



# STS-AIChE PE/PO Workshop

## Process Troubleshooting: Addressing Common Oversights

Julie D. White

Senior Consultant

Onshore PSM and Risk services

Scandpower Inc.

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Risk Management

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# Process Troubleshooting – Why is it Important?

- Effective troubleshooting improves
  - Process Reliability (On-stream factor)
  - Product Quality (Right first time)
  - Process Safety (Reduces potential for loss of containment).
- Effective troubleshooting
  - Proactively identifies and corrects daily process issues
  - Intervenes prior to escalation to process safety near miss or incident.

# Process Troubleshooting – Case of ‘The Missing Blip’

## Runaway exothermic polymerization

- Process data from DAS Historian shows one temperature elevated above reactor alarm limits.
- A series of events leads to a process excursion.
- Team performs root cause analysis and issues corrective actions.
- Forward two months- Similar event leads to a process excursion.
- Previous incident data is benchmarked.
- What does the current team find?      Why?      What can we do better?

Disclaimer- All examples or cases contained in this presentation are hypothetical and are not based on a specific event.

# Process Troubleshooting – Case of ‘The Missing Blip’

What does the current team find?

- Temperature excursion suggestive of a runaway reaction prior to rupture disc burst on reactor.
- Data from previous event shows similar excursion.

Why?

- Historian ‘filtered’ data.
- Optimal x and y-axis ‘range’ overlooked.

What can we do better?

- Best data is typically from operator console or ‘high speed’ DAS. Historians ‘filter’ data.
- Training. Event checklist.
- Perform daily process troubleshooting. Use leading indicators (API 754).
- Maintain readily accessible PSI and case histories.

# Process Troubleshooting Workshop Overview

- Fundamentals
- Common Oversights
  - Data Gathering
  - Root Cause Analysis
  - Communication
  - Leadership
- Examples
- Technical Resources

# Process Troubleshooting- Fundamentals

- Daily process troubleshooting prevents escalation to incidents
  - Diagnose root cause and test hypothesis
  - Ask what happened, why, where, when, how, and who?
  - Address contributing factors
  - Follow up within specified time
  - Write results and locate in readily available file
- 
- Be hands on! Inquire daily about challenges to operating limits
  - Consider utilizing leading and lagging indicators and reliability based mechanical integrity
  - True solutions take time and acceptance by Operations
  - Listen to subject matter experts
  - Capture process notes from day one

# Process Troubleshooting- Common Oversights

- Data Gathering (Collection and Preservation)
  - Process Data
  - Field Evidence and Process Sampling
  - Interviewing

# Common Oversights- Data Gathering

- Process Data
  - Time critical activity
  - DAS Filters -> Quality decreases from consol data to Historian
  - Immediately preserve DCS alarm logs, high speed data recorders, maintenance logs (vibration). Secure all other electronic and paper data.
  - Train multiple personnel on how to secure data.
  - Data preservation responsibilities should be identified and written (i.e. check lists).



# Common Oversights- Data Gathering

- Field Evidence and Process Sampling
  - Place safety first when gathering field evidence or physical samples from the process. (JSA)
  - Prepare and communicate job tasks directly with individuals collecting samples. Create data sheets.
  - Prepare sample containers and create laboratory data sheets ahead of need.
  - Confirm laboratory equipment is calibrated. Maintain copy.
  - Discuss special staffing needs with unit or lab supervisor.
- Example- Change of test method during plant trial. Statistics.

# Common Oversights- Data Gathering

- Interviewing
  - Time critical due to natural change of memory
    - 24hrs
    - First hand account
  - Ask what happened? Listen without interrupting.
  - Ask to show what happened? Plot plan. Field. Console.
  - Follow up with questions to clarify information.
  - Ask for source of information.
- Example- Pilot

# Common Oversights- Root Cause Analysis

- Root Cause Analysis
  - Consider each daily, near miss, or incident from experienced but 'new' eyes
  - Use RCA methodology comfortable for team
  - Document sources
  - Benchmark- History does repeat itself
    - Site Benchmarking
    - Records
    - Operating History
    - Industry Benchmarking
    - Supplier Technical Lead
    - Specific- Reactive Matrix
- Example- Off normal process design

# Common Oversights- Communication and Leadership

- Efficiency
  - Streamline Notes for Management status reports (via email) and meetings (slides). Type and go- write once.
  - Delegate to skill sets
  - Utilize all resources
    - Site, corporate, suppliers, industry benchmarking, subject experts
- Team fatigue
  - API RP and corporate policy

# Common Oversights- Communication and Leadership

- Communication
  - Team
    - Confirm agreement with root cause and contributing factors.
    - Document all opinions and address.
  - Unit Management
    - Status reports
    - Prepare for local, state, and federal visits
  - Site and Corporate Management
    - Status reports.

# Technical Resources

- ANSI/API Recommended Practice 754, *Process Safety Performance Indicators for the Refining and Petrochemical Industries, Downstream Segment* (2010).
- CCPS/AIChE, *Guidelines for Investigating Chemical Process Incidents*, Second Edition, New York (2003).
- CCPS/AIChE, *Guidelines for Safe and Reliable Instrumented Protective Systems*, New York (2007).
- CCPS/AIChE, *Process Safety Leading and Lagging Metrics*, New York (2008).
- Lieberman, Norman P., *Troubleshooting Process Operations*, Third Edition, Tulsa (1991).
- Mannan, Sam, *Lees' Loss Prevention in the Process Industries, Volumes 1-3*, Elsevier Butterworth-Heinemann, United Kingdom (2005).
- Urban, P., *Bretherick's Handbook of Reactive Chemical Hazards*, Fifth Edition (2006).

For more information:

**Julie D. White**

**T** +1 713 654 1900 Ext. 123

**D** +1 713 405 8710

**M** +1 832 287 1716

[jdwhite@scandpower.com](mailto:jdwhite@scandpower.com)

[www.scandpower.com](http://www.scandpower.com)

[www.lr.org](http://www.lr.org)

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