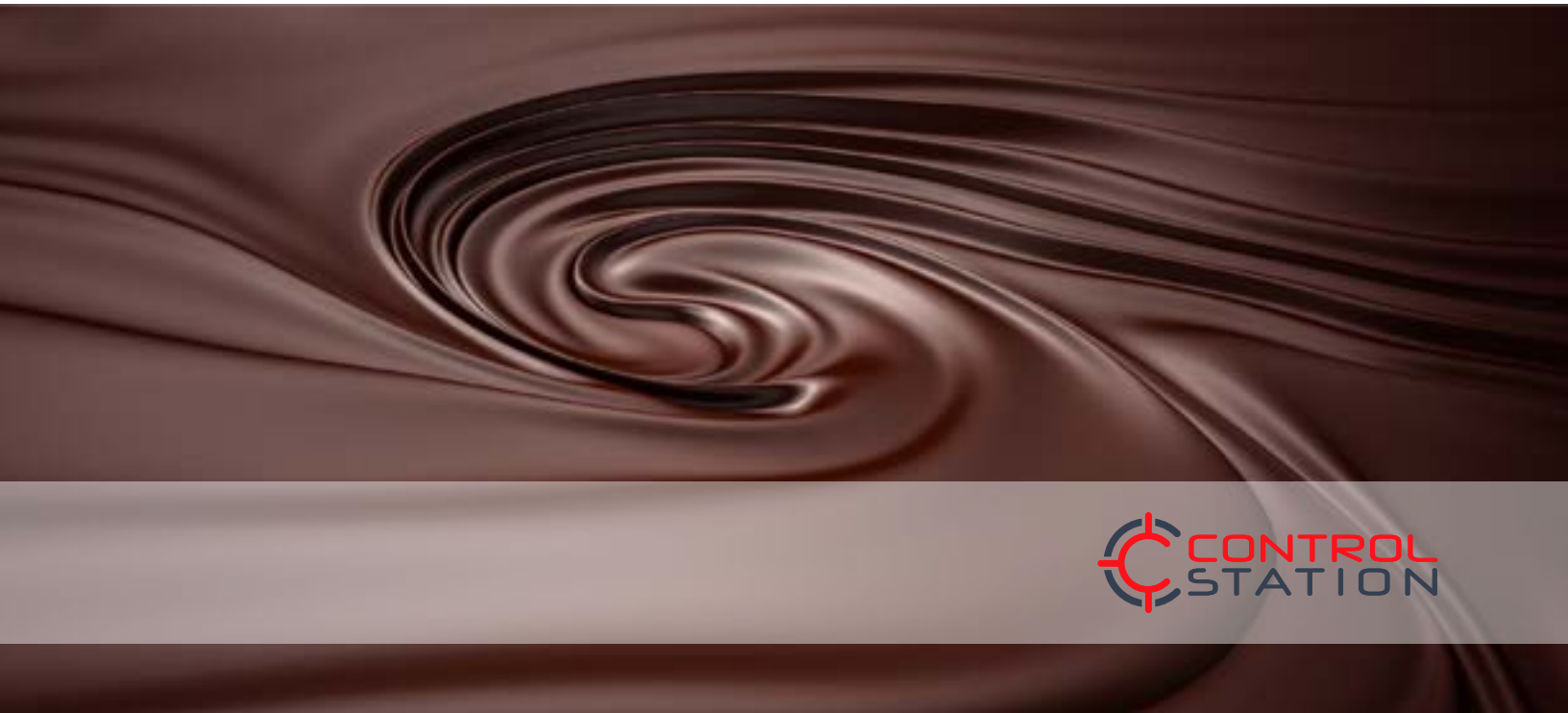
Tuning Parameters that Melt in Your Mouth!

Most everyone loves Chocolate. While delightfully simple in terms of taste and texture, chocolate is actually quite complex. Chocolate possesses the unique characteristic of maintaining its solid shape at 23° Celsius – room temperature – and yet it melts a mere four degrees warmer in your mouth. The ubiquitous appeal of chocolate and its innumerable derivatives has created a $100 Billion market. Even so, the complexities associated with its production is a regular source of consternation for chocolate manufacturers around the world.The production process demands tight control in order to meet the markets standards for taste and quality.

