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DeltaV Live Upgrade: Comprehensive Database Migration to PCSD for DeltaV Live

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DeltaV Live/Upgrade: Comprehensive Database Migration to PCSD for DeltaV Live

MICHAEL GRBICH	Project Summary
SHANNON PAYNE	Pre-Work and Design
IAN PINTO	DeltaV PCSD Library Development
SHANNON PAYNE	Testing & Integration
IAN PINTO	Implementation
SHANNON PAYNE	Challenges & Learnings
MICHAEL GRBICH	Conclusion

Project Summary

Execution goals overview

Project Goals for DeltaV Live

- Create new graphics in DeltaV Live for operations using the original graphics as a starting point
- Develop a tailored library specifically crafted to enhance the features of DeltaV Live graphics.
- Utilize the latest version of PCSD to make a custom library to serve the needs of 5 different process units
- Upgrade all current modules to employ the latest function blocks such as EDC, DCC, AT, etc.

Project Goals for the SIS

- Move all Cause-and-Effect Graphics from Wonderware to the DeltaV
- Migrate all SIS alarms to the DCS for tracking, conditional alarming, and tuning
- Utilize the DCC/EDC Function blocks for the DCS Resets to the Triconex SIS System
  - Use the interlock and permissive features to better inform operations on conditions preventing a reset

Additional Project Goals

- Upgrade our DCS System to Version 15
- Upgrade all serial cards and VIMs (Virtual I/O Modules) to redundant EIOCs with firewalls
- Create custom library templates for our SIS modules
- Migrate all landing modules from former serial communication to LDTs (Logical Device Tags)
- Remove all Soft AI function blocks and replace them with traditional AI blocks for enhanced functionality

Projects Executing on the Same Timeline

- Wonderware upgrade and graphics revision
- SIS Version & Processor Upgrade
- New Compressor governor SIS System
- SIS program modifications based on PHA recommendations
  - These changes had to be captured and added to the new Cause and Effect graphics in DeltaV Live

- ***These projects were not part of our project, but affected our planning & implementation

