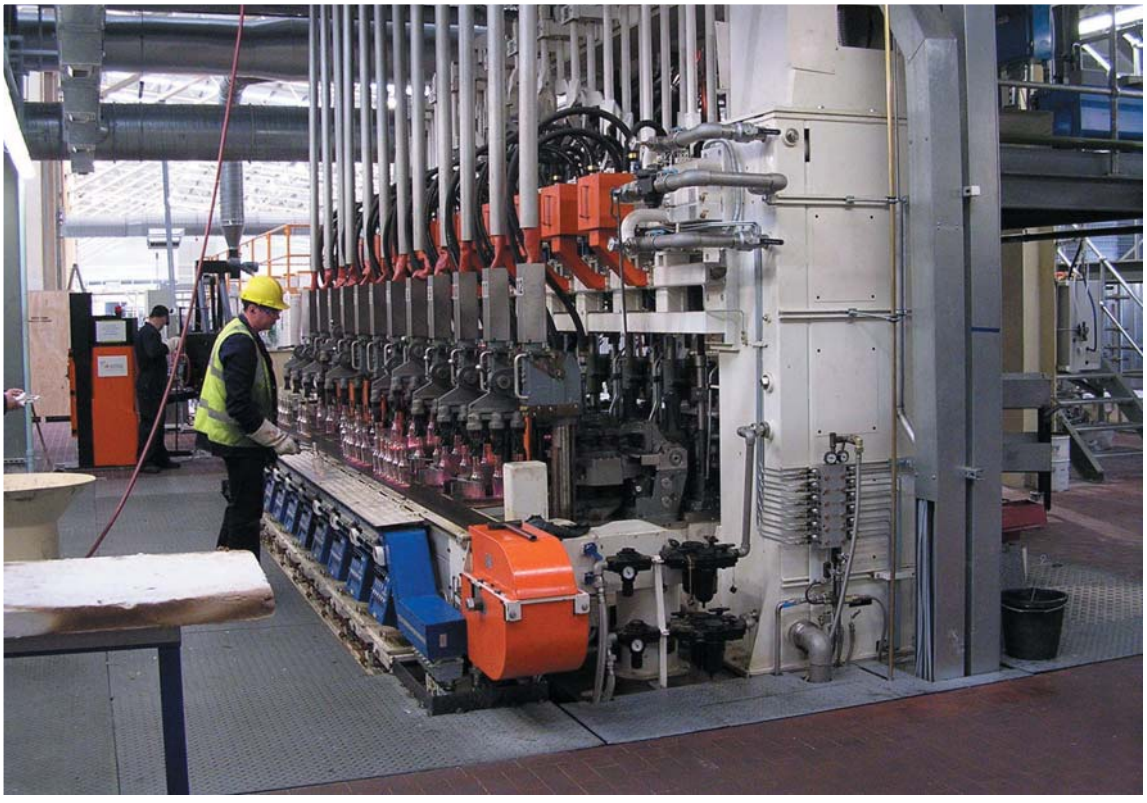
Emhart Glass: AIS - pneumatic IS machinery at its best

THE EVER MORE PRESENT MARKET NEED AND DEMAND FOR QUALITY IN GLASS CONTAINERS IS PUSHING MANUFACTURERS TO INVEST IN MACHINERY THAT NOT ONLY SATISFIED THIS REQUEST, BUT CAN ALSO REDUCE WEAR ON MOULDS AND INSERTS. THE AIS MACHINE IS EMHART'S ANSWER, WITH ITS OPTIONS OF SERVO ELECTRIC TAKE-OUT, INVERT AND THE TWO-AXES SERVO CONTROLLED FLEXPUSHER.

LEO DIEHM - PRODUCT DIRECTOR, IS MACHINES

EMHART GLASS

AIS 12-section
4 1/4 TG
500 bpm



The Advanced Individual Section machine (AIS) is, nowadays, recognized by the glass industry as the superior performer amongst pneumatically driven IS machines.

