



High Performance Graphics for Improved Operator Interface

International District Energy Association
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UNI's Campus Utilities

- The UNI Power Plant generates steam and electrical power providing for lighting, heating and cooling for the main campus
- Four boilers with a total capacity of 345 kpph
 - Two gas and oil fired low pressure boilers
 - One pulverized coal fired boiler
 - One CFB boiler
- One 7.5MW extraction turbine



Project Overview

PROJECT: Replace Controls on Boiler 3 and Boiler 4

Replace obsolete controls and improve operation and maintenance

- Existing combination of DCS and pneumatic controls
- Very different platforms between boilers
- Difficult to maintain
- Limited availability of spares. Limited experienced technical support



Project Goals

PROJECT: Replace Controls on Boiler 3 and Boiler 4

- Improved control
- Benchboard removal and HMI upgrade
- Common platform
- Data visibility
- Improved maintenance



HMI ???



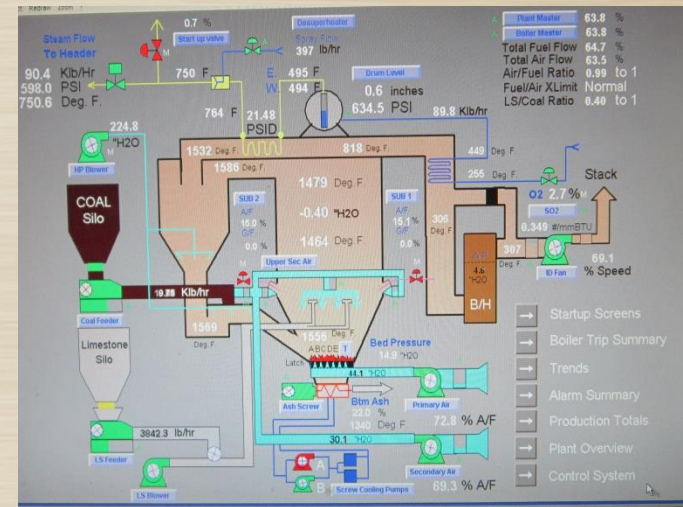
HMI Design



Boiler 3



Boiler 4



High Performance HMI

- **Guiding documents**

- ✓ *The High Performance HMI Handbook* by Hollifield, Oliver, Nimmo, and Habibi
- ✓ ISA101 – Human-Machine Interfaces
- ✓ ISA18.2 – Alarm Management