Pre-Work & Design

Laying The Foundation

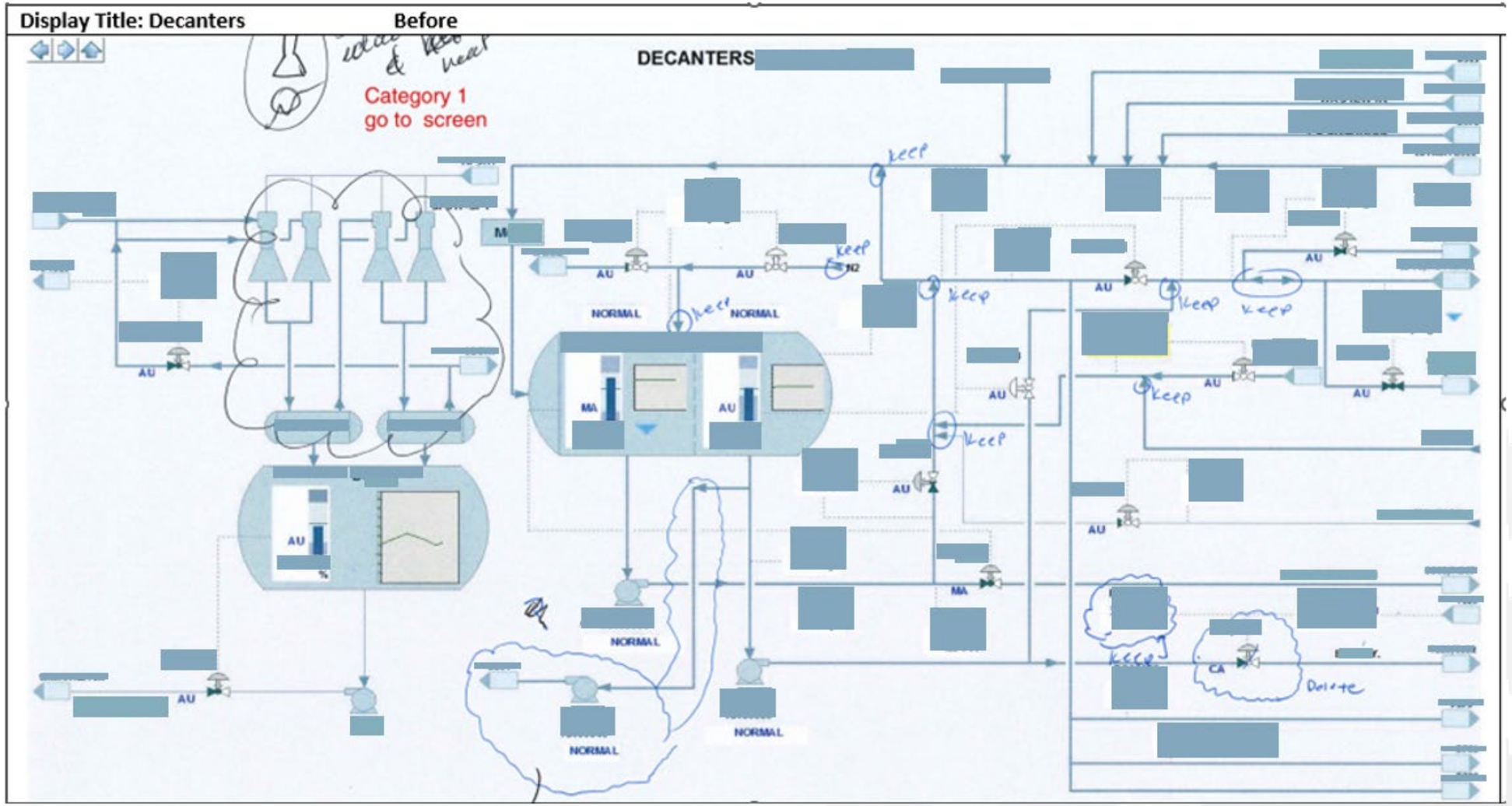
Graphics Workshop

- The first step to completing our goals was to re-design our graphics utilizing our current graphics as a starting point.
- We hired an Emerson Process Control Consultant specializing in operator interface and Operational & Situational Awareness standards.
- We designed formal Level 1, Level 2, & Level 3 Graphics
  - Also created purpose-built graphics for rate changes, and other unit activities
- We removed extra arrows, minimized crossing lines, reduced clutter on our graphics, and made all flows go from left to right where possible
- We elected to receive our updated graphics in Visio format for correcting and updating
  - This also helped our Emerson team create our new graphics in DeltaV Live

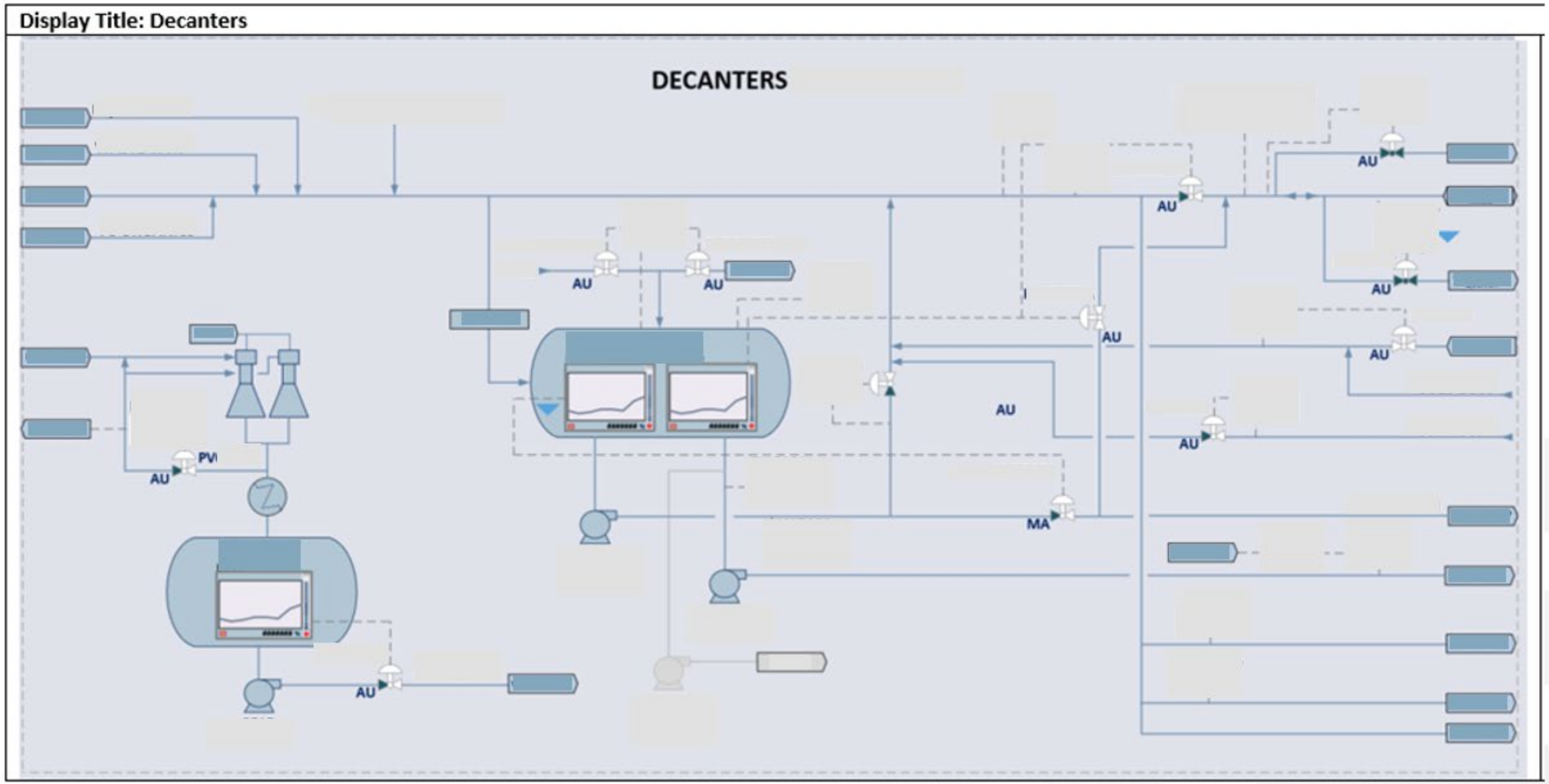
Workshop Summary

- I selected 2 operators per console to attend the workshop
  - 1 seasoned operator well respected by his peers
  - 1 younger operator who was held in high regard
- We had screen prints of every graphic in our system, unit PIDs, and PFDs
- I had remote access to our current system
- We gave our consultant a tour of our control room, console, and operator workspace
- We spent 3 days reviewing Level 3 graphics and getting them updated
- We spent the 2 days reviewing our overview graphics and modifying them to meet Level 2 graphics standards
- We spent the last 2 days creating 3 Level 1 graphics

