

Process Pilot[®]



AUTOMATED BLOWMOLDER CONTROL SYSTEM

Reliable, 24/7 automated blowmolder management Precise material distribution control, on every bottle Consistent, high-quality bottle production Tools to optimize performance, energy, material and more Compatible with all major brands of blowmolders Environmental, blowmolder and material variation compensation

The Process Pilot[®] automated blowmolder control system

The Process Pilot[®] automated blowmolder control system is a combination of software and hardware interface components that work in conjunction with the Pilot Profiler[®] measurement system to provide a hands-free means to maintain the blowmolding process.

The Process Pilot[®] system incorporates sophisticated algorithms that analyze minute changes in material distribution and, based on these changes, proactively adjusts critical blowmolder settings to maintain the proper thickness distribution for the bottle being produced. The Process Pilot[®] system effectively closes the loop between bottle distribution measurements and blowmolder operations.

Adding value to your operations with the Process Pilot[®] system

The Process Pilot[®] system offers a superior alternative to manual operation in dealing with critical issues that confront operators. The following examples highlight just a few:

Startup transients

During the blowmolder startup, temperature instability prior to full equalization has a profound effect on material distribution. The Process Pilot[®] system, with its ability to manage all blowmolder controls simultaneously, works quickly to re-establish proper control and greatly reduce the effects of startup transients on material distribution. As a result, better bottles can be produced faster without operator intervention, improving efficiency and pack rate.









Preform variability

Preform variables that occur within the preform supply on a day to day basis (due to moisture content, temperature, resin or other factors) are a constant processing challenge. With the Process Pilot[®] system, distribution changes due to preform variability are monitored on a 24/7 basis. If changes are detected, the Process Pilot[®] system automatically adjusts blowmolder settings to re-establish proper material distribution, providing high bottle consistency regardless of preform variables.

In this example, during a normal production run, a batch of preforms of a similar design, but 0.3 grams lighter were introduced to the blowmolder. The Process Pilot[®] immediately recognized the change and compensated accordingly.

The Process Pilot[®] system can control the blowmolder process to a level of precision unmatched by methods that rely on limited feedback from weight-based data.

Management of environmental issues and unexpected changes

Material distribution is constantly monitored by the Process Pilot[®] system. This system automatically compensates for regular and random events such as temperature fluctuation in and around the blowmolder, material variations, preform quality or other conditions common to blowmolding. Because the Process Pilot[®] system dynamically adjusts the blowmolder operation to maintain proper material distribution, it is possible to maintain tight process control limits with unattended operation. These examples show typical environmental fluctuations during an extended period of time, with and without management by the Process Pilot[®] system.





Process Pilot[®] control turned on (note improved distribution

 $\mathsf{Process}\ \mathsf{Pilot}^{\circledast}\ \mathsf{control}\ \mathsf{turned}\ \mathsf{off}\ -\ \mathsf{24}\ \mathsf{hours}\ \mathsf{(note\ amount\ of\ distribution\ variability)}$

Expanded versatility of preforms

Working with preforms that are not optimized for a given bottle design can be a processing challenge. The Process Pilot[®] system, with its ability to dynamically adjust multiple blowmolder parameters simultaneously, can overcome many process issues that operators cannot handle easily with manual control. The following graph offers an example of how the Process Pilot[®] system can make multiple, simultaneous adjustments to accommodate a preform that is close but not ideal for the bottle being produced.

consistency)



Operational improvements realized with Process Pilot[®]

- Improved lightweighting capabilities
- Adjustments for unplanned temperature changes—lamps, baffling, environment
- Reduction of process drift
- Better accommodations and adjustment for preform variability due to resin type, moisture content, temperature, IV, etc.
- · Reduced effects of start-up transients
- Overcoming variations in operator skills
- More consistent production shift to shift, day to day

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Process Pilot°, the Virtual Operator

The Process Pilot[®] automated blowmolder control system provides a level of control that is unattainable by human operators. Working as a virtual operator, the Process Pilot[®] system makes the changes that would normally be handled by an operator. Unlike a human operator, however, the Process Pilot[®] system monitors operation 100% of the time for the slightest changes in material distribution and continuously adjusts the blowmolder to keep the process on track.

Advantages of the Process Pilot[®] automated blowmolder control system

- 24/7 operation and management of blowmolder, with associated cost savings
- · Multi-variable adjustments performed simultaneously
- Wall thickness control to microns–permitting maximum lightweighting while maintaining desired performance characteristics
- Interface to all key blowmolder models including KHS, Sidel, Krones–making it possible to have one style of control for all of your blowmolders, regardless of manufacturer
- · Improved opportunities to optimize the process

Thickness measurement vs. section weights for closed-loop control

The key to accomplishing such close management of the blowmolder output is tied to the ability to accurately monitor material distribution over the entire sidewall of the bottle. The comprehensive thickness monitoring and precision measurement provided by the Pilot Profiler® distribution measurement system afford a continuous means to monitor material movement. Unlike reliance on a limited number of average section weights or predicted mass measurements, the Process Pilot® system has up to 32 measurement points available that provide direct measurements over the entire sidewall of the bottle. Any change whatsoever in distribution can be identified from source to destination. With this type of feedback, the Process Pilot® system provides precise process control.

The Process Pilot[®] Blowmolder Management System

The Process Pilot system controls the blow molder based on direct feedback from bottle measurements. Measurement feedback through continuous monitoring is used to automatically adjust blowmolder settings, maintaining the blowmolding process at optimum levels. The Process Pilot management system is designed to ensure that all final production bottles have the desired quality and performance attributes in spite of environmental, blowmolder or material variations that occur during the production process.

The Process Pilot approach is based upon three fundamental concepts:

Measure: Agr's Pilot Profiler® measurement system monitors every bottle to identify on-going changes in material distribution.

Control: Process Pilot closed-loop control software proactively manages the blowmolder thickness measurements to maintain desired material distribution and produce consistent, high quality bottles.

3 Optimize: Process Pilot enhancement tools give you the means to optimize bottle production to a target that is most suitable for the product, application or operational goals—making it possible to efficiently produce the best performing bottles with maximum profitability.

Agr's Pilot Vision™ system further expands process and quality management capabilities by incorporating vision-based inspection in conjunction with the Process Pilot blowmolder management system. This powerful combination offers a total process and quality control program for PET containers that includes thickness management, random defect detection and stable, consistent production 24/7, that can only be achieved through automated blowmolder control.