An IS machine investment is motivated by the ever more demanding glass container market. Outstanding container quality, in conjunction with maximum performance, is needed to remain competitive. The times when container market demands could be predicted are gone. Therefore the key requirements and driving forces for new IS machines are: performance in conjunction with quality and flexibility.

Figure 1 shows a state-of-the-art Emhart Glass AIS 4 1/4 Triple Gob beer production line with parallel mould open and close mechanisms, equipped with several options:

- Plunger Process Control System (PPC);
- Servo Electric Invert (SEI);
- Servo Electric Take-out (SETO);
- Flex Pressure System (FPS) programmable with the FlexIS Control System.

Fig. 1 AIS 4 1/4 TG 10-section beer line

WHY IS AIS THE BEST PNEUMATIC IS MACHINE?

To answer this question, first of all, the disadvantages of the conventional IS machine must be understood. The way the blank and blow moulds are moved on the standard IS machine has not changed since the birth of this machine in 1927. Started as a single gob Individual Section machine, it has been continuously improved during the last 80 years. Double gob was introduced around 1950. The press and blow process, and later Narrow Neck Press and Blow (NNPB) process, were then pioneered. However, higher container quality requirements and the more demanding NNPB forming process brought the deficiencies on the conventional accurate mould motion to the surface.

As Figure 2 illustrates, closing the moulds around the hinge pin on a radius results in considerable weaknesses. Several difficult to control parameter variations lead production disturbances.

HEAT ELONGATION

Due to the high working temperatures, the mould holder arms elongate further into the section. The hot insert elongates from the hinge pin so that the outer cavity nearly compensates the mould holder arm elongation. The outer cavity centre under cold and hot condition is almost at the same position. On the contrary, on the inner cavity the insert heat elongation is added to the mould holder arm elongation. The inner cavity centre is shifted further into the section under working condition. For example, on a 5 1/2 DG section the blank centre distance, due to heat elongation under working condition increases considerably. This fact of moving the inner cavity into the section leads to plunger aligning difficulties. Especially in NNPB where the blank mould - neck ring position is essential for the plunger up stroke production disturbances happen.

WEAR ON MOULDS AND INSERTS

The conventional mould closing moves the moulds by the mould holder arm and inserts around the hinge pin. As a consequence, the cavity centres move on a radius. During production the mould and insert band diameter wear so the mould holder arm compensates for the wear by moving further. This shifts the blank mould centre into the section and can create plunger alignment difficulties and positioner wear. This, in turn, can result in critical defects in NNPB production.

DISTANCE BETWEEN MOULDS AND GLASS

One of the key difficulties on arcuate mould motion is the fact of the unequal distance between the mould and the glass, when the moulds are open. For example on the blank side the unequal distance between the parisons and the moulds makes reheat uneven between the cavities, because the radiation heat exchange is proportional to the 4th power of the distance between the glass and the mould. This explains why this inconsistency is compensated by changing set-up. The same situa-

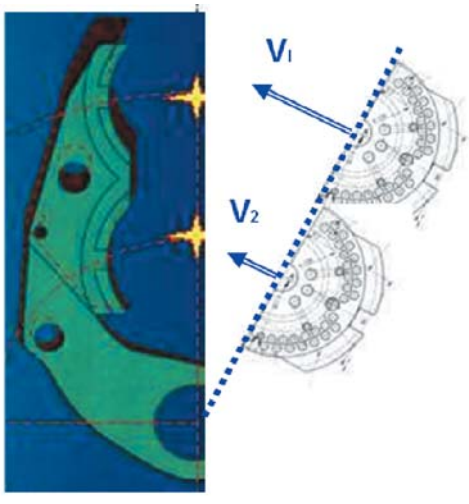


Fig. 2 Arcuate mould motion (heat elongation)

tion occurs on the blow side during mould close. Inner and outer parisons have a considerable difference in radiation heat exchanged with the mould halves.

