

Swabbing on the run

All four high speed tandem IS machines at Ardagh's Moerdijk glass container plant near Rotterdam have been equipped with specially developed robots to perform essential mould swabbing duties. The Ardagh Glass project team responsible for this innovative technology has worked closely with Heye International and robotics specialist Socabelec to create a system that provides significant productivity and cost saving benefits.

Dutch glassmakers have long been at the forefront of technological developments that optimise production efficiencies and maximise the industry's profitability. And among the latest examples of the innovative skills employed by Ardagh Glass personnel at the company's Moerdijk site is the development of a robotic solution to the previously manual task of mould swabbing.

Since starting production in 1998, the plant at Moerdijk has focused on the high volume manufacture of beer bottles. Today, the plant is owned by Ardagh Glass and is one of two factories operated by the diversified international packaging group in the Netherlands.

The original plant featured one melting furnace and two high speed production lines. In 2009, a second furnace and two more lines were added. Their combined manufacturing capacity is 640 tonnes/day. NNPB beer bottles are produced in a green composition, in five capacities from 207ml to 710ml.

Just under 200 people are employed at Moerdijk, where production efficiencies of better than 93% are standard. All four lines are equipped with 10-section tandem double gob Heye IS machines with 5in centre distances, involving 160 cavities in total. Apart from minor differences in terms of take-outs etc employed, these are four identical lines. All machines are equipped with Heye servo pushers and two lines feature Heye servo take-outs. At the cold end, state-of-the-art automated inspection and packing equipment is employed

throughout. There is a constant flow of trucks to collect and deliver palletised loads of bottles to the local customer, with comparatively limited stocks maintained at the factory's warehouse.

OPERATIONAL EXCELLENCE

The swabbing robot initiative became the subject of evaluation at Moerdijk in 2011. With its high production volumes and minimal job changes, the factory was considered an ideal location to test and prove the effectiveness of robot-administered swabbing lubricants.

Ardagh Glass had been assessing the benefits of using funnels with oil lubricants every third cycle, before the engineering team started to consider the use of robots. Furthermore, the equipment's potential to undertake other glass forming-related tasks, including changing moulds and blanks was recognised as being worthy of detailed assessment.

The project team led by Bernard

Vorspel initially started to develop a robot that could handle the payloads required for these different duties. As Operational Excellence Manager for Ardagh Glass, Mr Vorspel leads a team of people who are responsible for the identification and implementation of process improvements at the glassmakers' international production sites. He has been involved in the glass industry for 10 years, including eight years in his current role.

A wide range of ideas were proposed and considered before the decision was taken to concentrate on the requirements for automated swabbing. On the recommendation of global automation solutions expert FANUC, Belgian robotics specialist Socabelec SA was invited to join the Moerdijk development team. Based at Ham-sur-Sambre, Socabelec was already closely associated with the hot and challenging glassworks environment, having previously developed robotic solutions for leading global suppliers of automotive windscreens. Now that the project has been successfully implemented, Socabelec continues to work closely with Heye International personnel, whose job is to roll out the technology to other glass factories. Every new Heye IS machine is enabled with an option to include the swabbing robot. In essence, every machine is 'robot-ready', should the customer decide to adopt the technology in the future. "The partnership with Socabelec is working extremely well" Mark Ziegler, Heye International Marketing Manager confirmed, "helping us to provide an even more efficient service to customers."

LONG-TERM OBJECTIVE

It has been an objective of the international glass container industry to identify a workable automated solution for the mould swabbing >



One of the swabbing robots installed at the Moerdijk glass container plant.



No losses have been identified after swabbing when using the robots.

process for more than three decades and the Ardagh Glass-led project has successfully developed and proved its equipment in operation at Moerdijk.

"It took longer than originally anticipated because the project required financial investment, proving that the equipment worked effectively, both in longstanding trials and in production conditions" Bernard Vorspel recalls. "We wanted to prove that we could improve our production as well as our quality, in addition to providing personnel safety. It had to be shown that humans could work together with robots (symbiosis between man and machine) without increasing job change times." Although others have attempted to resolve the automatic swabbing issue before, they had been unable to resolve spraying issues to the industry's satisfaction. "Persuading the Board to support the project was not our most difficult challenge because of their history of supporting R&D projects" Mr Vorspel continues. "In terms of swabbing, we are confident that our goals have now been met, although there remain other opportunities to develop further, including those relating to temperature measurement, gob loading measurement etc."

SUCCESSFUL INSTALLATION

There are now four swabbing robots at Moerdijk, the last two installations having been completed in early 2016.

The original 125kg prototype model is still running successfully at almost 99.9% uptime efficiency but the other three lines are equipped with the smaller, 25kg production version. Having successfully proved that the prototype worked as required, the robot has been optimised to include a series of weight saving measures and additional features, including a redesigned spraying arm. Not only is the robot significantly smaller but so is the beam that carries it, as well as the cage. A cleaner design has been created, incorporating a new design of flow sensor, several parking places, left and right swabbing configurations and the possibility to observe the process from the IS machine operator's room. "We are now completely satisfied with this version and decided to install it on the other lines" says Bernard Vorspel.

The robust design created is expected to operate at optimal efficiency for at least 10 years, the only equipment items likely to require replacement every five years or so being the cable and hoses. The spraying installation, linear track etc are described as being state-of-the-art and very hard wearing to accommodate the challenging conditions encountered at the hot end.

Several commercially available swabbing compounds have been proved to operate successfully with the installation to accommodate the preferences of different glassworks.

The robot has allowed the glassmaker to save more than 75% of lubricant when compared to conventional manual swabbing methods, as well as much faster application times, important environmental benefits via less airborne pollution and better health and safety conditions for machine operators thanks to the need for less interaction with the forming machine.

There is also the benefit of consistent spraying of the same lubricant layer thickness on mould blanks, avoiding production losses during swabbing cycles and providing valuable material savings. Impressively, four mould halves can be sprayed in less than one second. Furthermore, the use of robots can provide important labour savings, enabling operators to concentrate on optimisation and defect correction.

Apart from regular checks for hoses, cabling and bearings etc, no special maintenance routines are required. A test spray function is provided should any deviation in the spray pattern be noted and adjustments or replacement parts be required.

During job changes, the robot's operating parameters are reset off-line, repeating the settings created for previous runs and thereby ensuring further important savings can be realised. In addition, the equipment's pre-programmed settings permit more than one job to be made on the same IS machine. "That's the great flexibility provided by robots" says Bernard Vorspel. Furthermore, a short payback time has been realised.

The glassmaker confirms the existence of zero rejects from swabbing, as well as the avoidance of section stops and improved operator safety. In addition, operators confirm the provision of stable and repeatable volume, thickness and location of swabbing agent in the process.

CULTURAL CHANGE

The project team's goal is to install the same equipment throughout the international Ardagh Glass network, allowing each of the group's glassworks to take advantage of this major robotic advance, as well as the accompanying cultural change to the subject of glass forming and in particular, swabbing. "Historically, swabbing has been used inappropriately by the industry to compensate for loading defects and to overcome problems associated with inadequately maintained sections etc" says Bernard Vorspel. "The robot is part of a complete quality management programme that needs to be put in place."

Within five years, Mr Vorspel believes all new IS machines purchased from Heye International will feature swabbing robots. This should lead to the production of more consistent, better quality glass containers. He also suggests that more advances in the deployment of robots for other aspects of the forming process will be the subject of further developments in the future.

Heye International confirms that swabbing robot orders are currently being processed for customers in the USA and Australia, both of which are scheduled for installation during 2016. ■

FURTHER INFORMATION:

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