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

Performance degrades without a sustained training program

- **End of initial training**
- **With practice of simulated upsets**
- **With no further practice**

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....

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...

“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

Copyright 2010 RSI Simcon, Inc.
• Fatal accident; Tosco, Avon refinery, Martinez California 1997
  • “… operator training materials were outdated.”

• 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.”

• Fatal accident; Baker Panel Report on BP Texas City Isomerization explosion 2007
  • “… the lack of rigor in operator training was not a Texas City phenomenon, but exists in greater and lesser degrees 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>
</tr>
</thead>
<tbody>
<tr>
<td>• DCS Introduction</td>
<td>• Distillation</td>
<td>• Process Description</td>
</tr>
<tr>
<td>• Math for technicians</td>
<td>• Boilers</td>
<td>• Procedures</td>
</tr>
<tr>
<td>• Instrumentation</td>
<td>• Furnaces</td>
<td>• Training workbooks</td>
</tr>
<tr>
<td>• Pumps</td>
<td>• Compressors</td>
<td>• Assessments</td>
</tr>
<tr>
<td>• Valves</td>
<td>• Reactors</td>
<td>• Unit drawings</td>
</tr>
<tr>
<td>• Thermodynamics</td>
<td>• Refrigeration</td>
<td>• DCS unit-specific</td>
</tr>
<tr>
<td>• Process control</td>
<td>• Heat exchangers</td>
<td>• Routine duties</td>
</tr>
<tr>
<td>• Chemistry</td>
<td>• Troubleshooting</td>
<td>• Safety systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Advanced regulatory control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Advanced process technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Multi-variable Process Control (MPC)</td>
</tr>
</tbody>
</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
  - Instrumentation
  - Heat exchangers
  - Unit-specific training
  - Troubleshooting
  - Parallel
  - 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

1. DCS Introduction 4
2. Instrumentation Basics 5
3. Process Fundamentals 2
4. Technology-specific Fundamentals 5
5. General Computer Skills (ongoing)
6. Regulatory Control 5
7. Unit-specific DCS 3
8. Unit-specific Control Strategies 5
9. Job Orientation – Routine Duties (ongoing)
10. Unit-specific Simulator Training 30
11. Multivariable Predictive Control (MPC) Basics 2
12. Unit-specific MPC 5
13. Advanced Process Technology 2
14. Final Written and Demonstration Exams 2
15. Parallel 10

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
• 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
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

Copyright 2010 RSI Simcon, Inc.
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

George Dzyacky (di-za-key)
Director of Training Services
RSI Simcon, Inc.
1880 Diary Ashford, Suite 685
Houston, Texas 77077
Office: 832.448.5900 ex. 215
Mobile: 219.712.0434

george.dzyacky@rsisimcon.com