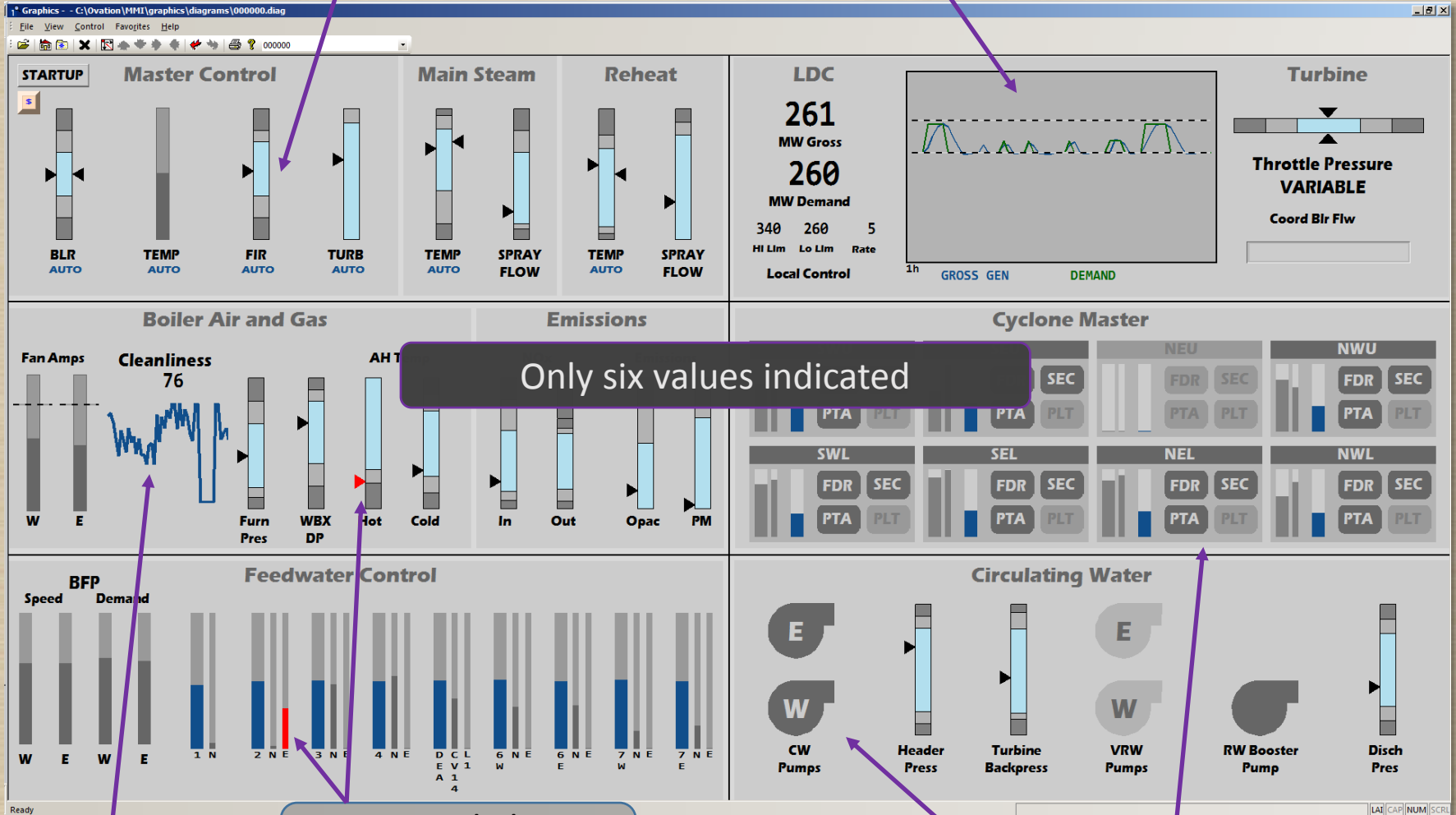
- **Enhance operational awareness**

- ✓ Low contrast depiction / Limited use of color
- ✓ Values are presented in context (information)
- ✓ Critical values included in embedded trends
- ✓ Alarm colors are reserved for only indicating alarms
- ✓ Hierarchy design