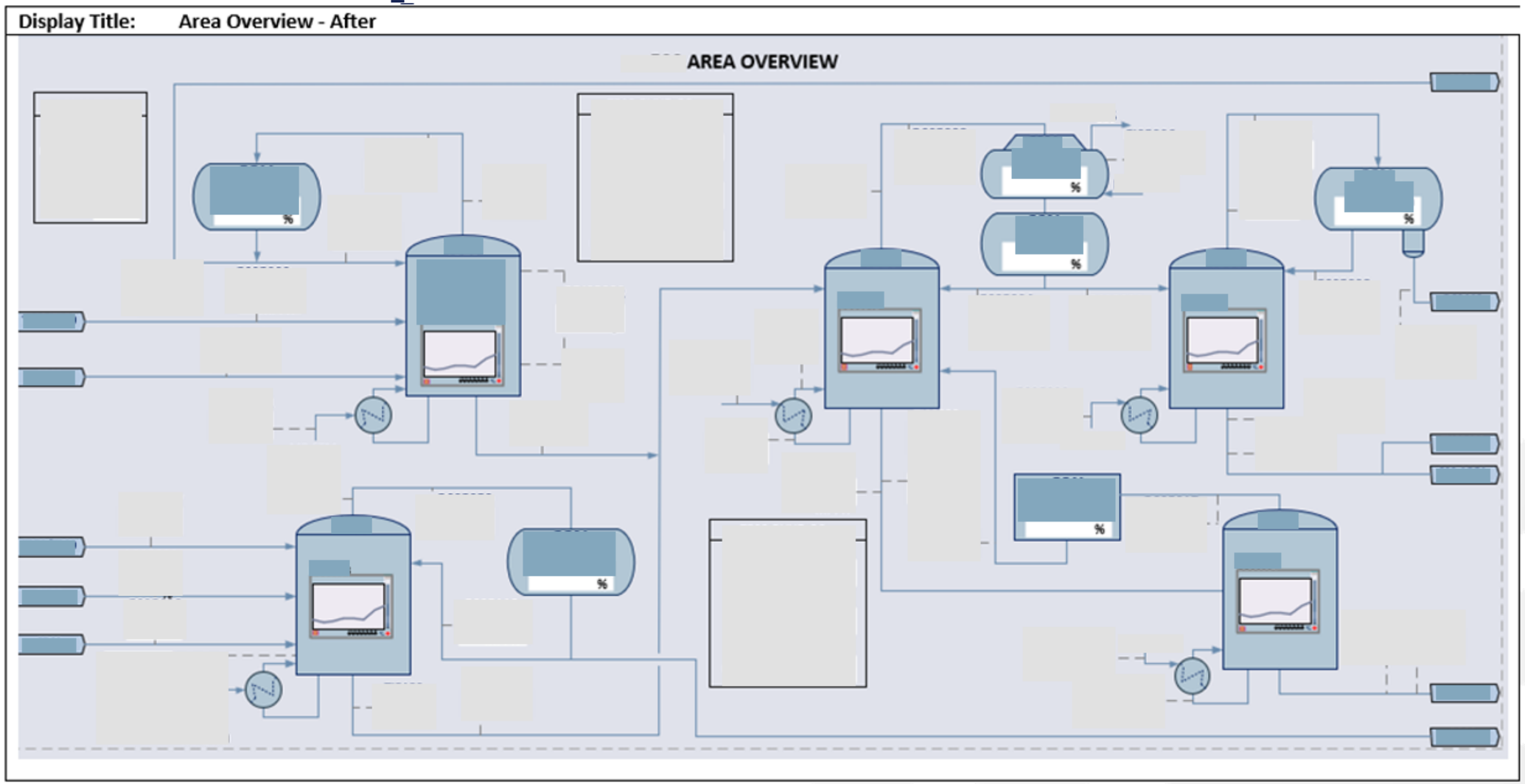
Graphics Workshop Example



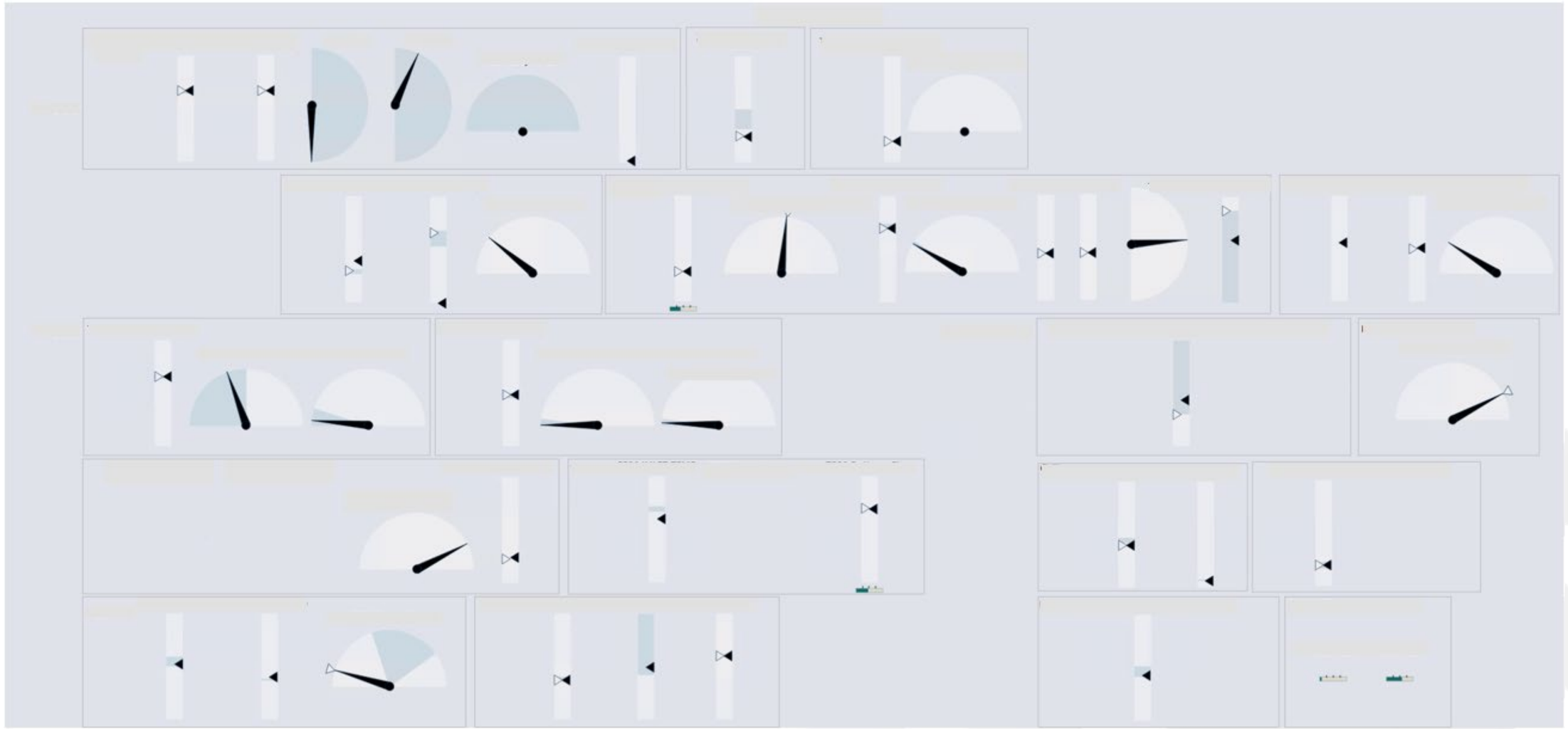
Visio Example Level 3



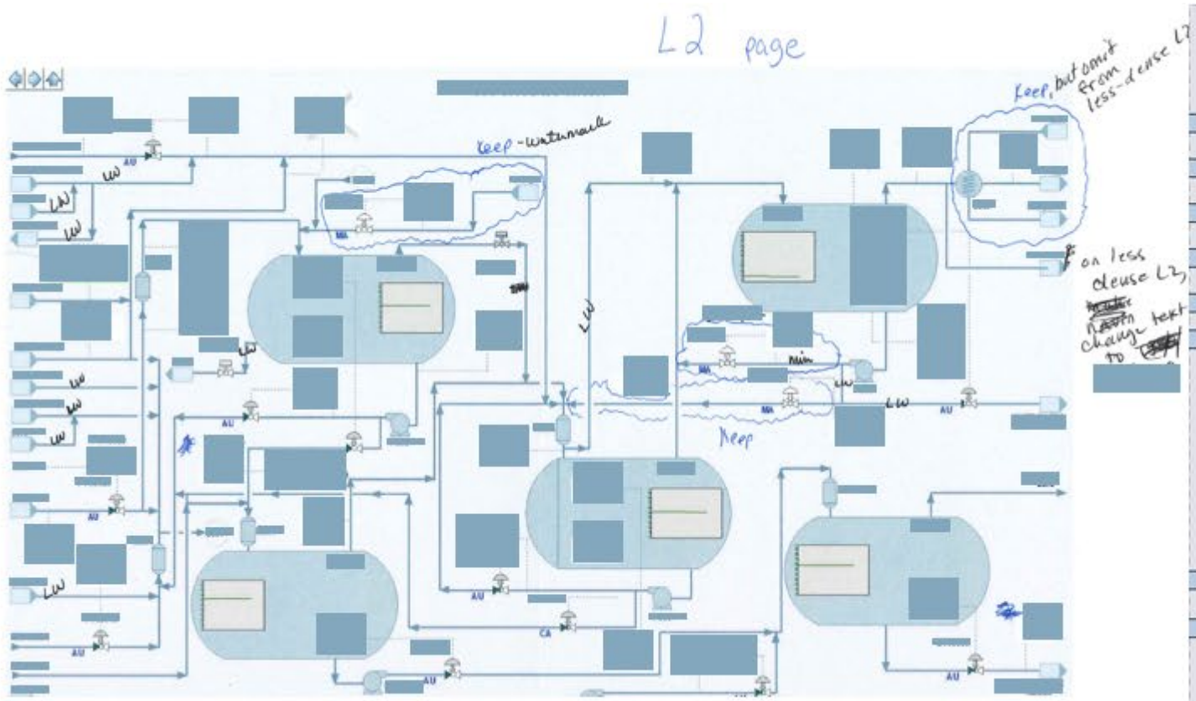
Visio Example Level 2

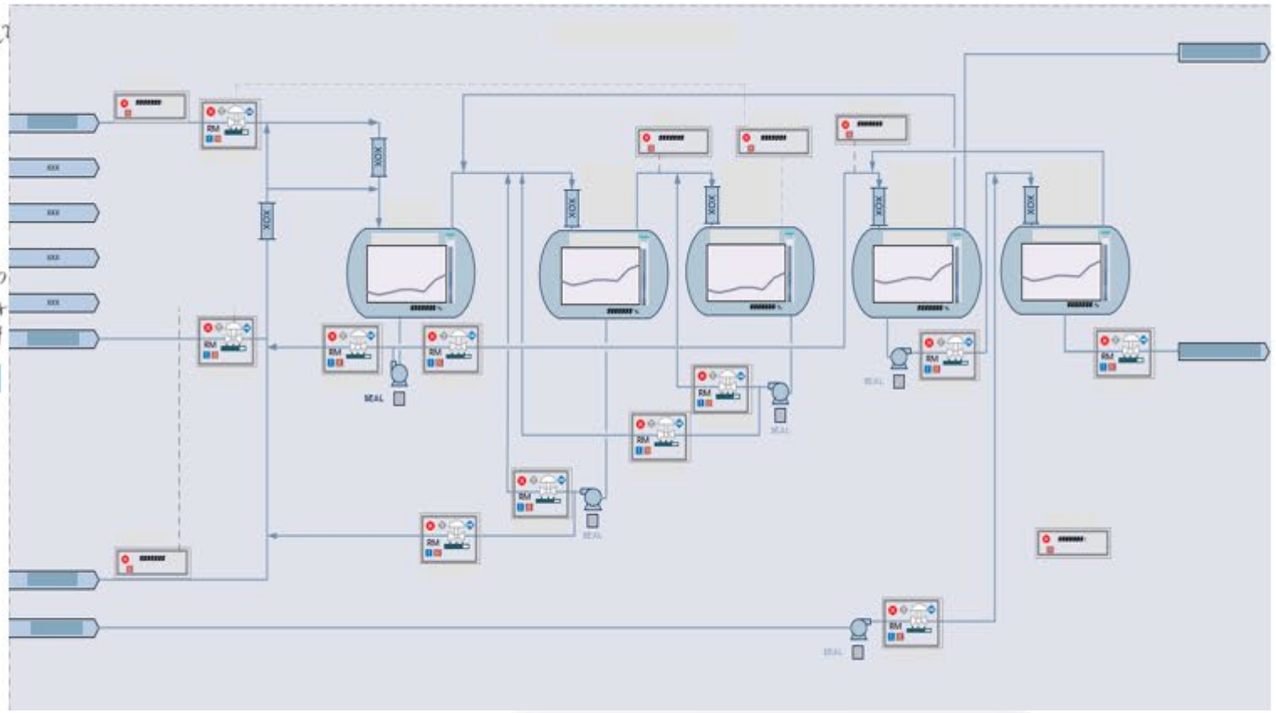


Visio Example Level 1



Before & After Comparison





Graphics Workshop Conclusion

- Graphics were returned to us within weeks of each workshop
- I reviewed Visio results with the original operators, then the whole group of console operators
- There were some redlines and revisions, but all were minor
- Once we agreed the graphics were finalized, we sent them over to our Emerson Automation Team
