NEW GLASS FORMING MACHINE GENERATION BASED ON MECHATRONIC TECHNOLOGY

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Replacing the former manual glassmaking process with a mechanical process was in some respect a step backwards concerning the quality of the containers in terms of uniformity of wall thickness, which of course was more than equalized by the increase in productivity. The glassblower, at least to a certain degree unknowingly just by experience handled the very demanding job of adjusting blow pressure and blow timing with phases of reheating and forming under gravitational force and was able to take care of the condition of every single gob to end up with a good container. This somewhat cybernetic process in case of the IS-machine was replaced by a rather simple sequence of basically two steps with a rather limited possibility of fine-tuning during each stage. In consequence especially the distribution of wall thickness in the produced ware wasn't as good as from the manual process. The average wall thickness and with this the weight had to rise to guarantee the required minimum values.

Consequently during the following further development of the mechanical forming processes one of the key words was "reproducibility" in order to be able to control the process even with a limited number of adjustable parameters (at least compared to the nearly continuously controlled process of the manual glassblower). A distinct step forwards was done with the introduction of the first electrically driven mechanisms in the IS machine about twenty years ago, from then on constantly growing in numbers. They by far outperform the former pneumatic drives in terms of constant behaviour regardless of the surrounding conditions. At Heye the first electrical drives were to be found as electric pusher systems with DC-motors, subsequently followed by even more stable stepper motors.

In parallel, with the H-1-2 machine a slightly different approach was made. In this machine appeared one of the first or even the first computer-controlled drive-system within a glass-forming machine. The design of this machine would have posed a lot of problems to the controls in glass machinery that were usual during that time. The following sketches show an overview of this unusual machine.

Heye will apply this well-known technology to the IS-machine. It is called:

Mechatronics

Mechatronics is a branch of engineering which seeks to enhance the functionality of technical systems by close integration of mechanical, electronic and data processing components." A closer look reveals, that according to this definition e.g. modern cars are crammed with mechatronical elements. A meanwhile rather powerful micro controller takes care of motor management e.g. in terms of ignition timing and control of air to fuel ratio.

Besides these electronic helpers as antilock brake system or electronic devices to control the driving dynamics are able to break each of the cars wheels independently

of the others without involving the driver, thereby stabilizing the car in critical situations. These examples demonstrate what can be meant with the expression mechatronics.

During the last years HEYE International was intensively engaged in development work of the Servo Drives.
In the range of the feeder mechanism this includes:

- Mechanical Plunger(B3)
- Servo Plunger (B4)
- Flex Plunger (B5 / B6 advantages)

as well as

- Mechanical Shear (B7)
- Servo Shear Drive (B8)
- Servo Shear Mechanism (B9 / B10 advantages)

These mechanisms (B11 / B12 visualisation) as well as the Lehr Loader 4206 (B13 parameters) have a shareable drive that enables the visualisation.

Further Servo Technology has been considered with the IS mechanism. At this, the visualisation programme is applied, too.

<u>These are</u>

- the mechanical Takeout (B14)
- the Servo Takeout (B15 / B16 advantages / B17 visualisation)

- the mechanical Blank Close Mechanism (B 18)
- the Servo Blank Close Mechanism (B19 / B20 advantages / B 21 visualisation)
- the mechanical Invert Mechanism (B22)
- the Servo Invert Mechanism (B23 / B24 advantages, B25 visualisation)

In the future further Servo Drives are planned. In detail these are:

- the E-Pusher
- the Plunger Mech.
- the Blow Mould Mech.

} (B26)

With these drives the visualisation programme can be applied, too.