HP HMI

"Information" Bars

Embedded trends

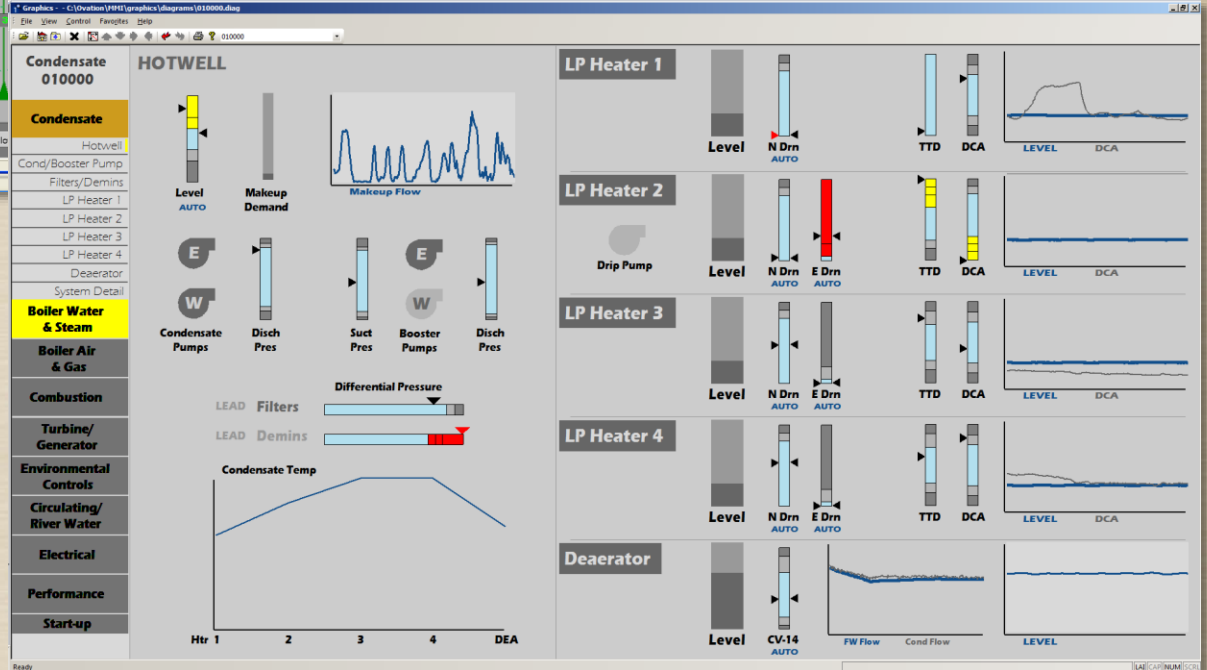
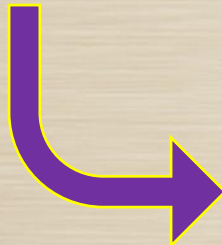
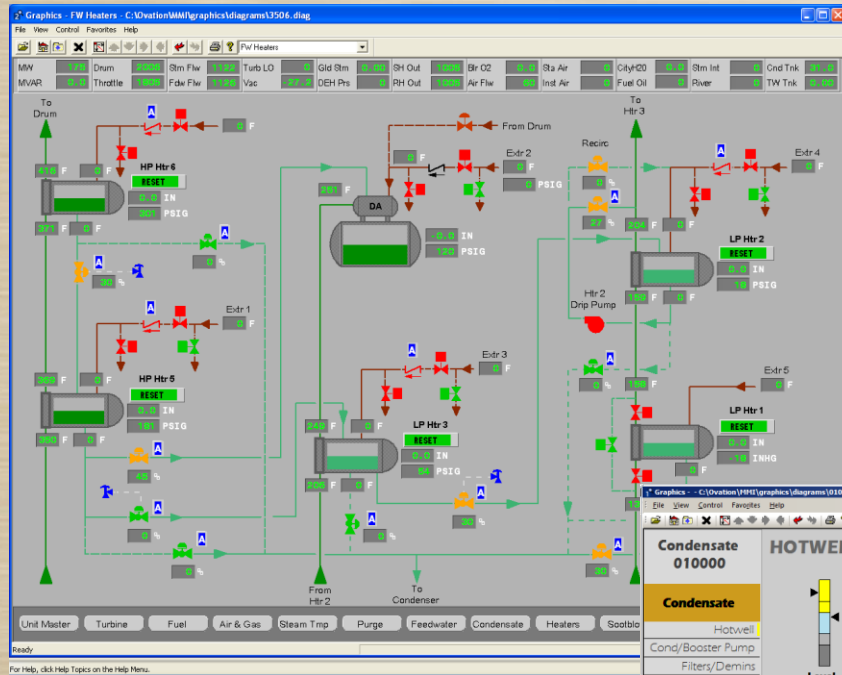


