80 Days to Operator Competency

FCC Conference League City, Texas April 12 – 16
Sulfur Conference League City, Texas April 14 – 16
Coking Conference Galveston, Texas April 19 - 23
Presentation Topics

- Baby-boom effect
- Skill erosion
- Capability – Demand gap
- Consequences of human error in the refining industry
- Operator training interventions and strategy for closing gaps
- 80 days to competency
- What is a simulator and how they are used
- Benefits of a comprehensive operator training program
- RSI simulation expertise
- Q & A
Baby boom effect

**Competent (adj); having suitable or sufficient skill, knowledge and experience**
The importance of sustaining your training program

Performance degrades without a sustained training program

1990 Chemical Manufacturer’s Association - “A Manager’s Guide to Reducing Human Error”
The Capability/Demand Gap

Describe purpose of alarms....
Understand basic instrumentation...
Locate equipment...
Describe basic utilities....
Recall procedures....
Describe basic process technology in the plant....

“Error is a natural consequence of the mismatch between human capabilities and demands ...”
AIChe Guidelines for Preventing Human Error in Process Safety

Industry trains at lower proficiency levels.

Industry expects performance at higher proficiency levels.

Compare instrumentation data to troubleshoot problems...
Examine effect of pressure, temperature and composition on distillation operation...
Coordinate the response to major process upsets...
Apply troubleshooting skills to avoid environmental excursions and use proper procedures to recover...
Consequence of the Capability/Demand Gap

  "...the flight crews and air traffic controllers were properly trained and certified."

- Fatal accident: Bethune WWTP, Daytona Beach, Florida 2006.
  "The CSB found no evidence that workers at the Bethune Point WWTP received any methanol, hazard training in the last 10 years."

- Shuttle Challenger disaster, 1986
  "...no reason to question the competence of the individual technical specialists or managers."

- MD83/Shorts 330 crash Charles De Gaulle Airport, 2000
  "...the lack of rigor in operator training was not a Texas City phenomenon, but exists to a lesser and greater degree across all 5 BP U.S. refineries."
Operator training interventions

3 general categories:
Simulators can be used effectively for training on:

<table>
<thead>
<tr>
<th>Technical Fundamentals</th>
<th>Process Fundamentals</th>
<th>Unit Specific Training</th>
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<tr>
<td>• DCS Introduction</td>
<td>• Distillation</td>
<td>• Process Description</td>
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<td>• Math for technicians</td>
<td>• Boilers</td>
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<td>• Chemistry</td>
<td>• Troubleshooting</td>
<td>• Safety systems</td>
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<td>• Advanced regulatory control</td>
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<td></td>
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<td>• Advanced process technology</td>
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<td>• Multi-variable Process Control (MPC)</td>
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</table>
Strategy for building a sustainable training program

• Immediate focus on developing comprehensive training programs

- DCS
- Pumps, valves
- Regulatory control
- Math for Techs
- Boilers, furnaces
- Compressors
- Advanced control
- Written and demo final exams
- Operate
- Parallel
- Instrumentation
- Heat exchangers
- Unit-specific training
- Troubleshooting
- Technology-specific Process Fundamentals
- Generic Simulators
- Unit-specific training
- High Fidelity Simulators

• Sustain with a Maintenance Program tied to plant MOC process
80 days to competency

