Emhart Glass-SA Cham, Switzerland*

The Next Generation IS Machine

Ever since the landmark introduction of Coca-Cola in PET in 1976, numerous packaging concepts have been marketed with the purpose of challenging the glass container. Nevertheless, the glass container remains the single packaging most associated with premium drinks and food, the world over. Glass has not only regained share in sectors such as beer and food; it also remains the world's most profitable mass-produced packaging to date.

Among the success factors surrounding the glass container, two stand out consistently over time. One is the uniqueness of material properties, the other is technology. Looking across technologies in the packaging industry; glass container forming remains unique in its philosophy. In 1924, a famous Emhart Glass Engineer, Henry Ingle, envisioned the replication of identical handling mechanisms. For decades, the IS standard has secured low manufacturing costs, while allowing the widest range of containers possible. Looking ahead, the question remains as to whether the IS standard could encounter foreseeable technological challenges, and what such challenges could be.

For those who remember the "suction" machine, rotating machine, the TF and many other concepts, the glass container industry has had its share of challenges to the IS standard. The IS concept prevailed every time because it essentially was the only concept that could combine efficiency with flexibility, like no other technology could. Some of the largest productivity gains during the past twenty years were mostly achieved in the forming process itself: the introduction of Verti-Flow® mold cooling allowed the IS machine to operate up to 20% faster. It also helped place more emphasis on lightweighting techniques.

On the container handling side however, it could be argued that productivity gains were fewer as the performance of IS mechanisms has remained largely dependent on air which is a highly compressable fluid.

A key element of the IS philosophy is the ability to partially activate and shutdown a machine. The shutdown of individual sections for maintenance and repair, rather than the entire machine, is radically distinct from any other mass-production technique used today. However, a drawback of such flexibility

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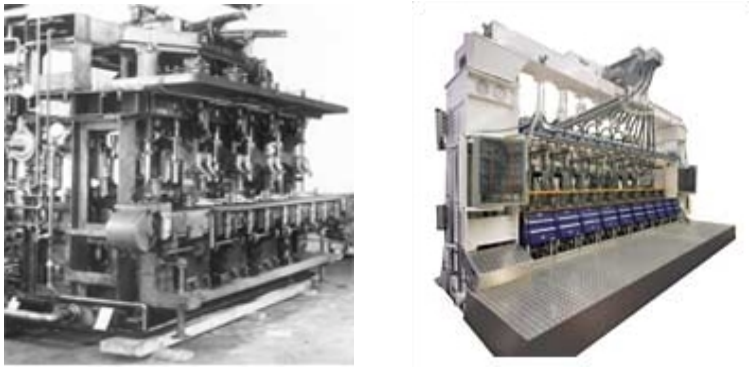

An old IS Machine and a new IS Machine
Photo: Emhart

has been that single sections have required individual adjustments. Individual set-up could open the door for producing different sized containers on the same machine, at least theoretically. In practice, it remains a rare occasion. Flexibility has a downside too. It lends for large variances in motion among sections and undesired quality variances in the same production lot. Despite today's electronic timing, mechanism realignment still negatively affects productivity and the cost of the glass container. Here, we clearly see a large improvement potential beyond the currently used mechanism cushioning methods.

Attempts at expanding the IS standard were largely successful in terms of increasing the number of sections per machine and number of cavities per section, largely due to three technological breakthroughs: Gob Feeding, Gob delivery and, most significantly, electronic Event Timing. The single feeder principle introduced in 1923 was a tremendous contribution to enhancing gob quality and variance. Second is the automatic gob distributor put in operation by 1970. It significantly increased production yield by allowing gradual expansion of the number of sections, mold center capacities and the number of gobs delivered into the machine. Third and by far the most important development, is electronic Event Timing. The advent of electronic controls could be considered as the farthest-reaching improvement the industry has witnessed in the production of the glass container. However, electronic Event Timing remains an open-loop control system, "firing" instructions at the machine with no reliable feedback. Here, we at Emhart Glass see a major potential for evolving the standard into a closed-loop system. In the mid-1970s, electronics were introduced with electronically driven valve blocks destined to replace mechanically set timing drums. The industry immediately realized the benefits electronic controls have on daily tasks such as maintenance and job change. Therefore, it encouraged the fast expansion of electronics to a mechanical IS standard. On the front-end, the IS machine was expanded with electronics to correlate container forming events with gob feeding, cutting, and distribution. On the back end, the same events were synchronized with the pusher, conveyor and ware transfer activities.

While the introduction of electronics dramatically "tightened" control of the process, it also brought a new challenge to the hitherto undisputed IS standard. What started as a mechanical standard could no longer be dissociated from nor evolved without electronics. Also and contrarily to mechanics, electronic technology is inherently proprietary by design (Intel, Motorola, etc.) and prone to relatively rapid rate of obsolescence! As much as the industry defended the IS standard as a philosophy and forming process, it soon realized that the future of a purely mechanical standard is too limiting.

It is our view at Emhart Glass that major improvements to the IS standard have to build on its proven strengths - modularity and expandability. Concepts of gob feeding, gob distribution and electronic event timing have been successful because they embraced the IS philosophy of individual sections instead of doing away with it.

In addition to the thermal control of the process, electronic technology lends to a wide range of enhancements on the handling side. In all, they could result in as much as 30% cost reduction in the glass container. One such improvement potential lies in the reduction of mechanical complexity. Looking across technologies used for cans, cartons and plastics, we find that glass container forming still requires too many machine parts in enough variety and quantity to surpass other forming machines. The ability to better gage and equalize the process by better positioning mechanisms, eliminating complex air passages, piston rods and mechanism cushioning, are examples of simplifications towards such a goal.

A second consideration is mold equipment. Improvements to current slamming of molds due to compressed air driven mechanisms could be re-visited. Better means to control positioning could drastically reduce set-up time and decrease mold equipment damage. Recent developments at Emhart Glass in electronic and software technology, allow for automatic set-up and positioning of mechanisms prior to machine start up. Precise positioning and motion control between mold equipment elements has yielded unprecedented performance results. The most significant being in the area of increased speed and container quality and process repeatability.

We at Emhart Glass, believe that the IS machine's modular design lends itself to further improvements. Recently available electronic and software technologies allow for more precise mechanism movement, reduced job change time and significant reduction of process variation. Their implementation will have major impact on productivity and cost of the glass container. Cost reductions are also possible due to simplifications to the machine's structure.

The next generation of IS machines will offer a major leap in quality and higher output at significantly lower costs. An evolving market is pushing the glass container further into the premium sector where variety and brand image increasingly require technology standards less prone to performance variances and downtime. We would be delighted to meet with you soon and share with you such developments! Or, hear from you at our new website.
www.emhartglass.com.

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