Lights-out production: A highly optimised process

Manufacturers today are looking to cut down costs while ensuring continuous production. The article discusses the advantages of lights-out production that can be adopted in any factory. A read on…

John Murdoch
CEO,
Alfacon Solutions Ltd
john.murdoch@AlfaconSolutions.com

Lights-out factories are becoming more common, collaborative robots are growing in third-shift operations, mould-makers are designing factory floors for lights-out operations, fully functioning without human supervision. The prospect of making parts overnight with little or no labour cost is tempting to any machine shop. Competition is fierce and customers demand better parts and products to be available precisely when needed at the lowest possible price.

Meanwhile, the cost of materials, utilities, labour and employee benefits continue to spiral upward. The idea that a manufacturer can turn off the lights and go home every night while unattended mechanical minions crank out parts is an enticing idea.

Embarking on lights-out production

Modern technology makes it feasible to quickly implement lights-out production not just for large manufacturing operations but also for small CNC shops. There are a number of considerations to be noted before embarking on lights-out efforts. The big picture objective of lights-out is to reduce labour costs but there are other potential savings as well. Planning long, overnight runs for the night shift allows a shop's fully manned machine time to increase flexibility. More short-runs that require intervention for change-overs, work monitoring of more complicated parts and the ability to respond to a customer's urgent order can be accomplished during the day shift.

Machine operator's time is more efficiently used by setting up for overnight production while daytime runs are in progress. Additionally, power companies often charge less for energy used during off hours so that it may cost less to operate machinery during lights-out production.

Ensuring continuous & stable operations

The reliability of equipment in lights-out manufacturing becomes a pivotal consideration. No personnel will be on-site to address machinery malfunctions and automation equipment must operate flawlessly. Machine tools must be capable of continuous operation and must be highly stable.

Fulfillment requirements in the automated mould-making environment are characterised by high-speed conveyors in a lights-out operation. Running overnight unmanned shifts can improve productivity, throughput and on-time customer-driven delivery requirements. Delivering speed and accuracy in a complex mould-making environment is proving cost-effective because the reduction in labour generates a very rapid ROI (return-on-investment); even the conveyor solutions are custom-built or ETO (engineer-to-ordered) are easily cost-justified.

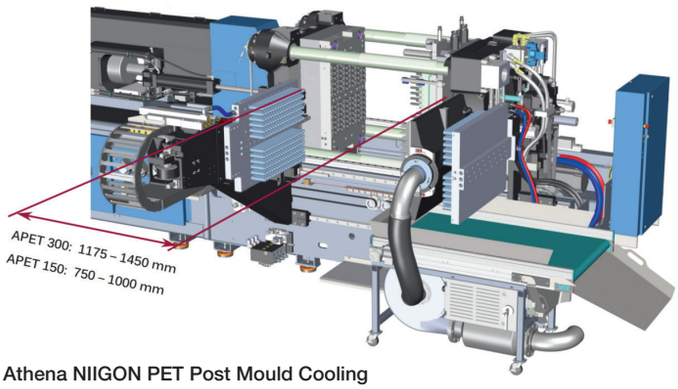
Rapid, error-free manufacturing

The advent of lights-out facilities is bringing rapid, error-free manufacturing, mould-making and fulfillment operations. Athena Automation, based in Vaugh, Ontario, set up a demonstration site for unattended PET (polyethylene terephthalate) preform production. This system highlights the research, consulting and industrial design services offered to customers.

PET lights-out development projects have important characteristics including auto start-up and shut-down, cycle completion, emergency shutdown and a goal of mold change in less than one hour with split gate technology. Lights-out capability with automatic product handling reduces total cost of ownership (TCO) while maintaining the highest up-time, reduced maintenance and reduced energy consumption. According to Aron Szasz Gabor, Athena Automation, "Developing streamlined factory automation and production processes drives the leanest industrial design services for factory optimisation."

Optimising processes

A fast, service-friendly system for moulds with up to 96 cavities improves output-per-capital through energy efficiency and an optimised process. The PET preform moulding machines



Athena NIIGON PET Post Mould Cooling

incorporate two-stage injection units with screw and plunger diameters from 85 to 140 mm. Reciprocating screw injection is available for lab or testing applications, all lights-out.

Post-mould cooling is useful with up to six cooling cycles in water-cooled tubes, an internal preform cooling on transfer pin, energy consumption of 0.21 kWh/kg (machine), 50% lower water consumption, flow-balanced water circuit for better cooling and preform exit temperature monitoring. The take-out robot and transfer station slide out of the way to allow ample mould access and provide space for post-mold tooling change.

Set up for a local blow molder this year at Athena's plant, the demonstration site boasted of a 150-tonne PET machine that has a P85/E85 injection unit and features auto startup and shutdown. The setup also had HMI-integrated auxiliary equipment, including a dehumidifier and resin dryer as well as a special system to handle preforms as they are made.

Speeding up the process

A conveyor, custom-built by Alfacon Solutions, carries the empty bulk containers to the machine, then moves them on once full. Currently, the containers of finished preforms are removed by forklift but according to Gabor, "The system has a 10-hour bulk container buffer, allowing fully unattended operation. The goal is to extend that time by using automated guided vehicles." Mold changes are handled by technicians. The moulds incorporate split-gate technology, which allows the cavity plate to be removed before the hot runner has completely cooled. Gabor adds that the target is a mold changeover time of less than an hour.

Alfacon Solutions also implemented an auto-zone conveyor system, autonomously moving bulk containers from empty zones to fill zones and on to full zones. Each zone is a robust chain driven conveyor driven by a single MDR (Motorised Driven Roller). The run-on demand design of the MDR will allow these driven rollers to 'conserve' and extend their life cycle. The final consideration in the selection of the 24-volt DC MDR design was its ease of deployment. By a simple change of the control mounted main power supply, the system can be deployed anywhere in the world. □