<table>
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<tr>
<th>Course</th>
<th>Days</th>
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<td>1. DCS Introduction</td>
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<td>2. Instrumentation Basics</td>
<td>5</td>
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<td>3. Process Fundamentals</td>
<td>2</td>
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<td>4. Technology-specific Fundamentals</td>
<td>5</td>
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<tr>
<td>5. General Computer Skills (ongoing)</td>
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<tr>
<td>6. Regulatory Control</td>
<td>5</td>
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<tr>
<td>7. Unit-specific DCS</td>
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<tr>
<td>8. Unit-specific Control Strategies</td>
<td>5</td>
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<tr>
<td>9. Job Orientation – Routine Duties (ongoing)</td>
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<tr>
<td>10. Unit-specific Simulator Training</td>
<td>30</td>
</tr>
<tr>
<td>11. Multivariable Predictive Control (MPC) Basics</td>
<td>2</td>
</tr>
<tr>
<td>12. Unit-specific MPC</td>
<td>5</td>
</tr>
<tr>
<td>13. Advanced Process Technology</td>
<td>2</td>
</tr>
<tr>
<td>14. Final Written and Demonstration Exams</td>
<td>2</td>
</tr>
<tr>
<td>15. Parallel</td>
<td>10</td>
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</tbody>
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Total days in training program: 80 Days
Is it the plant or the simulator?

Control Room

DCS

Plant

Training Room

Emulated DCS

Simulated Plant
Simulators; more than just training

- A high fidelity OTS is expected to provide intensive training in various plant operator regimes such as:
  - Normal operations
  - Cold unit startup (summer and winter conditions)
  - Unit re-start from tripped conditions
  - Normal and emergency shutdowns
  - Process upsets and emergency conditions

- The OTS allows for validation of:
  - Procedures: startup, shutdown, normal and emergency
  - Critical process designs
  - Critical automation systems, SIS logic, ESD and CCA
  - DCS control configuration

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RSI Simcon Operator Training Services

- Training Program Evaluation
  - Analyze current state of operator training against plant expectations

- Training Gap Analysis
  - Identify competency gaps for targeted training

- Training Program Development and Execution
  - Manage design and execution of operator training and development programs

- Training Simulators
  - Provide clients with training programs to compliment simulation technologies
Complete training packages

Our acquisitions and expansion into operator training services uniquely positions RSI to offer our clients:

• *Rigorous simulation technologies in a variety of fidelities to meet our client’s training, process design, and safety needs*

• *... and training solutions to compliment every one of our simulation technologies, providing our clients with operator competency assurance to meet their business needs*
Simulation expertise

• For more than 40 years RSI has supplied dynamic simulation solutions to these energy sectors:
  • Onshore / offshore oil and gas
  • Production platforms
  • LNG Processing facilities
  • Refining processes
  • Pulp and paper
  • Chemicals
  • Coal liquefaction
  • Utilities
Simulated processes

RSI has process simulation expertise in all sectors of the oil and gas industries

**Production and LNG**
- Storage and Offloading
- Onshore production
- Floating Production
- Receiving facilities
- LNG Terminals
- MEG Injection
- LNG Carriers
- LNG storage
- Gas lift
- Offshore wellhead
- Pipeline networks
- Subsea pipelines
- Gas compression
- LNG liquefaction

**Refining**
- Atmospheric Distillation
- Selective hydrogenation
- Alkylation – Sulfuric, HF
- Fluid Catalytic Cracking
- Visbreaker
- Residual FCC
- Hydrocracker
- Delayed Coker
- Isomerization
- Steam Cracking
- Sulfur Recovery
- Steam Reforming
- Vacuum Distillation
- H-oil
- Lube Oil
- Blending
- LC Fining
- Catalytic Reforming
- Aromatics Extraction
- Hydrogen Production
- Ethylene Dimerization
- Hydrodesulphurization

**Chemicals**
- Ethylene
- EB Styrene
- Xylenes Separation
- Polyethylene
- Polypropylene
- Ethylene Oxide
- Ethylene Glycol
- Methanol
- Ammonia
- Urea

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Benefits of a comprehensive operator training program

• Improve plant safety and reliability
• Address ageing workforce; new generation of workers in need of training
• Reduce time-to-competency
• Accident risk reduction; safety through composure
• Effective response to abnormal situations
• Normal and emergency procedure validation
• Improve yields
• Standardize knowledge and procedures
• Improve response time
Open discussion, Q&A

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