- We used these graphics to decide which Gems to use for our DeltaV Live graphics

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DeltaV PCSD Library Development

Library Mapping & Planning

Scoping Meeting LYB

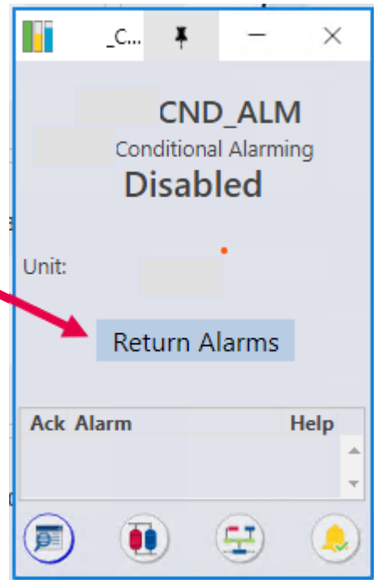
- Reviewed our Visio graphics with the Emerson Automation team
- Reviewed our current DCS library with the Emerson team, discussing the features we wanted to maintain
  - Setpoint tolerance features added to every module
  - Use of alerts vs alarms and operations vs supervisor permissions
  - Special case alarms utilizing alarm word
  - Color tables and alarm colors
  - Force Sim Graphic for scanning loops in simulate or debug