Sparkline

Reserved alarm
colors

Reduced color

HP HMI



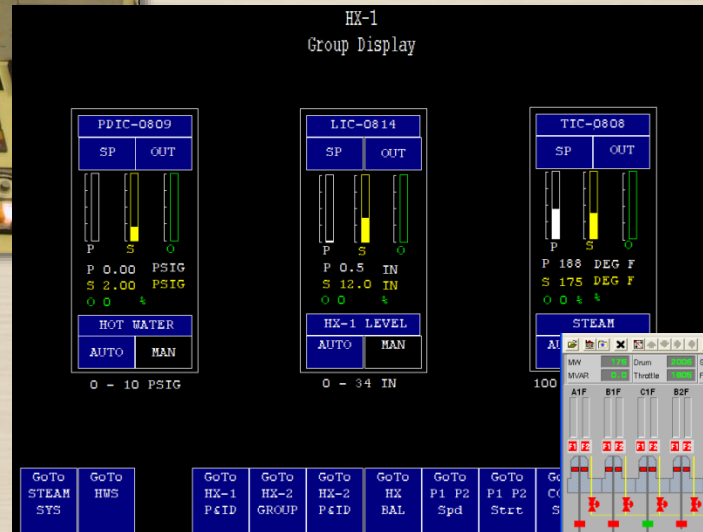
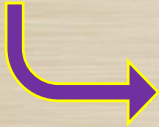
HP HMI



