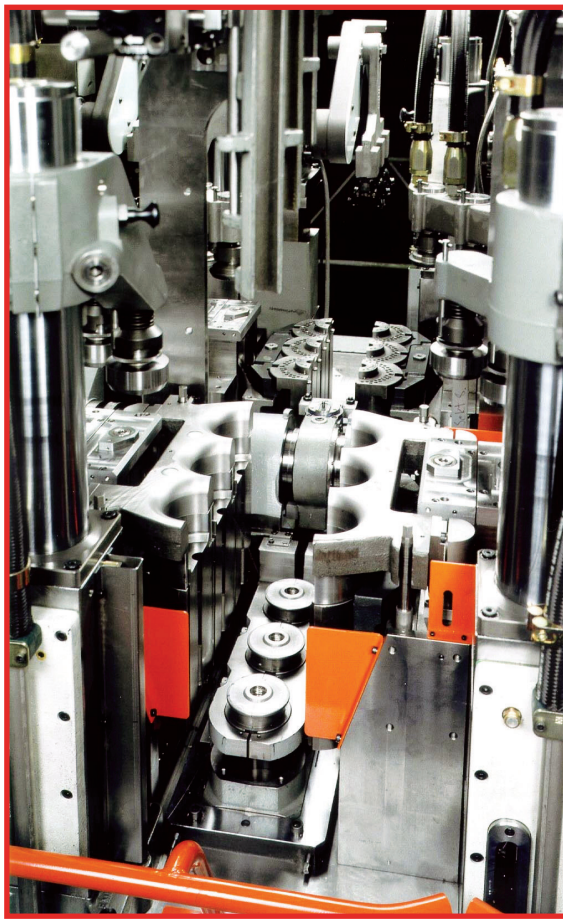
Replacing the IS machine

Alan Fenton* explains the form and function of a new servo electric-operating machine for the container glass industry, designed to replace IS machines.



Section of an NIS 5-inch TG machine, showing parallel mould open and close mechanisms on both blank and blow side.

The NIS machine permits a wide range of containers from 60-95mm diameter and is available in 8-, 10-, and 12-section configurations, in 6¼-inch double gob (DG), 5-inch triple gob (TG) and 95mm Quad Gob (QG). The QG conversion enables production of containers up to 65mm in diameter. The NIS might be capable of handling a 30% increase in production compared to TG operation of the same range of containers. Additional pack ware is possible at a reduced cycle rate.

The NIS machine uses servo technology, so it differs from conventional IS machines in the following ways:

- The container-making process can be optimised
- Job change and work out times can be reduced
- Ambient and machine noise can be lowered
- Future degrees of automation are possible.

Optimisation

Servo technology means that a mechanism's motion is both programmable and repeatable in time of operation and motion profile. Mechanism motions can be designed for specific containers; for example, mould opening distance can be reduced for a small diameter container and increased for a large diameter container. The downward force on the blow head, as it sits on the blow moulds, may be reduced to zero or just enough to partially lift the blow head to improve internal cooling. The same is possible for the baffle, except where a two-step operation of the baffle is used in conjunction with a V-Baffle, which is designed to eliminate the use of the funnel in the blow-and-blow process. This produces containers without a mark on the base of the container.

Servo takeout technology allows adjustment of the takeout in and takeout out positions, as well as adjustment of the kickback position to minimise take out in time. The servo driven invert enables precise adjustment of invert and revert positions, with special cycles also possible, such as stopping the inverting neck ring arm at predetermined positions. This could allow operators to change the neck rings on the blank side of the NIS. Finally, servo technology allows optimisation of the container process.

The interaction of the mechanisms can be timed so that collisions are avoided by small margins and 'dead time' is minimised. Forming times can be adjusted by changing groups of mechanisms so the process is adjusted – blank time, reheat time, mould time, rather than individual mechanism times.

The FlexIS forming control for the NIS is a modular and therefore expandable system. It can:

- monitor the machine mechanisms' motions and positions,
- monitor the servo axis temperatures and currents,
- statistically analyse trends and warn the operator of an improper motion characteristic,
- store all actions so that future, planned algorithms can enable the control system to learn and self-correct some process deviations.

Reduced job change work out times

During a job change an IS machine cools down, which affects lubricity of the lubrication, bearing fit and other mechanical interactions. At the end of a job change, the mechanisms of an IS machine have to be adjusted once to start the machine from its cooled condition, and again when it reaches its working condition.

With the NIS, servo mechanisms have motion times assigned so the mechanism maintains itself to achieve that motion time. Therefore, once set, the motion never changes and the job change work out time is reduced.

Reduced ambient noise levels

An IS machine equipped with 'stack wind cooling' generates noise levels that require the use of hearing protection. With a fully servo electrically driven machine such as the NIS, which is equipped with blank side and blow side VertiFlow cooling, the noise level is lower because noise from exhausting the pneumatic mechanisms is eliminated and noise from mould equipment impacts is controlled.

Automation

With servo mechanisms motion, time position and power usage all are known and are under the control of the machine controller. This allows specific motion profiles to be applied to mechanisms, assignment of positions other than the full stroke of the mechanism, and programming of force applied. Full and efficient use of the glass forming cycle can maximise forming time and minimise dead time.

The NIS and FlexIS suggest the possibility of a fully automated glass plant. For example, in a plant producing containers 24 hours a day with three shifts, one shift can perform all job changes and most maintenance. This means that for the other two shifts, one operator can supervise three or four machines from a central control point because there is little need for the full amount of maintenance staff and there is no mould maintenance.

Automation should remove the operator as much as possible to reduce costs. To achieve this, the process firstly needs reject systems to interrupt the process throughout the forming cycle. For example, a servo gob distributor can interrupt delivery of the gob to any section of the machine. It should also be possible to reject the formed parison before it reaches the blow mould. A defective container should be rejected at the dead plate or before the lehr.

Using video surveillance at the machine, an operator could supervise a number of machines remotely, detecting a fault and interrupting the cycle of a particular section, then sending a technician to correct it.

The above is a simplistic description of an automated glass plant, but with a servo electrically driven machine like the NIS and the FlexIS forming control system, as well as carefully thought out production systems, it could be possible.

* *Alan Fenton, project engineer, Special Projects, Emhart Glass. Website: www.emhartglass.com*