System integrators are evolving to meet the more challenging needs and elevated expectations of process manufacturers. With more focus on complex, big ticket projects, are SIs still fulfilling the requirements for ‘little stuff’ like control loop tuning? Control Station points out five themes to help integrators determine if their services measure up.
Do You Measure Up?

So you’re a system integrator. You’d like to think that your success was based solely on your knowledge and skills. Truth is — much of it was the result of competitive pricing, hustle and follow-thru. When the global recession resulted in reduced staffing levels, you were there to fill in the gaps. As automation technologies changed, you stayed in step with the trends. Now your customers rely on you for their bigger projects. But do you still measure up on the ‘little stuff’ like PID tuning?
No surprise – process manufacturers regularly require outside help with maintaining their facility’s internal systems. As resource constraints grow more prevalent many manufacturers turn to the same system integrators that installed their facility’s production and control systems in the first place. As may be expected, tuning a facility’s PID control loops is among the many maintenance- and optimization-related projects for which SIs are routinely contracted. Although not a big ticket item for the SI, tuning their customer’s regulatory controllers assures safe, profitable operation. And given the correlation between effective control and efficient production, it should be no surprise that manufacturers want to know: Are they receiving the best loop tuning service possible?

The PID controller is the dominant regulatory control system. First introduced in 1959 the electronic PID is a simple feedback control device. It continuously calculates the difference between a given process’ Set Point and its Process Variable. Three terms – Proportional, Integral, and Derivative – are used to correct for the associated error. Given its relative simplicity, range of application, and modest cost the PID is most certainly here to stay.

In spite of its operational simplicity the procedures for tuning PID controllers are not widely understood. Most universities limit the study of process dynamics and PID control to those few students pursuing a Chemical Engineering degree. According to the American Society for Engineering Education that means that only ~8% of engineers are exposed to the PID before entering the workforce. And while courses on PID are generally available to practitioners it’s not news that training budgets are frequently the first to be eliminated during soft economic times. As a result, formal education on the topic is sorely limited and PID controller tuning is widely viewed as a ‘black art’.

The Control Systems Integrators Association (CSIA) sees a steady shift taking place in terms of the relationship between manufacturers and system integrators. The group sees a growing reliance among manufacturers on integrators as they shift from tactical resources to strategic partners. In meeting the manufacturer’s more challenging needs and elevated expectations, a simple question remains: Are they receiving the best loop tuning service possible?

As a recognized authority on regulatory control and related solutions Control Station points out several themes that SIs should consider. These five themes can help an integrator to determine if their services measure up.
For most system integrators projects involving PID controller tuning are few and far between. Whether the service is delivered based on a firm-fixed price or a time and materials basis, it is generally in the SI’s best interest to tune their customer’s PIDs quickly and efficiently. If on the basis of a firm-fixed price, then efficiency drives higher profitability. If on the basis of T&M, then efficiency is appreciated by the manufacturer and opens a path to additional, higher value projects. Regardless of pricing methodology it is helpful to keep the following considerations in mind when tuning PID controllers:

#1 — Standards

Consistency and quality matter to manufacturers. Many have built and sustain a brand based on the use of standards. They expect that their SI partners also apply proven, repeatable procedures. Said another way, they need to know that someone isn’t flying by the seat of their pants while adjusting control systems and putting that brand at risk. If consistency and standards matter to manufacturers, then they should matter to SIs too.

» Apply industry best-practices for modeling and tuning PID controllers
» Consider the use of software tools as part of a repeatable procedure

#2 — Numbers

In order to help PID loop performance it’s understood that SIs need to initially hinder loop performance. Each test that’s performed while tuning – whether a step, a bump, or a doublet – is a controlled disturbance that negatively affects production. Tests drive the process away from the control objective in order to reveal the associated dynamics and to facilitate modeling. Even though they’re necessary, SIs can take steps to make sure tests are few in number.

» Limit testing to a given PID control loop’s “design level of operation”
» Simulate a controller’s responsiveness in order to avoid additional tests

#3 — Time

The time to tune a PID largely depends on the process’ dynamics and its data. SIs can’t slow the response of pressure loops just as they can’t accelerate the Dead-Time of temperature loops. Similarly, data that exhibits variability and noise can present tuning challenges for even
the most proficient SIs. Even so, system integrators understand that minimizing the time to tune each PID controller also minimizes any negative impact on their customer's production.

» Perform tests that are 4x-10x the noise in order to get a clear response
» Tune oscillating loops with the help of non-steady state modeling tools

#4 — Results

The best SIs deliver results that align with the manufacturer's needs. That involves knowledge of a manufacturer's processes and performance expectations. So don't tune a controller for tight Set Point tracking if the process is designed for disturbance rejection. What's more, understand that frequent retuning of any individual loop may generate additional services revenue but ultimately result in that manufacturer finding a new ‘partner’.

» Apply the form of the controller (i.e. P-Only, PI, PID) that's best for the loop
» Take the loop's tolerance for Overshoot and Settling Time into consideration

#5 — Documentation

Process manufacturers measure and document just about everything. Much of their recording, analysis, and reporting is needed to ensure a safe operating environment for employees and contractors alike. The same information also enables manufacturers to measure their effectiveness and to understand the return on their financial investments. Since PID tuning is an investment in process optimization, system integrators should document their handiwork.

» Record key considerations of the decision-making process and the results
» Showcase any performance improvements with before vs. after graphics
Loop-Pro: A Standards-Based Approach to PID Controller

Loop-Pro™ Tuner is a standards-based technology for tuning PID controllers. The software is widely recognized for both its ease-of-use and its unique ability to optimize highly complex loops. In six (6) simple steps Loop-Pro guides you through a repeatable procedure that delivers both consistent and superior results. Based on proven best-practices for modeling process dynamics and tuning PID controllers, Loop-Pro fulfills your customer’s requirements for standards-based controller optimization.

Repeatably Procedure

> Six step procedure: 
  Connect, Test, Model, Tune, Implement, Report

> Focus modeling on bump test data - avoid disturbance-driven data

> Use built-in heuristics to assess process data resolution and ‘quality’

Process Knowledge

> Compare the performance of existing vs. proposed tuning parameters

> Simulate performance of all controller forms (i.e. P-Only, PI, and PID)

> Simplify alignment of loop performance with its control objective
Validation & Documentation

» Facilitate capture of observations and performance of validation testing

» Capture details associated with loop testing, modeling, and optimizing

» Automatically store tuning reports and log tuning parameter changes
Simplifying Optimization:

The NSS Modeling Innovation

Control Station’s Loop-Pro Product Suite is comprised of award-winning, industrial grade process modeling and PID controller tuning software tools. Control Station is proud to have its products private-labeled or referenced by industry-leading OEMs such as Rockwell Automation, Yokogawa Corporation of America, and NovaTech Process Solutions. Each of its products is powered by the NSS Modeling Innovation and equips practitioners to tackle the complexities of highly dynamic industrial control loops —what you know as the ‘real world’.

If you experience difficulty modeling and tuning oscillatory, noisy and long Dead-Time PID control loops, contact Control Station and learn how Loop-Pro and the NSS Modeling Innovation can help you tackle your industrial strength challenges.