

## The Mahlo **APCPro** Automatic Profile Control System

Automatic Profile Dies for extrusion and coating are seeing increased use in plastic film and sheet extrusion, die coating and lamination applications with ever stricter control requirements. Mahlo has responded to these market needs by providing coating and converting measurement and control solutions incorporating automatic die control for the past two decades. Our newest generation Automatic Profile Control System (APC), refined in conjunction with major autodie manufacturers is the



### **Mahlo APCPro**

The APCPro consists of a user-friendly interface that is fully integrated into the main QMS-12 QCS System Operator Station. The control hardware uses a reliable industrial PLC with quick change SSR modules. All components are individually fused and incorporate status indicators for communications and I/O. The APCPro cabinet is laid out with ample space for maintenance and is capable of both high power diebolt heater applications as well as very wide dies. Most Mahlo APCPro Systems come pre-wired to the mating connector of the autodie power cable to make it truly plug-and-play.



## Mahlo APCPro Features:

- Interface Fully Integrated into the QMS-12 Operator Station
- **FASTART**® for Accelerated Control During Startup and Changeovers
- Continuously Monitors for Die Bolt Heater Failure
- Neighboring Die Bolt Compensation
- Die Bolt Re-Mapping
- Self-Tuning
- Predictive Neck-In and Edge Bead Compensation
- Comprehensive Recipe Management
- Compatible with all Autodies
- Low Maintenance Modular Design

*All APCPro configuration settings are recipe dependent and can be unique for each product >*

The screenshot displays the 'PID controller configuration' screen. It includes a title bar with 'mahlo APC Pro v2.0.8' and a date/time stamp. The main content area is titled 'PID controller configuration' and contains several input fields for parameters: Operating point (50%), KP (100), KI (200), KD (0), Damping (200), Min. actuating variable (0%), and Max. actuating variable (100%). A 'Confirm' button is located at the bottom right of the configuration area. The interface also shows a 'System configuration' tab and a 'Target profile preset' tab at the bottom.

The screenshot displays the 'Runtime settings [APC pro]' screen. It features a title bar with 'mahlo APC Pro v2.0.8' and a date/time stamp. The main content area is titled 'Runtime settings [APC pro]' and contains several settings: Preheat Power (Target for normalize and correction) set to 50%, Use preheat ramp checked, Increase preheat value by 10 %/s, Automatic 'freeze' when deviation to target is > 60.0 %, Neighbor Bolt Comp. checked, Max. difference in % set to 35, Normalize energy output checked, Use circuit test feature checked, Perform test at startup checked, Test interval set to 1 h, Colorize defective dies checked, Enable zoom feature checked, Enable Dead Band checked, and Lag Distance set to 3.50 m. There are 'Exit' and 'Confirm' buttons at the bottom. The interface also shows a 'Calc' button and a 'PLC' button on the right side.

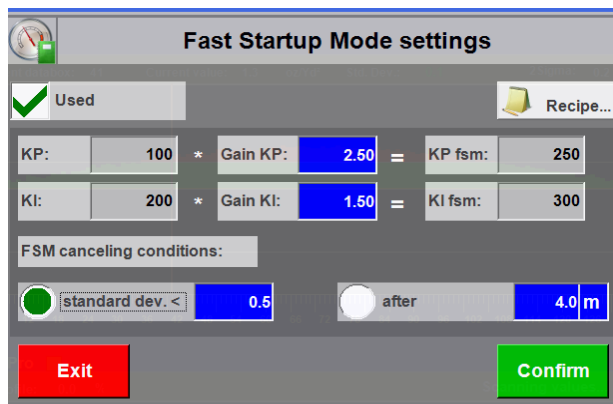
< Each diebolt heater control is self-tuning with its own Proportional-Integral-Derivative (PID) settings.

## Mahlo APCPro Highlights:

### **FASTART<sup>®</sup> Mode**

How can scrap be reduced to the bare minimum after a startup or changeover? What is the fastest way to achieve saleably flat product? The answer is the Mahlo FASTSTART

- Fast Time to Weight / Thickness Specification During Startup and Changeovers
- Feed Forward Control Algorithms
- Overdrive Die Bolt Heaters for Short Duration
- More Aggressive Neighboring Diebolt Compensation
- Control Adjustments after Every Scan starting with the very first
- Disable Same Spot Synchronization