MOULD CLOSE ON A RADIUS

The moulds, depending on the cavity location, have different closing speeds. Like on a conventional 4 1/4 TG machine the inner blank moulds "clap" together at high speed. This results in a significant impact and reduces mould lifetime considerably.

The need to assemble the mould to the insert in such a way that the mould lock is away from the hinge pin to prevent blank seams was noted throughout the glass industry. Another negative point on arcuate mould closing is that on each production cycle the moulds are re-aligned by the closing action. Continuous insert movements are required so that the moulds align on each cycle. This accelerates the wear on the involved parts.

NOW IT IS EASY TO EXPLAIN WHY THE AIS IS THE BEST PNEUMATIC IS MACHINE

If you design a machine that eliminates all these troublesome deficiencies you have an AIS machine.

The AIS machine features the parallel mould open and close mechanisms on blank and blow side. This exclusive feature enables a more balanced cooling and improved mould equipment alignment. Mould and insert wear are reduced. The internal cooled mould holder arms reduce the heat elongation impact to a minimum. Plunger alignment difficulties, especially during start up, as reported on arcuate mould closing, are eliminated. User experience shows that mould wear can be reduced significantly.

Maintaining equal distances between the glass and the moulds permits and equal parison reheat. (See Figure 4).

The AIS machine concept eliminates the deficiency of the arcuate mould opening and closing and the explained variations by design. The parallel mould motion ensures stable operations and, therefore, excellent container quality.

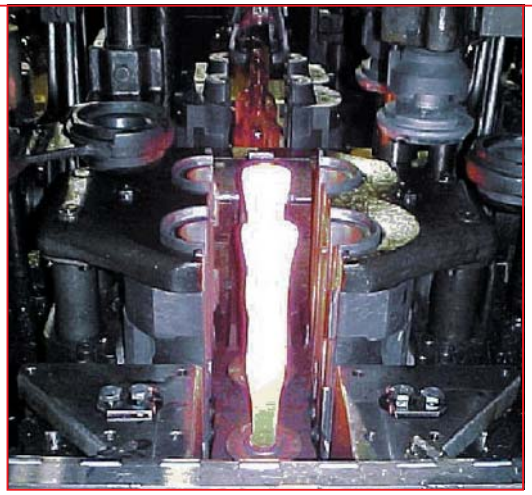


Fig. 3 AIS DG 6 1/4 parallel mould open

IN ADDITION...

The clamping force to the mould is applied more efficiently resulting in less mechanism wear and improved closing.

The optimized pneumatic system with the 26-line electro pneumatic valve block ensures increased machine speed.

Container demand is not predictable and no one knows what type of container he will produce in the future on his machine. To cope with this requirement the AIS machine provides a solution. The AIS machine can be converted in less than six hours from a 6 1/4 DG machine into a 4 1/4 TG production line. This capability makes the AIS machine the perfect machine for the manufacture of wine and beer bottles.

SUMMARY

The AIS machine provides a very cost effective way to benefit from familiar technology, with the option of servo electric take-out, invert and the two-axes servo controlled FlexPusher.

Customers not yet ready for the NIS, due to the considerable technological step involved, can move forward with AIS technology and improve performance. The fact that AIS customers reorder this machine is an unquestionable confirmation that the AIS is the best pneumatic IS machine on the market.

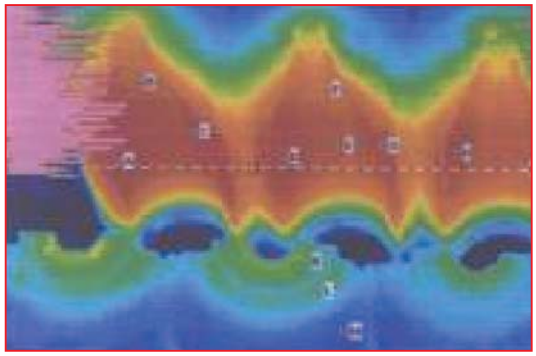


Fig. 4 - AIS TG 4 1/4 blow side thermo graph image

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