

Bucher Emhart Glass, Cham, CH

Process Control with FlexIS closed loops

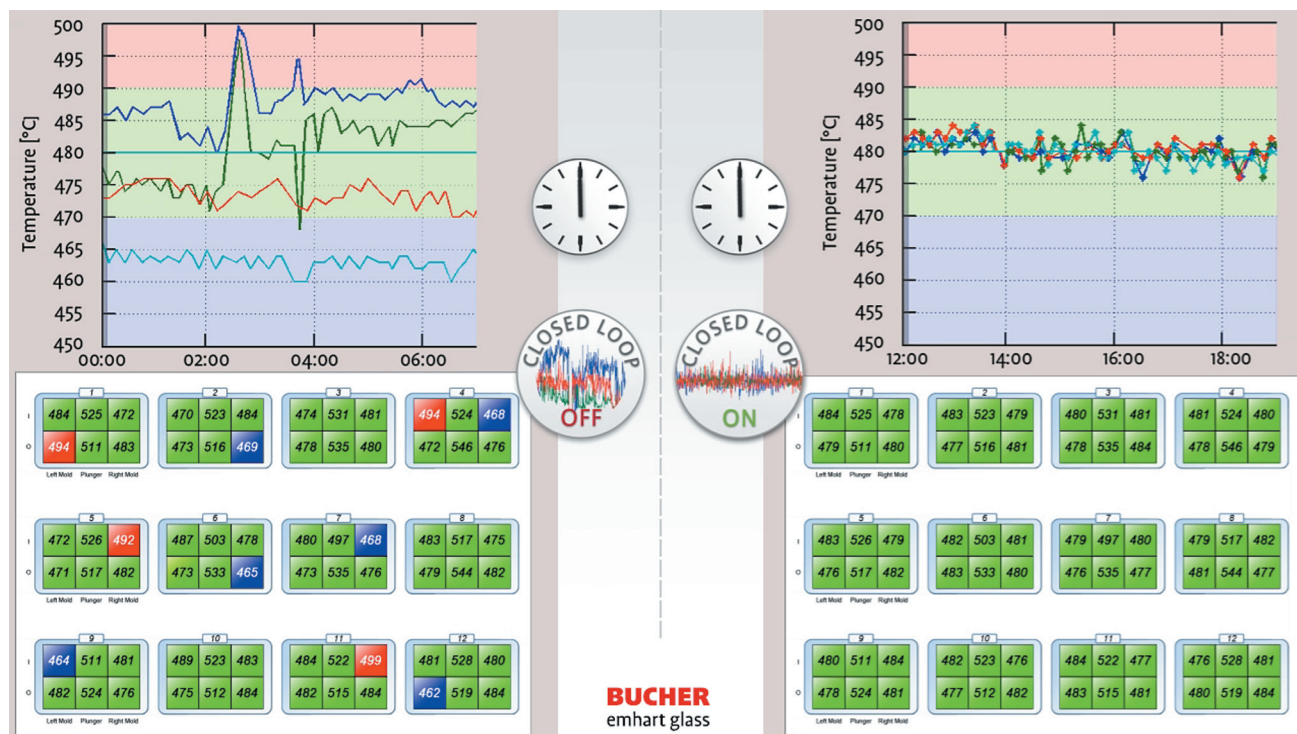
Since a few years, measurement systems like Plunger Process Control (PPC) and Temperature Control System (TCS) provide valuable insight into the production process of glass containers. For the machine operator it is however a tough job to systematically monitor the measured parameters and perform all the appropriate manual readjustments. Automating this process with closed loops is therefore a logical step, leading to more constant production and thus higher efficiency.

Imagine a current AIS or BIS machine producing in 12 section triple gob: 72 mold half temperatures and related cooling valves can be adjusted. Measurements show that it is already a true challenge for an operator to keep the temperatures within $\pm 15^\circ\text{C}$ over a 24h time span. It also requires experienced and disciplined operators because the naturally long reaction