- Discussed implementation date & incorporating SIS portion of project with another integrator
- Covered the entire scope of changes and the responsibility of each provider

Scoping Meeting Emerson

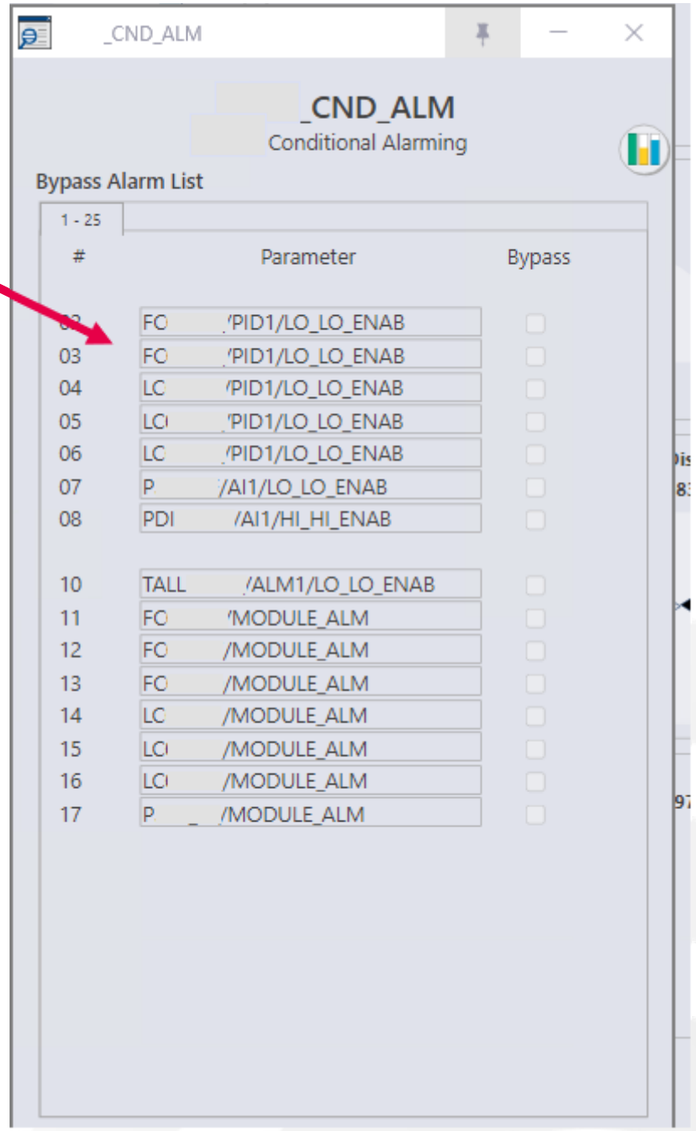
- Previewed the base PCSD library modules and new function blocks
- Reviewed DeltaV Live Gems and graphics features
  - LYB selected the features we wanted to utilize
  - Emerson discussed the licenses LYB would need to purchase based on the features and enhancements selected
- Emerson walked LYB through their process for developing the library and graphics
- Discussed timeline for execution and FATs
  - Planned our method for FAT & SAT