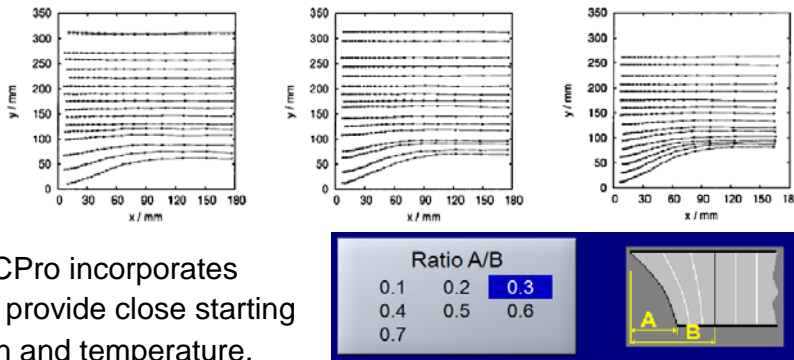
When FASTART<sup>®</sup> is selected, the PID tuning, neighboring diebolt compensation, and control damping are set to much more aggressive values (User Selectable), and the diebolt heaters are overdriven for a short duration (kick & drift) with control action performed after the first scan. When the product is flat to within a recipe-dependent standard deviation or footage, the control reverts to normal control mode. The result is a flat, in-spec sheet in the shortest possible time and in the shortest length of material!

### **Diebolt Heater Testing**

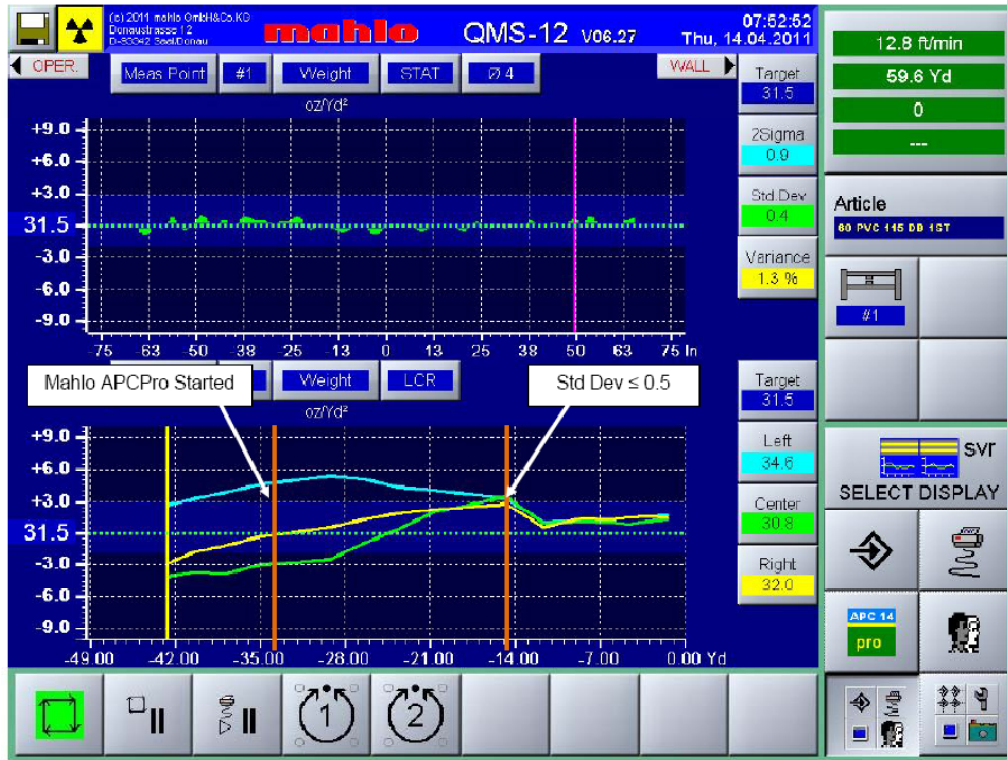
Included as standard with the Mahlo APCPro is our Automatic Diebolt Heater Testing feature which measures for heater continuity upon startup and automatically at user-selectable intervals. Not only does the APCPro detect and alarm in the case of a heater failure, it even identifies the specific bolt that has failed! Then the APCPro compensates for the failed diebolt using its neighboring diebolt heaters until the defective heater is replaced. And this is all performed automatically!

### **Predictive Neck-In**

The amount and shape of neck-in & edge bead is dependent on a large number of parameters – polymer, melt temp., extruder and haul-off speeds, roll distance, die design attributes, etc. The Mahlo APCPro incorporates preprogrammed neck-in algorithms to provide close starting points given the extrudate composition and temperature. Any minor residual tuning can be stored in that product's recipe.



These innovative features of the APCPro are focused on a single goal: control the cross-machine profile to the flattest possible in the shortest amount of time and material.



**Startup Time / Length to saleable Flatness within 4 Minutes / 19 Yards of Material**

Coupled with Mahlo's large selection of precise measurement sensors and the industry's most rugged and reliable scanner offering, Mahlo's APCPro Automatic Profile Control System has achieved this goal.

## About Mahlo

For over 65 years, Mahlo has built its reputation based on the design and manufacture of rugged, innovative, cost effective on-line monitoring and control technologies. It is our focus to provide our customers with tailored solutions that offer a quick return on investment and are supported by our experienced and responsive technical support team. Mahlo's reputation for customer support is second to none. Please contact Mahlo today!