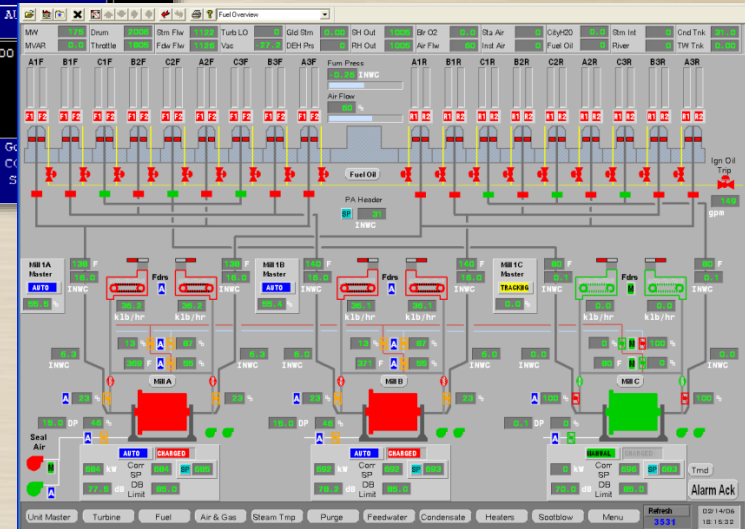
Interface Evolution



Benchboard



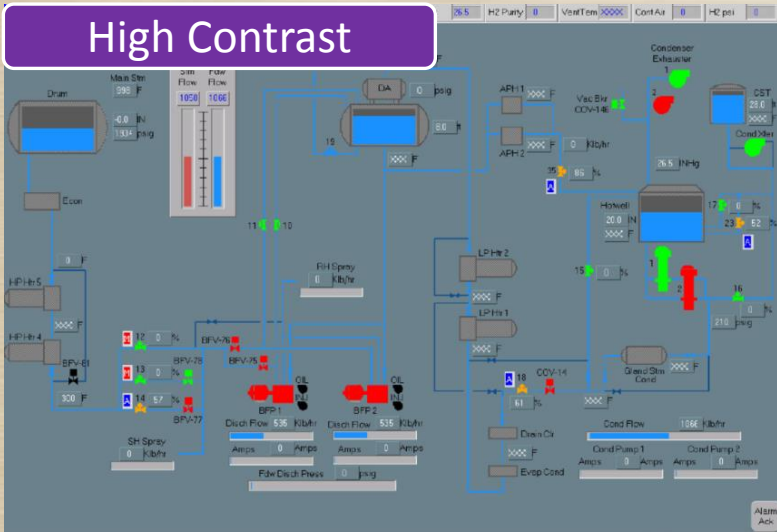
Faceplate



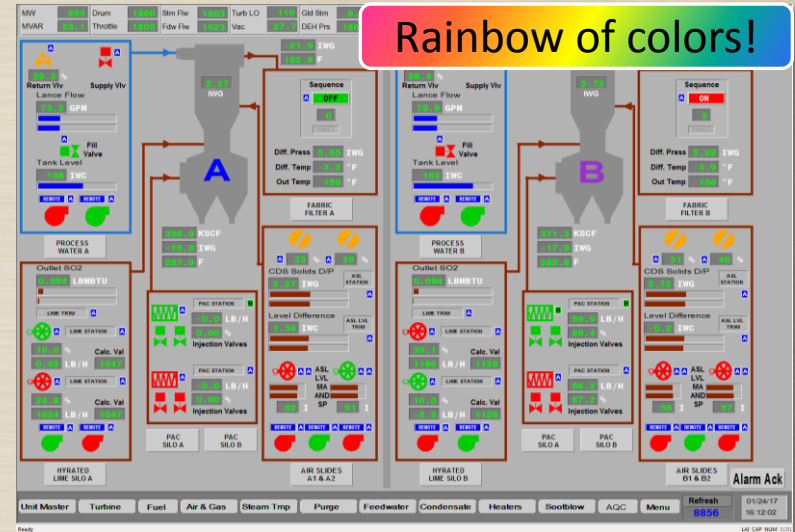
P&ID

Traditional HMI

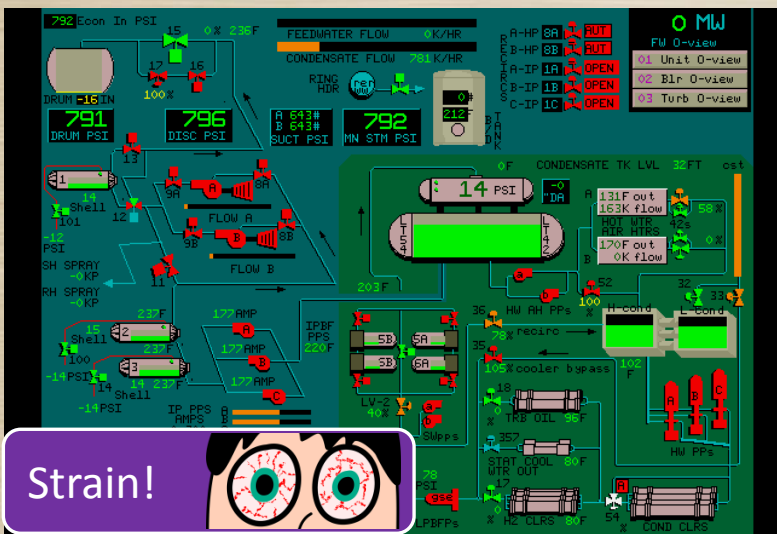
High Contrast



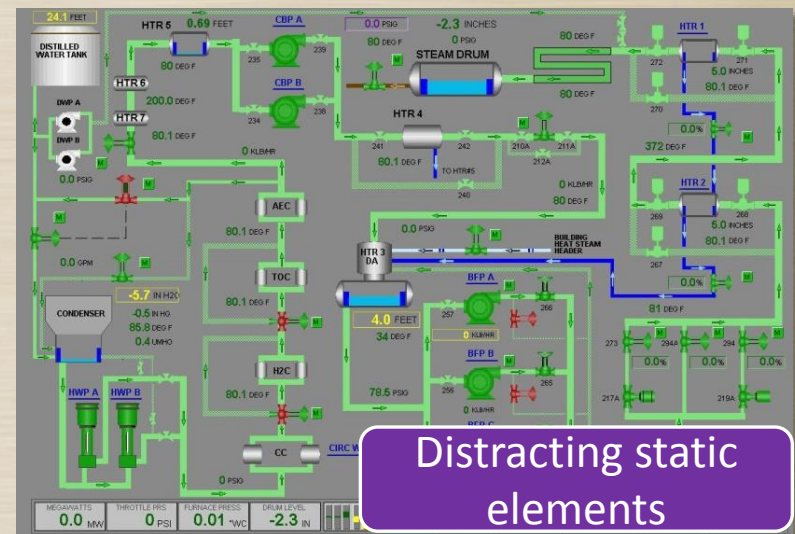
Rainbow of colors!