Conditional Alarming Custom Module & Faceplate

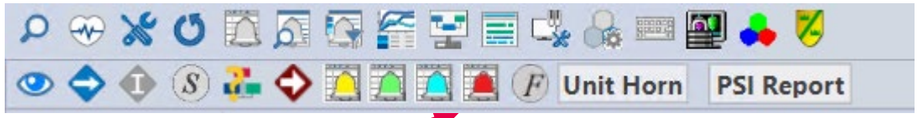
Operator push button to return alarms



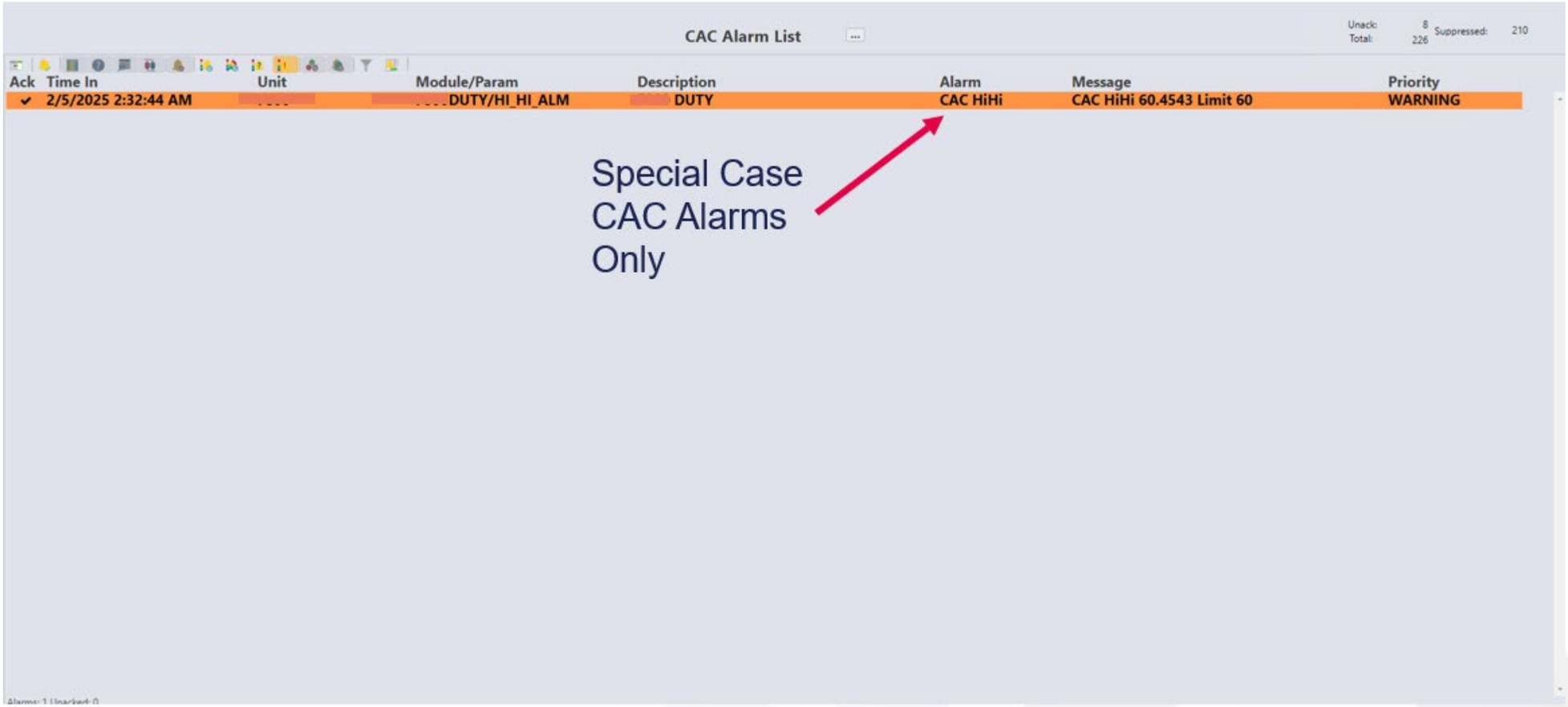
List of individual suppressed alarms



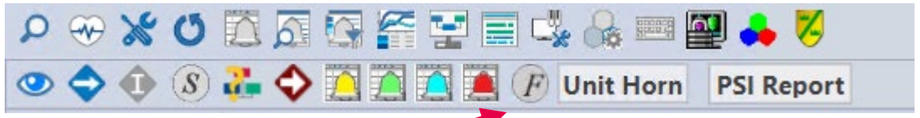
Conditional Alarming Custom Module & Faceplate



