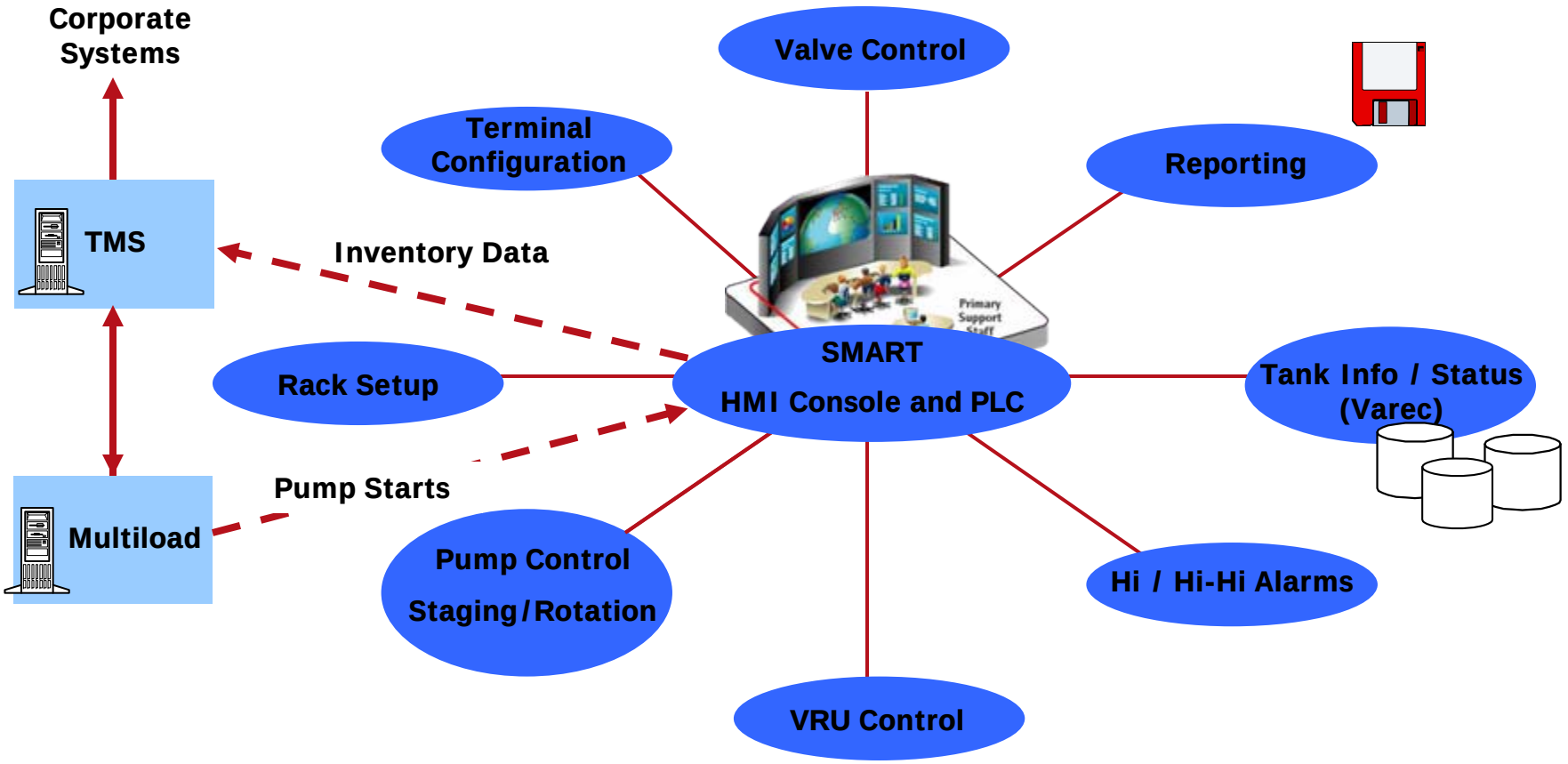
Automation for Better Tank Management

"Using technology to achieve better profitability"

Presented by Michael Crabb
www.tecservllc.com

NISTM – Houston – Sept 11, 2009

Terminal Automation Architecture



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“Smart” Terminal Automation - Why should you care?