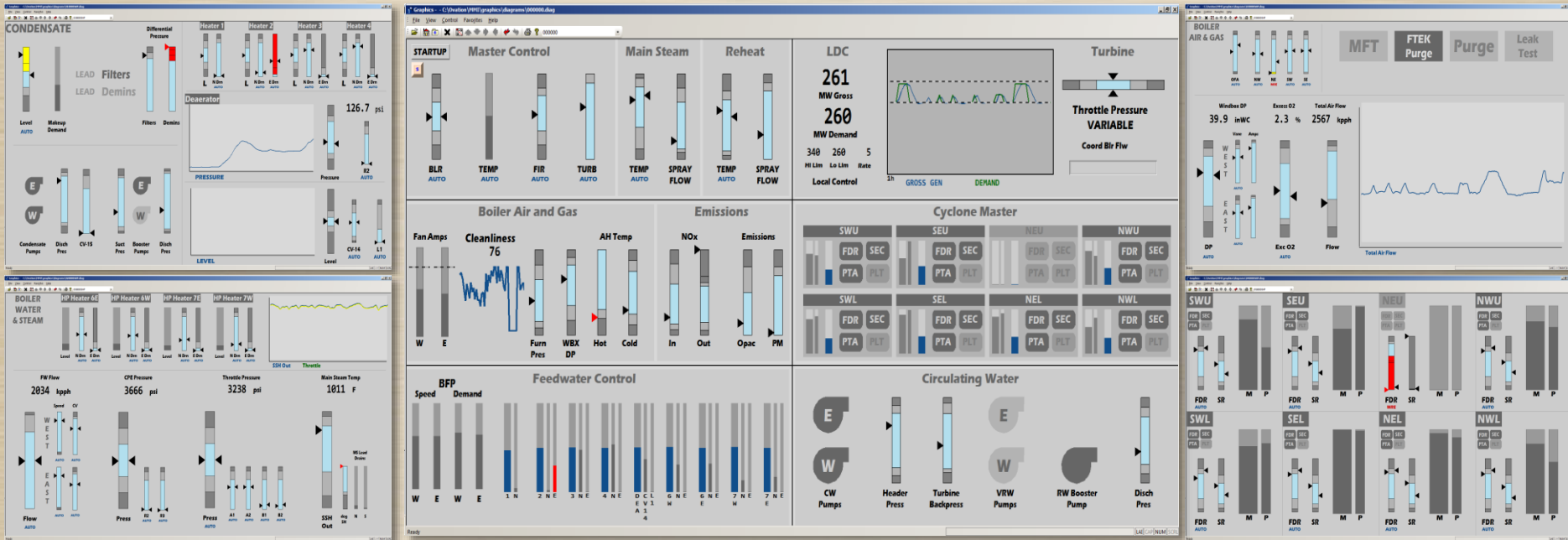
Strain!



