Early Delivery Partial Task Simulators
Support Training for Fast Track Projects

Alex Lekich
Alex.Lekich@gses.com
Overview

- Discuss the value proposition
- Simulator project implementation
- Control systems approach and results
- Summarize the benefits of having an early delivery partial task simulator
The Value Proposition

• The user need
  – Gas conversion project success
  – Immediate & long term training objectives
  – Focus on Safety

• Possible solutions
  – OJT during commissioning
  – Classroom training
  – Full Scope Simulator
  – Generic Simulator
  – Partial Task Simulator
Simulator Project Implementation

- Define details of system solution
  - Confirm the areas of training focus
  - Determine which plant systems need to be simulated and to what extent?
  - Which DCS graphics screens support gas firing training?
  - Identify logic what & where (DCS, other)?
  - Data collection & availability
Simulator Project Implementation

• Started while unit gas conversion design was still ongoing
• No usable I/O list existed
• DCS database, logics and screens were in flux or incomplete during simulator build
• Data availability challenges given actual plant design schedule
  – Many questions
  – Periodic updates of logic drawings
  – At times had to interpret and design logics
Simulator Project Implementation

• Process models typical of drum unit
• ABB DCS required emulation as working configuration files not available yet
  – Control logics (84 drawings)
  – Graphics (18 pages)
  – Our experience with the ABB Symphony Plus DCS System was leveraged
Simulator Project Implementation

• Remote & factory testing enabled
• Simulator shipped three months ARO
• Installation in a day
• Training began immediately

• One interesting stated outcome was the simulation engineers learned the logic very early in the project and this made the full scope testing more efficient
Overview of Systems Modeled

• The high fidelity plant systems were
  – Fuel Gas
  – Boiler Water/Steam
  – Boiler Air/Gas

• Boundary conditions functionally modeled to support mass and energy balances (FW, etc.)
• Electrical generation functional but power to equipment assumed available or simple on/off
• BOP systems not modeled
High Fidelity Modeling (FS)
High Fidelity Modeling (AG)
High Fidelity Modeling (BR)
High Fidelity Modeling (FW)

HiFi model but tested less rigorously for early delivery simulator as BOP
Emulated Operator Graphics
• This was a key training need
• Some data missing
• Fast track to full scope facilitated beneficial changes to logics and screens
Emulated Gas Header Help Graphic

- All gas firing help screens were critical for training
Emulated Boiler Purge Help Graphic

- Did not get purge logics
- Had to take DCS permissive screen and engineer
Emulated MFT First Out Graphic
Emulated Gas Recirc Graphics
Other Emulated Graphics

Boiler tube temps available in the hifi JTopmeret model and an important change to unit operations given gas conversion.

While BOP, a hifi JTopmeret model made mass and energy balances easier to deal with on the early delivery simulator.
Simulator Emulated Logic (Gas Leak Test)
Simulator Emulated Logic (MFT)
Simulator Emulated Logic (Burner Light Off)
Simulator Emulated Loop Logics
Resource Team

• GSE: 3+ team members plus Project Manager plus partially assigned logics engineers, graphics designers & Computer System Analyst

• From End User: 3+ operations & I&C

• From Consultant: 2 at various times “driving” testing & prep for training
GSE Mantis DR System

- An online system linked everyone
- Different sections available for different types of discrepancies
  - GSE graphics to logics to system modelers
  - DRs can be assigned to responsible person, commented on, and edited (data support)
- Debugged and corrected logics in virtual commissioning mode and provided feedback to plant design team
Overall Benefits

• Early training on targeted plant systems prepared operators for actual change management
• Real-Time training even during the integration/testing
• Startup/Shutdown procedures were updated based on interaction with the simulator during integration
Overall Benefits cont.

• Plant logic exercised with customer I&C engineers and allowed for correction of logics, graphics, & db issues before actual commissioning

• What was a training project became a virtual commissioning project
Overall Benefits cont.

- Integration/testing of early delivery simulator prepared the customer team for full scope simulator testing
- Early delivery, **plant specific** partial task enabled full scope simulator development continuity (SUTs)