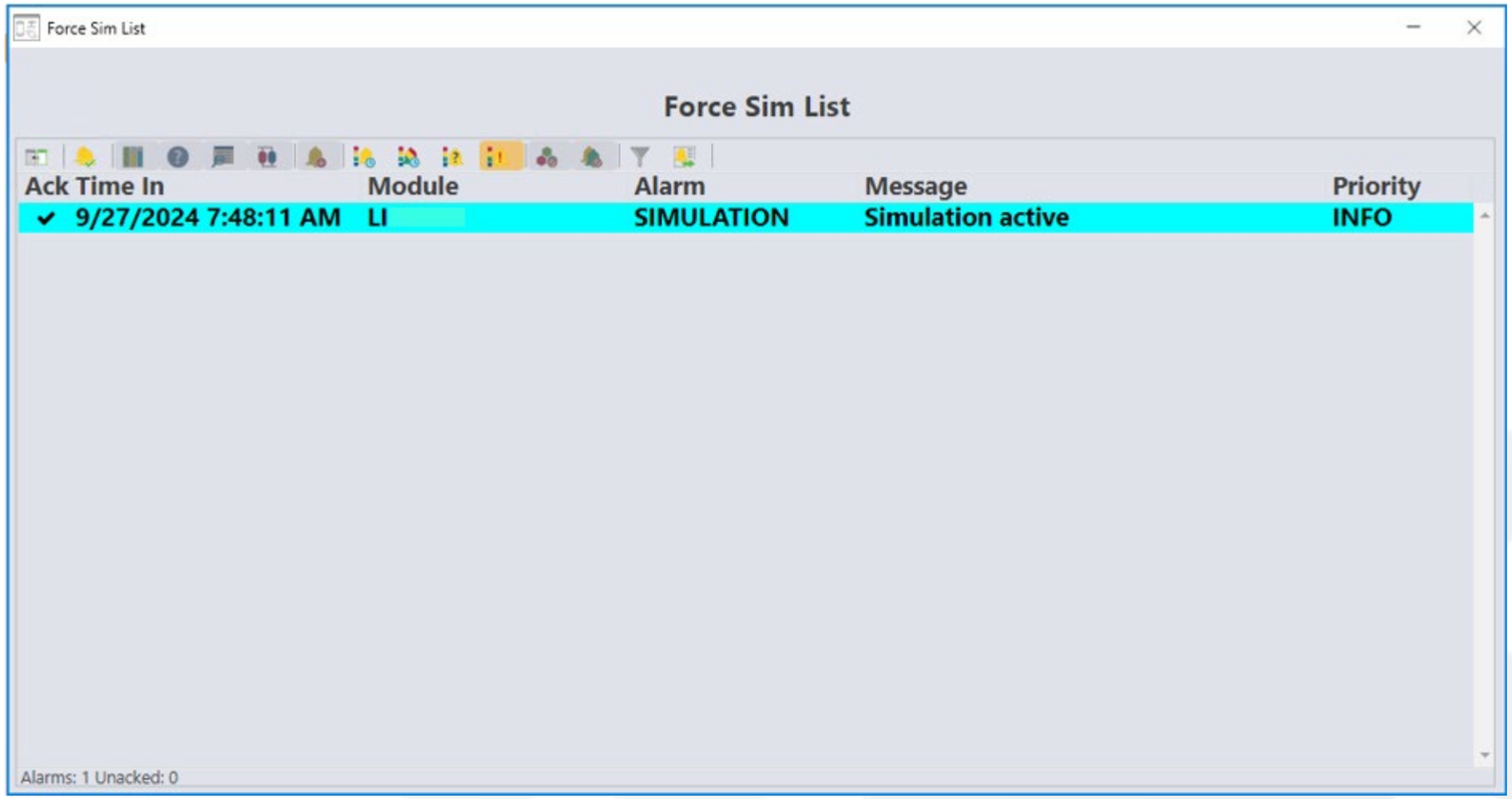
Custom Menu Button



Conditional Alarming Custom Module & Faceplate



Custom Menu Button



Library & Graphics Development

Post Scoping Meetings

- Emerson began by assembling the new library
- Once Library was completed, specific Gems were configured and demoed on a test page
- Face Plates & Detail Popups were demoed next
- Once all demoed items were approved, Emerson began creating the graphics

Weekly Reviews

- Shannon was at Emerson office every Wednesday for progress review
- We would demo the existing DCS to answer technical questions and resolve any snags the team found
- We would add to and remove item as open tickets needing input from either Emerson or LyondellBasell

Pre-FAT Checkout

- At library and graphics completion by Emerson, the library was given a pre-FAT review
- We met as a team and discussed FAT strategy and agreed to test by console based on operator availability
- Set the goal to complete all tasks with operations first
- Emerson compiled a spreadsheet of all module parameters vetted by LyondellBasell for comparing existing modules with new modules

Testing & Integration

Factory Acceptance Testing &
Assembling Each Segment of the Library

Pre-Testing

- We as a team checked our library and graphics to ensure it was ready to present to operations
- Emerson setup multiple dual & quad workstations as they exist at the console in the control room
- All layout files, menus, popups were checked on each mock workstation
- Emerson setup 4 stations for FAT and provided 2 Automation engineers on site and one remote during the entire 8 week FAT

Parallel Work & Testing

- SIS system integration team programed all Cause and Effect graphics, SIS specific Control Modules, & Faceplates utilizing the library & setup data provided by Emerson
- A separate FAT was performed by console at the SIS integrator location
- All FATs were completed for the SIS and EIOC conversions prior to the main DCS FAT at Emerson
- LyondellBasell validated all of these items were successfully integrated into the library and graphics successfully at Emerson FAT
- Puffer-Sweiven began assembling our hardware, applying licenses, and setting up for the final integrated FAT while we were completed the DCS FAT with Emerson