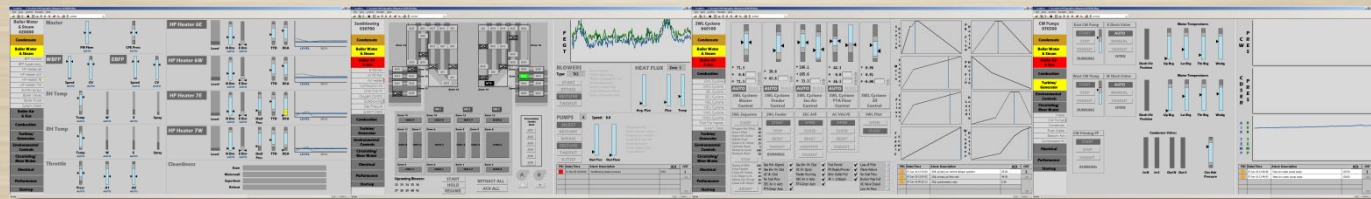
Distracting static elements



HP HMI



Benchboard



Operator Workstation

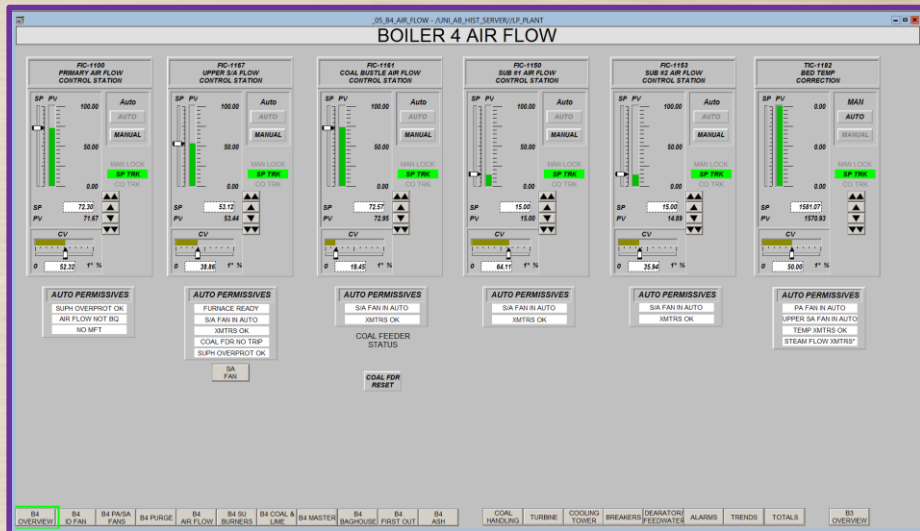
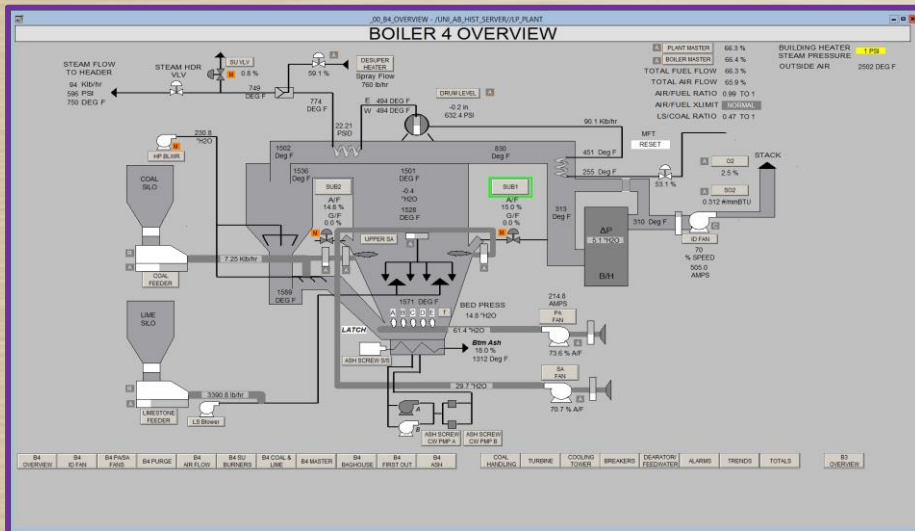
Going Gray in your 30s

- **Added goals**
 - + **Improve Operator Awareness**
 - + **Resolve Color Conflict**
- **Implementation**
 - **Project Management Triangle**
 - **Fast, Good, Cheap**
- **Too much, too soon**
- **Door open for further adoption**