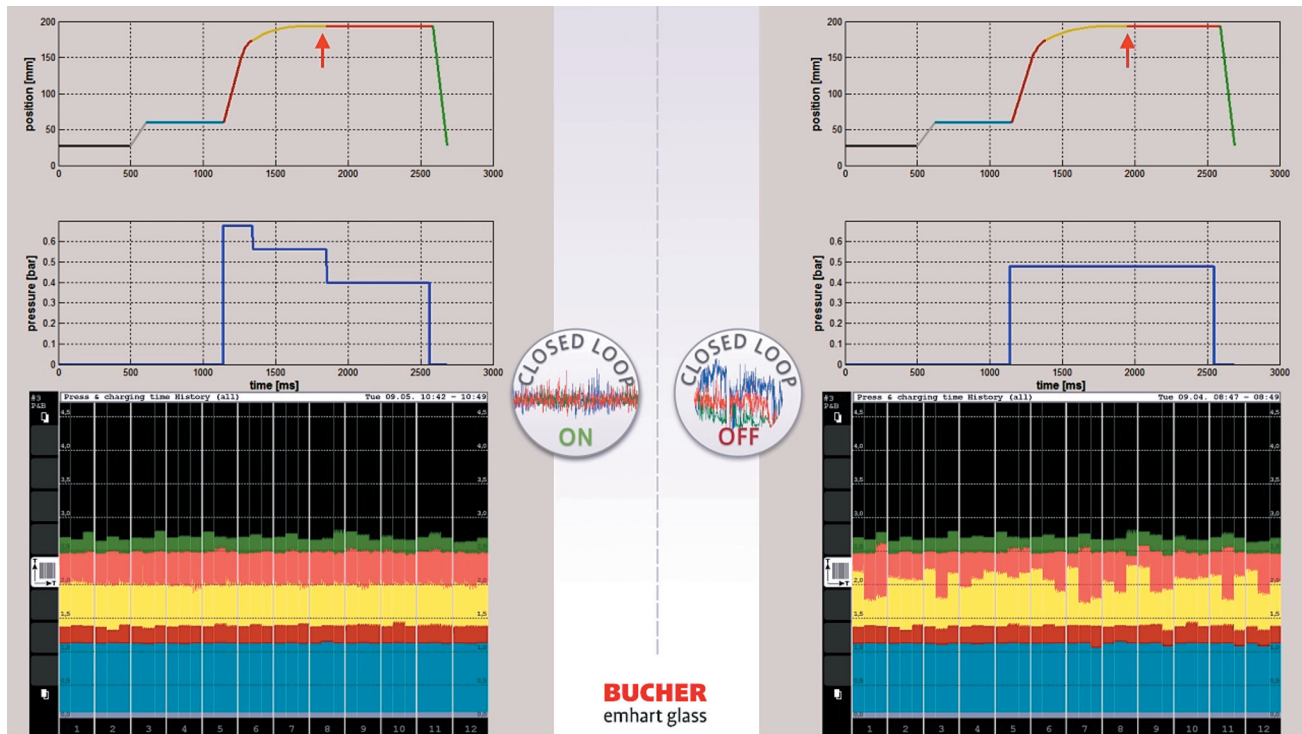
time of the molds to cooling inputs can lead to unintended overreaction. This is where **FlexIS Blank Cooling Control** provides an important benefit. Blank mold temperatures are kept automatically within a band of typically $\pm 8^\circ\text{C}$, day and night. And after startup of a new production, cooling is adjusted to match the desired mold temperatures as well. The

operator has more time to focus on other tasks. It becomes easier to maintain good product quality because the variation of critical parameters is reduced.

Controlling the pressing in P&B or NNPB is no less demanding, especially when the advantages of multi pressure pressing are used. **FlexIS Plunger Up Control** provides ideal support in this instance. Getting the characteristic timing values from the PPC system for every plunger stroke, the closed loop adjusts the initial pressure levels to achieve the desired setpoint for the plunger rise time/dwell time. FlexIS Plunger Up Control uses four pressure levels (including zero bar), the first and second of which are adjusted by the closed loop. The third pressure level is



Comparative situation showing FlexIS Blank Cooling Control switched off / on respectively. Switched on, the closed loop keeps the temperatures within a narrow band around the desired temperature.



Comparative situation showing FlexIS Plunger Up Control switched on / off respectively. Switched on, the closed loop adjusts the FPS pressure levels and timing so that all cavities press with the desired dwell time.

applied during the dwell time and always stays as defined by the machine operator. Using more than one pressure level (multi pressure pressing) permits users to influence the initial up motion and the distribution of the glass independently from the applied pressure during dwell time. This is a major advantage for controlling the parison characteristics and defect prevention. It is important, however, to switch from one pressure level to the next at the correct moment. FlexIS Plunger Up Control also takes care of this task, determining the correct moments based on the last few press curves, individually for each cavity.

Full Integration

Both of the closed loops described are fully integrated into the FlexIS controls system. This means that the machine operator can set up and adjust all parameters on the FlexIS User Console (UC). All settings are stored

with the job and are therefore immediately ready after a job change. Furthermore, the machine operator also receives feedback directly on the FlexIS UC, seeing at a glance if a cavity operates at the adjustment limit. He also recognises easily which settings are adjusted by a closed loop (values are greyed out / read only in all views). This facility helps the operator to cope with these new tools and to take real advantage of them.