Advantages

- Automatic supervision
- Reduction in inadvertent errors
- Auto Notification of alarm events
- Escalation of alarm events
- Automatic logging of events
- Audit trail of events & actions

Benefits

- Enhanced Safety
- Overfill prevention
- Reduces and/or prevents operator errors
- Insure timely alerts before a major incident
- Shutdown potentially hazardous operations
- Ensure operator intervention

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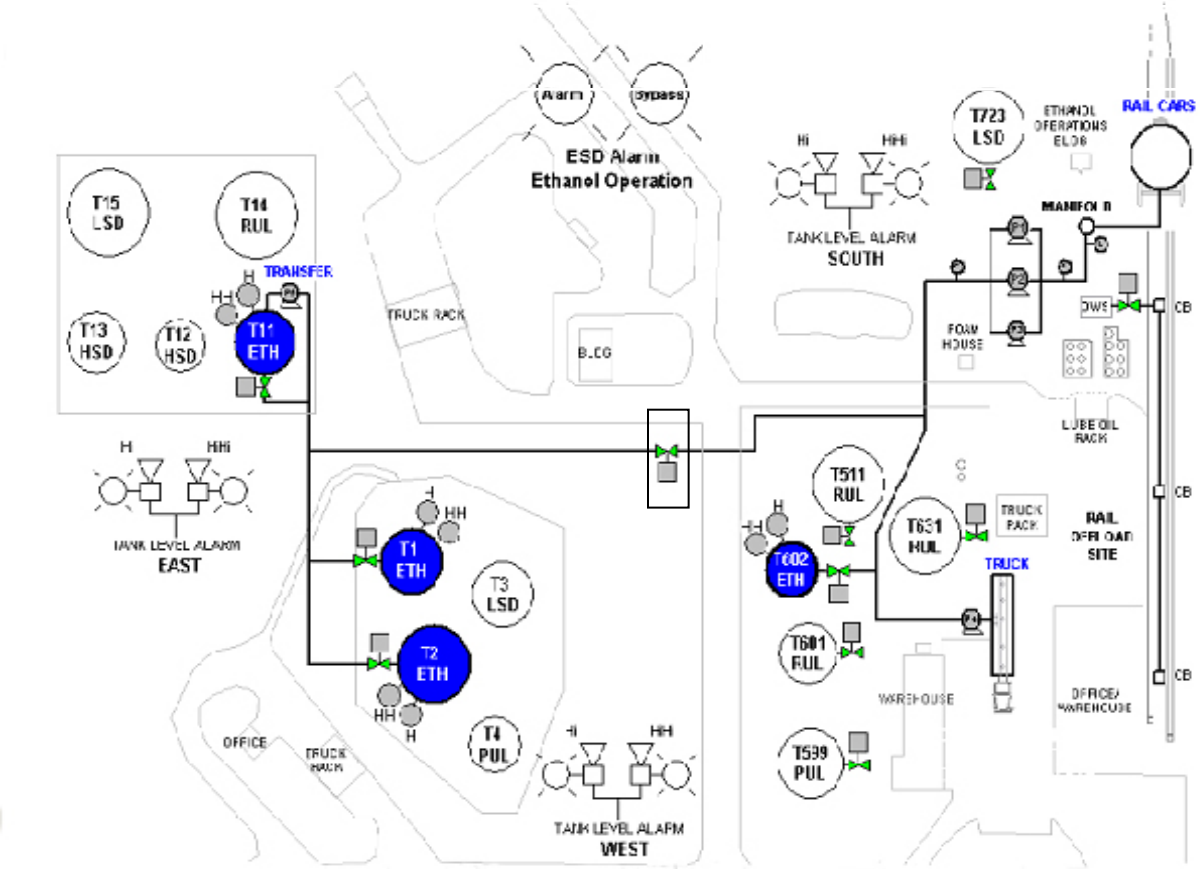
Typical Goals of Automation ("Old School")