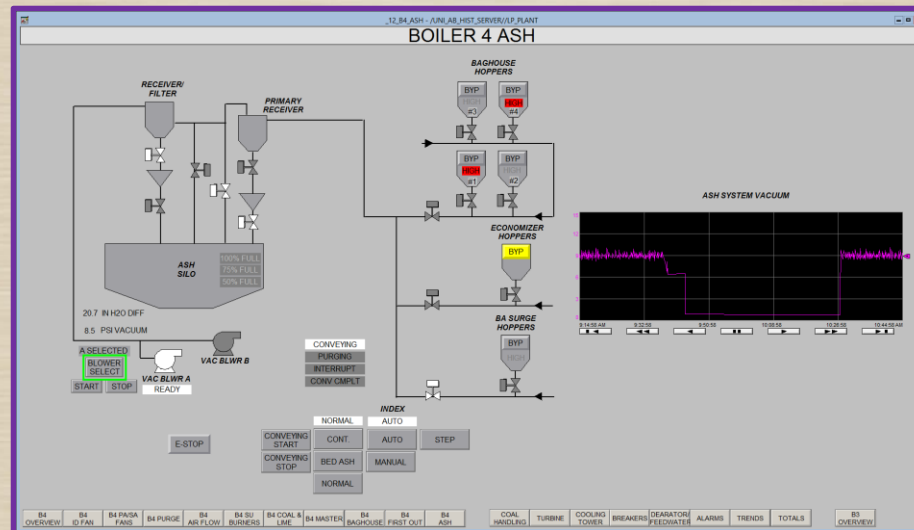
Project Solution

- Blended solution
 - ✓ P&ID with reduced color usage
 - ✓ Hard-coded faceplates with reduced color



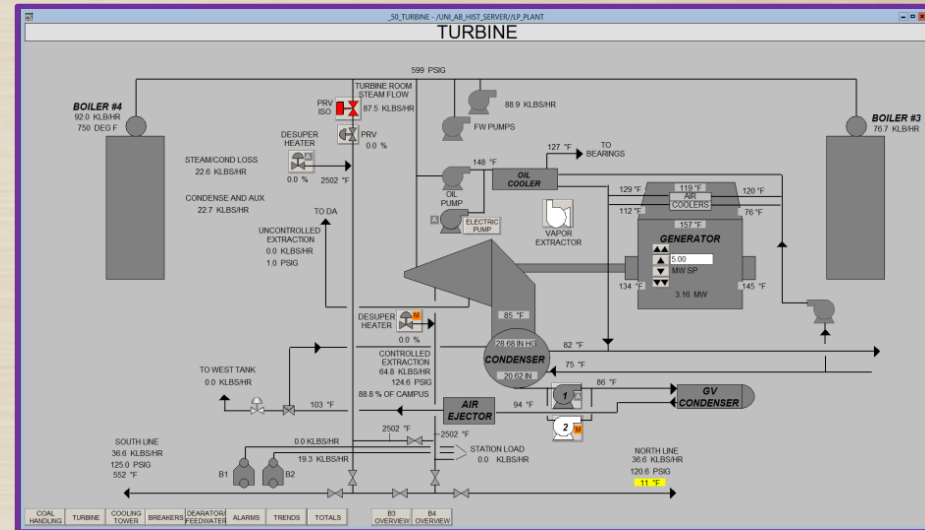
Project Solution

- Blended solution
 - ✓ Imbedded trends
 - ✓ Strong trends usage
 - Information bars....



Results

- + Success and satisfaction!
- ✓ Less distraction
- ✓ Easier to identify problems
- ✓ Easier to navigate
- ✓ Quicker to respond
- ✓ Improved information visibility
- ✓ Improved Control Room interaction



Things to Consider for Your Project

- You need a believer!
 - A collaborative team
- Scaled implementation
- Alarm Management is critical
- FAT and Training
- Operator adoption
 - Inertia *I HATE change!*
 - P&IDs
 - Digital values
 - Trends

