Neil Freeman
Operator Competency
Plant Operators

enabling business? (efficiency, risk)

constraining business? ($\Delta SP$, $\Delta OP$, ALARMS)

Operators Today

Loops in MAN

Complexity

$\downarrow$ waste

$\downarrow$ energy

$\Delta$ changes

? abnormalities

Efficiency

More w/ Less

Operators Tomorrow

$\uparrow$ safety

$\uparrow$ productivity

$\uparrow$ sustainability

$\uparrow$ ROI

- Incidents
- Variability
- Downtime
- Missed Targets

Alarm Mgmt

Conditional Monitoring

Adv Proc Ctl

Support

= Process Performance

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The only thing wrong with Experience ... obtaining it takes a very long time.

Capturing life’s experiences is done in the real world!
Why
Converting an operator from average or below average productivity to above average productivity can improve the bottom line by approximately $250,000.

American Petroleum Institute
People Impact is Critical

Time to competency vs. optimum time in role vs. average time in role (current incumbents removed)

Time (months)

- Average time to attain "competency"
- Average time in role
- Average optimum time for an employee to occupy this role
Defining Operator Competency – What is it?

- Competency
  - ability to effectively apply experience in performing a specific task properly
  - there must be an element of criteria that defines/assesses proper execution
- Standards, Qualification & Certification
  - Regulatory process to define scope, criteria & methods of competency assessment
- Experience is required to properly perform a specific job founded upon:
  - Knowledge – Fundamental Process Understanding
  - Skills - Procedural Training, Practical Skills, Achieved through Practice
  - Behavior – Composure, Trained Response, Reflexive Under Pressure
- Expert
  - Possess reliable expertise, confident understanding
- Expertise
  - Skills, knowledge and understanding possessed by expert
- Experiment
  - has no place in production but can be a great training strategy

*Process Knowledge & Operating Skills*  
*Go hand in hand with Theory & Practice*  
*Behavior comes with Confidence*
Sustainable Business Results from a Long Term Training Program

**Normalized Production rates – Last three Turn-arounds**

3 Results
- Rapid 3 Day Startup
- Design Target Achieved in 21 Days
- Outperformed Design Target (105%)
- 46 Day Average - 92.4% of Design
- Flaring Reductions of 2000 Tons

2 Results
- 3 Major Plant Upsets During 45 Days
- 46 Day Average - 62.7% of Design

1 Results
- Slow 10 Day Startup
- 5 Days Troubleshooting
- 46 Day Average - 58.8% of Design

Benefits captured during Startup exceeded 5 times simulator cost
What
What are simulators?

The Plant

The Plant DCS

Networked Dynamic Plant Models

Operator Stations

Instructor and Engineer

Real World

Virtual World
What are the types?

- Customized direct connect High Fidelity OTS
- Process Training Simulator
- Generic OTS
- Customized Standalone OTS

Benefits vs. Price

- Specific
- Complex
- Instructor
- Simple
- Advanced
- Multiple
- Foundation
- General
- Single
How do training simulators help?

• Training is specific:
  – Focus on start-up, recurring failures, practice difficult or critical procedures

• Training is practical:
  – Use familiar console interface with realistic plant responses

• Training is motivating
  – Goals can be achieved
  – Confidence is built
  – Experimental learning
  – Procedural learning

• Simulator based training offers unique advantages
UniSim Operations Suite User Interfaces

UniSim Engineering Station
UniSim Instructor Station
UniSim / Experion Operator Station
UniSim Session Designer

UniSim Design Dynamic
UniSim Safety Manager Control Environment
Experion SimC300
Experion Server

UniSim / Experion DCS Interface

UniSim Design Dynamic
Operator performance can be decomposed into three levels:

- Competency: Subjective (Instructor Ratings) and Objective (Competency Metrics)
- Task: Task Completion (Checklists)
- Outcome: General and Specific Performance

How to Assess:

- KPI Variation (TPTs)
- Task Completion (Checklists)
- Subjective (Instructor Ratings)
- Objective (Competency Metrics)

*** not shown in storyboard ***
Define Competency Assessment Approach

- Define competency assessment approach

**TASKS**

**COMPELENCY MODEL:**
- All Users
- Console Operator Level 1
- Console Operator Level 2
- Supervisor
- Field Operator

**BEHAVIORAL INDICATOR(S):**
- Maintain Situation Awareness
  - Detects process changes by regularly reviewing operating displays
  - Understands causes of process changes and their likely impact on plant performance
  - Accurately predicts future plant status based on current process changes

**RATING SCALE:**
- 3-Region Anchored Scale
- 7-Point Likert Scale
- Binary scale (Yes, No)
- Multiple choice
- Percentage scale
- Comments only
- 4-Point Observational
Review trainee performance after exercise and provide feedback.

- Instructors use the performance dashboard to provide feedback to the trainee.
- The feedback provides the basis for coaching and any recommended interventions.
- Interventions can be any number of things such as:
  - Repeat the exercise
  - Review related training modules/procedures
  - Complete an ad-hoc exercise
  - Complete a related exercise from the library
Typical Operator Assessment Measures

• DCS Interaction Skills
  – DCS Familiarization with regulatory loop, graphic, faceplate, trend
  – Peripheral Skills – handling keyboard & mouse
  – Alarm Handling – prioritized acknowledged, response, managed
  – Emergency Shutdown System – operator interaction with ESD

• Procedure Compliance – intent, task, sequence, precedence
  – Safe Start Up – sequence, safe/best practices
  – Safe Shutdown – sequence, safe/best practices
  – Rapid Process Recovery – recognition, diagnosis, response, recovery
  – Troubleshooting Skills – early event detection and incident avoidance

• Personal Skills
  – Communication – clear, open, 2-way dialog with team
  – Confidence – composure, methodical, ability to adapt, takes charge

• Assessment Criteria
  – Subjective/Qualitative
  – Quantifiable/Measurable
Challenges

Automation - APC

Retirements

Demographics

Lower entry levels

Complexity

Environment

Mentoring

Global virtual teams
Operator Experience

• An Operator Training Simulator is a great *Dynamic Solution* that packages life’s lessons quickly
  – Basic Training for New Operators
    • Process/Control Familiarization  1 week
    • Initial Startup, Shutdown  1 week
    • Incident Avoidance  1 week, 10 exercises
    • Incident Recovery  1 week, 10 exercises
  – Annual Refresher Training between Turn-Arounds
    • Incident Avoidance  1 week, 10 exercises
    • Incident Recovery  1 week, 10 exercises