PID Loop Optimization: Past, Present, Future

By: John Gerry, P.E.
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The Distant Past

Trial and error
1. Make a SP change
2. Wait
3. Adjust a number
4. Repeat
Trial and Error “Success”

- Great response to SP
- Lousy load response

The Recent Past – Tuning Calculations

- Ziegler – Nichols
- Cohen Coon
- Lambda
- IMC
- Others
Manual Tuning Calculations – “Success”

Assuming no calculation mistakes....

Ziegler Nichols:
- Good load rejection tuning.
- Aggressive, so not very robust.
- Lots of overshoot.
- Only works for series type controllers.
- Make sure you get the other units correct.

IMC, Lambda:
- Good SP tuning.
- Sluggish, so usually robust.
- Very poor load rejection (design based on SP changes)
- Make sure you get the other units correct.
The Very Recent Past

PID Tuning Software

- Optimizes PID controllers
- Direct from process data
- User chooses response/robustness
- Algorithm independent
- Units handled automatically

PID Tuning Software “Success”
Today – Optimize the Entire Loop

- Loop Types: Level – process goals, inverse response, pH (linearization)
- Linearization – linearize the entire control loop
- Valve – quantify valve problems
- Filter – find the largest filter that does not degrade response
- Interactions – RRT
- Oscillations reduced

Today – “Success”

- Good defined by process goals
- Good response over the entire range of operation
- Interactions
Today – “Success”

Continual improvement

- Loop performance clarity throughout the organization
Today – “Success”

Tools for continual improvement

Tools for clarity

Today – “Success”

Loop Health – consistent across the organization
Today - Success

Interactions - PSD

Today – “Success”

Plant-wide oscillation detection, diagnosis, removal

<table>
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<th>Oscillation</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Mean %</th>
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<th>Mean</th>
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Report provided by PlantTriage

2007 User Conference Build a Stronger Automation Foundation
Today – “Success”

Diagnostic drill-down

Today – “Success”

AMCT
The Future

Broad-base acceptance of Performance Monitoring
Becoming a must-have application (like a historian)

The Future

More process focused
Unit operation specific by type