed the intricate workings of the human brain. With its ability to discern critical defects from imperfections, AI assumes the role of a discerning glass expert - with ramifications extending beyond productivity and quality to a more subtle impact upon the energy footprint of glassmaking.

AI-driven inspection introduces a richer classification of defects, discernment of critical defects, a calibrated tolerance for acceptable blemishes and a significant reduction in false rejections - all accompanied by expedited corrective actions. Besides, the precision achieved by AI in defect identification stands in stark contrast to the legacy approach that had inspection machines lumping together various defects under a single rejection rate.

THE EVOLUTION OF IBOT: PINNACLE OF AI INTEGRATION

With R&D endeavours at IRIS delving deeper into the glass manufacturing process, their culmination has been the creation of iBot - an intuitive tool tailored to offer ultra-comprehensive analysis for operators and managers across hot-end, cold-end and quality control teams. iBot transcends the capabilities of conventional Manufacturing Execution Systems (MES), providing real-time predictions of process defects as well as immediate communication with hot-end leaders and operatives for corrective action. iBot's prowess lies in its ability to assimilate data from all Evolution machines connected to it, encompassing adjustment parameters and measured values for each inspected bottle. This



real-time processing equips iBot to offer adjustment priorities for each machine while prioritising the main defects. Yet beyond mere defect identification, iBot identifies production drifts section by section - facilitating proactive corrective actions as it averts critical limits and rejection. Here iBot essentially harnesses the full potential of AI to deliver exceptionally-detailed analyses, repeatability, accuracy, predictions of drifts and systemic defects, as well as accurate information regarding defect origin and criticality. Its seamless setup ensures swift adaptability for job changes - making it a potent tool for monitoring performance and effecting prompt changes.

Indeed comprehensive AI deployment translates into error prevention - signalling a boost in the pack-to-melt ratio whilst offering critical insights for future manufacturing and conservation of energy, effort and resources - all to enhance productivity ultimately. Recognizing the pivotal role of inspection in the industry, IRIS remains confident that reducing rejection rates as a high pack-to-melt ratio is maintained will positively impact the carbon footprint of the glass industry - and profoundly at that. ■