Field Experience

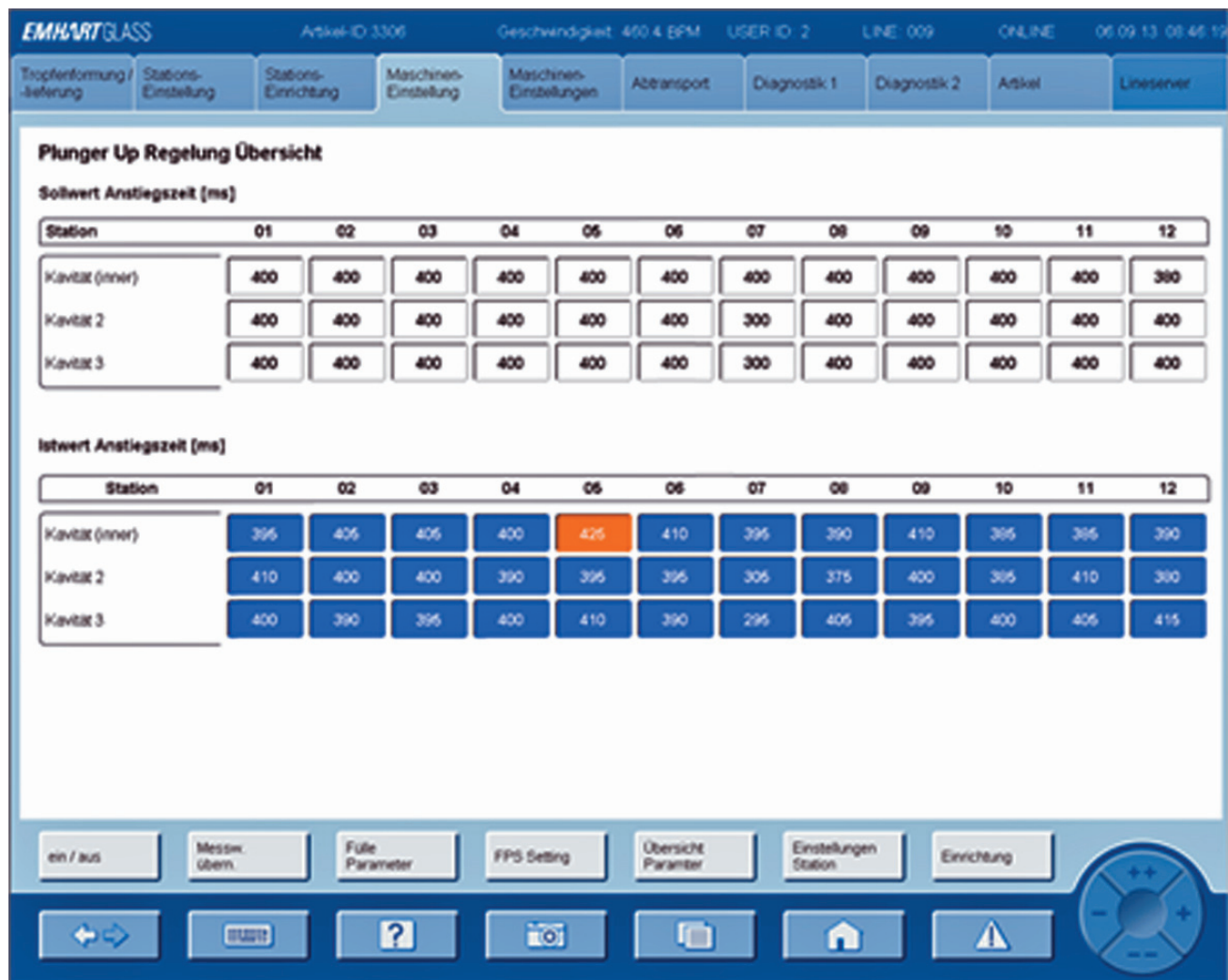
FlexIS Plunger Up Control and FlexIS Blank Cooling Control are both commercially available and installed in various glass plants in Europe and South Africa, gaining ground also in South America. Some installations were undertaken during the development phase to obtain early feedback from customers. This led to refinements even before the equipment's commercial release. Feedback

generated from customers is very positive.

Carlos Barranha (Vidrala S.A.) comments:

The TCS gives us finer control over the heat exchange on the blank side. Mounted on an AIS machine, the 'Blank Cooling Control' closed loop can take advantage of separate valves for each mold half in the section, compensating for imbalances that may exist in the cooling process. This contributes, for example, to greater stability of the vertical glass distribution and the mitigation of the settle blow wave.

Furthermore, the possibility of measuring automatically and systematically neckring and plunger temperatures allows us to detect problems more quickly and thus prevent or minimize the generation of defects, e.g. from broken plunger cooling tubes.'



3: Overview page of the FlexIS Plunger Up Control, showing setpoint and measured values. The background colour indicates all cavities switched on and cavity one of section five operating at the maximum allowed pressure.

Karl-Heinz Mann (Wiegand-Glas) comments:

We use Plunger Up Control since more than a year now. Through the use of constantly adjusted multi pressure pressing we can avoid blank seams and we can better achieve reasonable dwell times even for plungers having more friction. The fact that the dwell time is kept so constant also reduces sugary finish. We could stretch the intervals for changing the molds and starting up after job change is smoother and faster!

Outlook

Bucher Emhart Glass will continue to make further developments in the field of process control. A closed loop for controlling the plunger temperatures is currently under test. A closed loop taking care of equalized bottle spacing is in the pipeline as well. And finally, a new TCS software will be released soon, where the user has more flexibility in defining the measurement sequence. This flexibility can also be

used by the FlexIS to support the section start-up sequence, for example (under development).

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