The Myths

• Myth 1: Tuning is Everything
• Myth 2: Averages are More Important Than Dynamics
• Myth 3: There Isn’t Time to Look at Everything
• Myth 4: Each Unit Operation is an Island
• Myth 5: Analog Instruments Can’t Deliver Diagnostics
• Myth 6: You Can’t Show the Value in Dollars and Cents
Myth 1: Tuning is Everything

The Equipment

- Exceeding Design Capacity
- At Limits of Performance
- Degrading Over Time
- Poor State of Repair
Operations

- Choosing the Right Targets
- Managing the Process
- Fire-Fighting
- Interactions

The Control Loop

- Measure
  - Noise
  - Variability
  - Non-linearity
  - Interactions
- Decide
  - Controller Design
  - Loop not in Normal
  - Tuning
- Action
  - Hysteresis
  - Valve at Limit
  - Stiction
  - Operator Changes
  - Disturbances
Myth 1 Debunked

- Tuning is One Piece of the Puzzle
  - Equipment
  - Operations
  - Loop
- Software Tools
  - Identify the Problems
- Focus Your Efforts

Myth 2
Averages are More Important than Dynamics
Which is More Efficient?

Dynamic Inefficiencies

- Scrap/Waste Product
- Recycle
- Loss of Operator Attention!
- Downtime
- Excess Energy
- Excess Raw Material
Causes of Inefficiency

- Process Upsets
- Controls
  - Tuning
  - Loop Interaction
- Equipment
  - Valve Stiction
- Operator Response
  - Overload, Confusion
  - Right Information not Available
- Setpoint Not at Optimum

Myth 3
There Isn’t Time to Look at Everything
Time is Money

• Your Time is Valuable!
  • Direct Cost
  • Opportunity Cost

• Automate the “Grunt Work”
• Graphical Tools
• Focus Your Efforts

TreeMap

See the Entire Plant

Public-Domain Technology
“Triage” Your Plant Data

What Matters Most?

- Economic & Technical Factors
You Can Look at Everything

Performance Supervision Looks at Everything!

• Automate the “Grunt Work”
  • Data Collection
  • Calculations
  • Analysis
  • Prioritization
• Apply Graphical Tools
• Focus Your Efforts

You Focus On the Most Important Things

Myth 4
Each Unit Operation is an Island
Unit Operations

- Boiler
- Distillation Column
- Dryer
- Reactor
- Blending
- Filtration
- ...

Not an Island: A Network
Interactions Come From...

- Units Upstream
- Units Downstream
- Recycle Loops
- Sharing Common Resources
- Control Strategy Issues
- Start-Up, Shut Down
- Batch Operations
- Oscillation

Typical: 40% Loops Oscillating

Oscillation Summary
Myth 4: Each Unit Op is an Island

The Truth: Unit Operations are an Interacting Network

- Interactions Create **Most** of the Variation
- Common Cause Can be Found, Quickly

Look at the Big Picture

Use Modern Tools

Eliminate Upsets at the Source

Myth 5

Analog Instruments Can’t Deliver Diagnostics
The Value of Diagnostics

- **Improved Service Factor of Control Equipment**
  - Availability is improved
- **Predictive Maintenance**
  - Plan maintenance resources and costs
- **Improved Plant Performance**
  - Solve problems which affect Plant Performance and profitability

Fieldbus Diagnostics

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<tr>
<td>Comm. Failure</td>
<td>Yes</td>
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<tr>
<td>Valve Travel</td>
<td>Yes</td>
</tr>
<tr>
<td>Noise Band</td>
<td>Yes</td>
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<tr>
<td>Valve Stiction</td>
<td>Yes</td>
</tr>
<tr>
<td>Valve Hysteresis</td>
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<tr>
<td>Cause of Oscillation</td>
<td>No</td>
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### Analog Instruments + Performance Supervision

<table>
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<tr>
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</table>

- **Operations Performance**
  - Even More Diagnostics
    - **Diagnostics**
      - **Diagnostic** | **Analog + PSS**
        - Process Shift | Yes
        - Process Constraints | Yes
        - Dynamic Models | Yes
        - Opportunity Gap | Yes
        - 6-Sigma | Yes
    - **Diagnostic** | **Analog + PSS**
        - Harris Index | Yes
        - Robustness | Yes
        - Response Time | Yes
        - Settling Time | Yes
        - Mode Changes | Yes
Myth 5: Analog Instruments Can’t Deliver Diagnostics

The Truth: You Can Get Diagnostics from Your Existing Instruments, For A Lot Less Money

- Diagnostics Deliver Results
- Maximize the Value from Installed Base

Data is Available via OPC
Diagnostics Delivered to Your Desktop
A Fraction of the cost of New Instruments

Myth 6
You Can’t Show the Value in Dollars and Cents
Myth 6

- You Can’t Show the Value in Dollars and Cents
- Performance Improvement is “abstract”
- Performance Improvement is “nice to do”

Manufacturing Reality

- Many Things are Important
  - Cost
  - Quality
  - Safety
  - Reliability
  - Throughput
  - Maintenance Costs
  - Energy Costs

Current Performance?

Which are the most Important?

Focus Improvement Efforts
Dollars and Cents
An Example

Calculating Energy Reduction

- Reduction in Natural Gas Demand
  - Reduced from 196 SCFM to 183 SCFM
  - Gas Pricing: $10.89/MCF
    - From [http://tonto.eia.doe.gov/aepoline/ps/sum_dou_nus_m.htm](http://tonto.eia.doe.gov/aepoline/ps/sum_dou_nus_m.htm)
  - 24 x 7 operation, 330 days/yr

- Energy Savings
  - 13 SCFM
  - Gas @ $10.89/MCF

- Gas Saved
  - 13 SCFM X
  - 60min X 24 hr X
  - 330 day/yr
  - = 6178 MCF/yr

- Total Savings
  - 6178 MCF/yr X
  - $10.89/MCF
  - = $67,274/year
Myth 6: You Can’t Show the Value in Dollars and Cents

The Truth:
There are many savings opportunities, each able to show value in dollars.

- Reduce Variation
- Stabilize
- Shift toward the Optimum

Compare to baseline results
Involve others to gain alignment

The Myths – Questions?

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