Emerson FAT Part 1

- Brought in 6 operators over 4 weeks. 2 for each console
- Operations checked all control loops on each graphic
  - Primary
  - Secondary
  - Complex loops
- Emerson Technical Lead & LyondellBasell Technical Lead facilitated the SAT with operations
- 2 supporting engineers made changes and returned for retesting

Emerson FAT Part 2

- Emerson engineers assisted with detailed alarm audit from LyondellBasell master alarm database
- LyondellBasell technical lead reviewed all comparison spreadsheets for differences and reviewed and approved al module differences
- LyondellBasell technical lead checked all complex controllers and critical controllers comparing each control module with the 2 systems setup side by side
- 2 supporting engineers made changes and returned for retesting

Operations Training

- With the database complete Emerson worked with Puffer-Sweiven to setup a single dual monitor stand alone simulation system for training operations.
- LyondellBasell technical lead developed a training document covering all of the changes from DeltaV Operate to DeltaV Live
- Simulator was installed at LYB by Puffer-Sweiven
- LyondellBasell Technical lead trained all console operators per the training plan
- Simulator was left in place and running at site for operators to freely use and ask questions about

Implementation

Deploying the Project at Site

DCS Upgrade

- The first day of the turnaround maintenance window operations handed the unit over to CSE, reminding us that the tank farm would still be operating
- Puffer-Sweiven completed the DeltaV Version 15 Upgrade the first week
- SIS was running the entire time for operations to continue tank farm operations
- One small outage was taken while we flashed I/O controllers

DeltaV Live & Library

- Operations lead and console operator reviewed all graphics one more time
- LYB Controls System Engineering group received loops from instrument technicians simulating values at the field side of the marshalling cabinet
- Emerson technical lead and automation engineer supported any changes, filled out SAT documentation as we progressed
- Everyone involved completed one last alarm audit to ensure all alarming was correct and matched the LYB master alarm database

SIS Cause & Effects

- Since the DCS received all new cause and effect graphics and modules from the Triconex SIS system:
  - LYB Controls System Engineering group received loops from instrument technicians simulating SIS values as part of the complete SIS checkout all the way through to the DCS
  - LYB Controls System Engineering night crew shot all of the internal loops from the SIS to the DCS and checked out all of the resets

EIOC Checkout

- LYB elected to complete a 20% randomized loop check of all converted EIOC points that were not SIS
  - BentleyNevada
  - Detronics Gas Detection
  - ABB Analyzers communicating through analyzer gateway
  - MultiLin electrical breaker monitors
  - Mass Spec Flare analyzers
- LYB Technical lead reached out to each craft group ahead of time to have them work in the loop checks as possible during their turnaround tasks to minimize impact on other workgroups

Challenges & Learnings

Takeaways for Future Projects

3 Separate Integrators

- We utilized 3 separate integrators to accomplish our project
- We had several interactive planning sessions hosted at different integrators sites with everyone present to setup timelines, database freeze points, handoff dates, and discuss progress checks
- We minimized the number of meetings agreeing if there were any issues affecting timelines it would be brought to everyone's attention immediately and a special meeting would be called.
- We created a detailed project timeline with dates, responsibilities and mapping out any an all overlap

Undocumented Changes

- LYB technical lead was primary support for the unit being updated
- Other engineers and specialists were still making changes at site during the year we started this project
- LYB technical lead created a spreadsheet to track changes where nature of changes and dates were documented and any MOCs were uploaded
- Performed an audit once database was completed for new and changed control modules dating back to project inception date
- Minimal changes were missed, but resolved during SAT

Complex Implementation Strategy

- When all FATs were completed the entire team had 3 meeting to discuss implementation strategy
- Entire project was loaded and implemented with the upgrade, therefore the upgrade was given the priority
- The DCS was receiving a 100% loop check from marshalling cabinets for checkout, so the DCS team had 2nd priority
  - This was able to work during the SIS upgrade
- The SIS system was checked out all the way to the new Cause & Effect Graphics

Upgrade Challenges

- We experienced some communication issues and layout issues.
- We reached out to the Emerson Engineering team in Austin
- Finding: Latest firmware on KVM solution did not support DeltaV Live
- Resolution: Rolled back the firmware on the new switches and all machines resumed normal functionality
- Notes:
  - KVM solutions were new in-kind replacements
  - Historically we have not checked KVM solutions at FAT without issue.
  - Moving forward we plan to bring one KVM solution and set it up like a full workstation from site

DeltaV Licensing on RTS

- While checking out the Remote Terminal Server we found our DeltaV Live Plus Features were not working
  - Menu not correct, navigation issues, hover feature not working, etc
- Reached out to Puffer-Sweiven Sales rep and had the licenses expedited
  - Licenses were delivered within 36 hours
  - No Effects to timeline
- In the future we plan to setup the RTS for checkout during future DeltaV Live projects

Conclusion

The Benefits

Project Success

- We were able to restart our unit safely and efficiently
- We finished our DCS, SIS, HMI, ESD checkout in record time and were able to turn the unit over to operations 5 days early
- Surveying operations, they are very pleased with their system and the new enhancements
- Restarts from upsets have proven that the combination of DeltaV Live graphics and the work completed at the workshop made for better, more operator centric graphics
- The DCC programming for all interlock resets have reduced callouts and provided operators the ability to expediently troubleshoot restart issues
- This project is an example of investing time and resources up front is critical to a successful and smooth roll out.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