When a world-class manufacturer of chocolate and confectionaries struggled to control the temperature of critical production processes, they turned to Control Station's easy-to-use, industrial-grade tuning technology. Persistent oscillations within the facility's cold extrusion process exceeded acceptable tolerances and put production at risk. Repeated manual attempts to tune the PID control loops failed and engineers were unable to reliably control the loops in automatic mode. With its unique ability to model highly oscillatory process data, Control Station's Loop-Pro™ Tuner technology provided the answer.

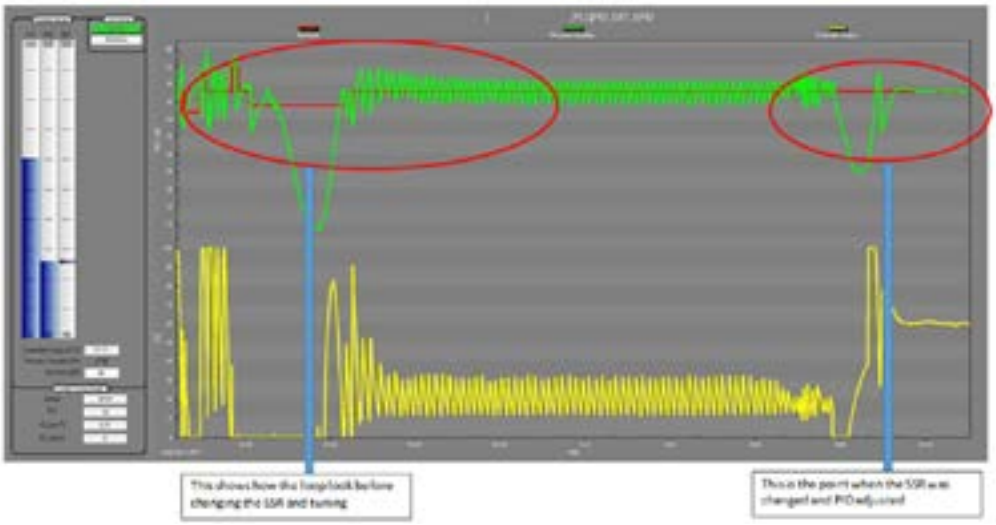


"We tried everything to improve control but the temperature of each barrel consistently swung nearly +5 degrees Celsius. With the help of Loop-Pro™ *we were able to tune the loops quickly and easily. Now the barrels operate efficiently within 0.5 degrees of Set Point."*

M. Wilson - *Reliability Technician (Controls)*

When a Picture Tells a Thousand Words

Cold extrusion is a common method by which chocolate is processed. It involves the control of pressure, flow, and temperature to produce chocolate that is temporarily flexible and that retains its shape upon exiting the extruder. Unfinished chocolate is fed into the extruder where it is pushed under pressure through a barrel. For most chocolate the cold extrusion process is performed at temperatures ranging between 18° and 28° Celsius. Production at lower temperatures requires significantly higher pressure and typically results in output that is crumbly. In contrast, production at higher temperatures yields output that is unable to retain its shape.



The graphic above showcases the oscillatory behavior exhibited by the cold extrusion process' temperature controller. Prior to tuning with Loop-Pro™ the temperature loop can be seen swinging between 39° and 56° Celsius. After tuning variability within the process was eliminated.

A recognized leader in the production of chocolate and other confectionaries struggled with the manufacture of its flagship product using the cold extrusion method. The UK-based production facility regulated the performance of individual controllers using PLC technology originally purchased from Modicon – now Schneider Electric. In spite of their best efforts, engineers at the facility were unable to tune the controllers and maintain temperature within the desired tolerances. Specifically, extrusion temperature oscillated by more than 4° Celsius above and below the control loop's Set Point. Such dynamics put the facility's production at risk.

Loop-Pro™ is the only PID controller tuning software that accurately models oscillatory and noisy data associated with the full range of industrial control loops – not just level loops . Using Loop-Pro™ the facility's engineers were able to quickly model and tune the PIDs responsible for regulating extrusion temperature. The ability to launch multiple instances allowed engineers to examine side-by-side the different process dynamics associated with heating versus cooling. Loop-Pro's graphic tools also empowered them to tailor loops easily for appropriate responsiveness and optimal control. Once the new tuning parameters were uploaded engineering staff saw immediate improvement in control. The loop's variability dropped to less than 0.5° Celsius — an 87% reduction in variability.

Finally – tune your facility's most complex PID control loops for optimal performance.

Learn why Loop-Pro™ is the only product that accurately models oscillatory, noisy process data.
Contact us today at +1 (860) 872-2920 or sales@controlstation.com.