- Manage Pumps and Provides Operation Indication
  - Turn pumps on/off
  - Hi and Hi-Hi Levels
  - Pump staging/Status
  - Valve position



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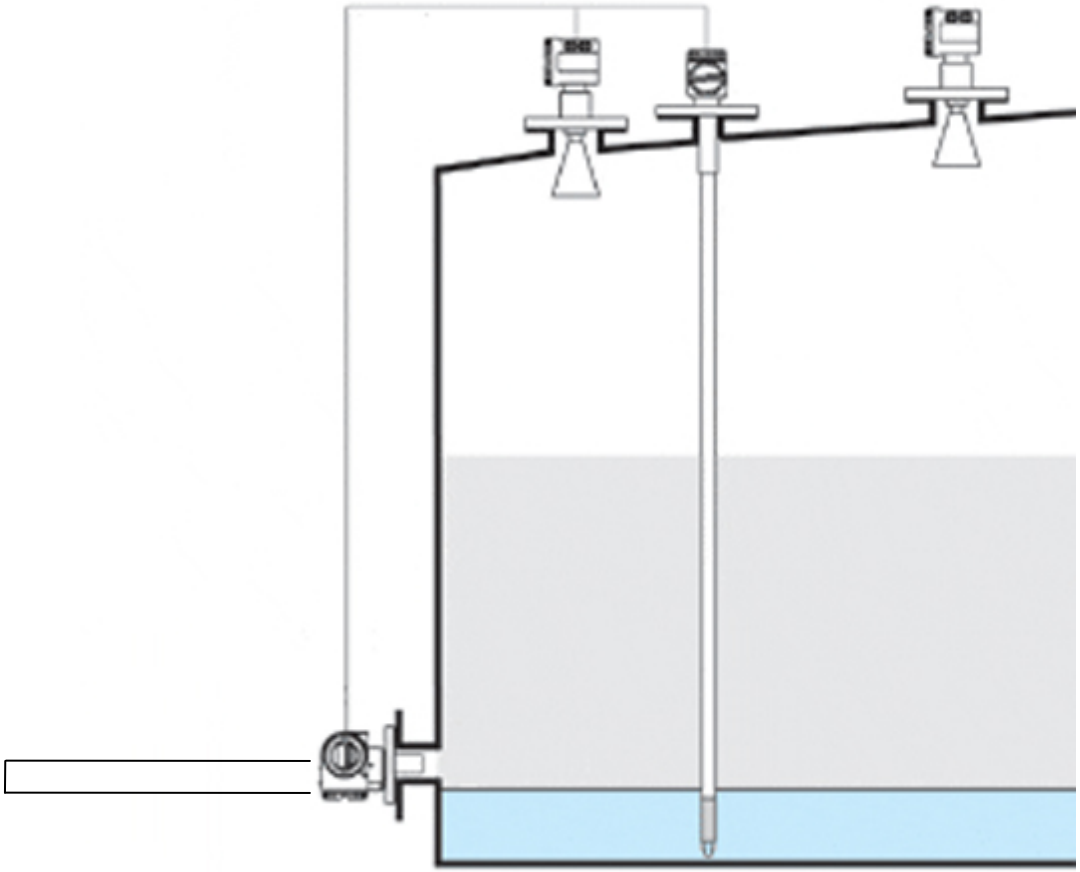
Automation (So Much More Could Be Achieved)

- Link High Level Alarms with Valve Controls
  - Risk is “slamming” valve on ship or pipeline receipt



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Automation (So Much More Could Be Achieved)

- Better Yet …
  - Link fuel inventory management with valve control to stage partial closing of automated valves to slow fill rate, giving more reaction time and physical indication of impending problems to pump operator

Inventory Management

PLC

Automated Valves

Avoid Tank Overfill Spill

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Automation (Additional secondary protection)

- Integrate external secondary containment with hydrocarbon sensors to completely shut valves and disable storm water pumps in the event of an overfill

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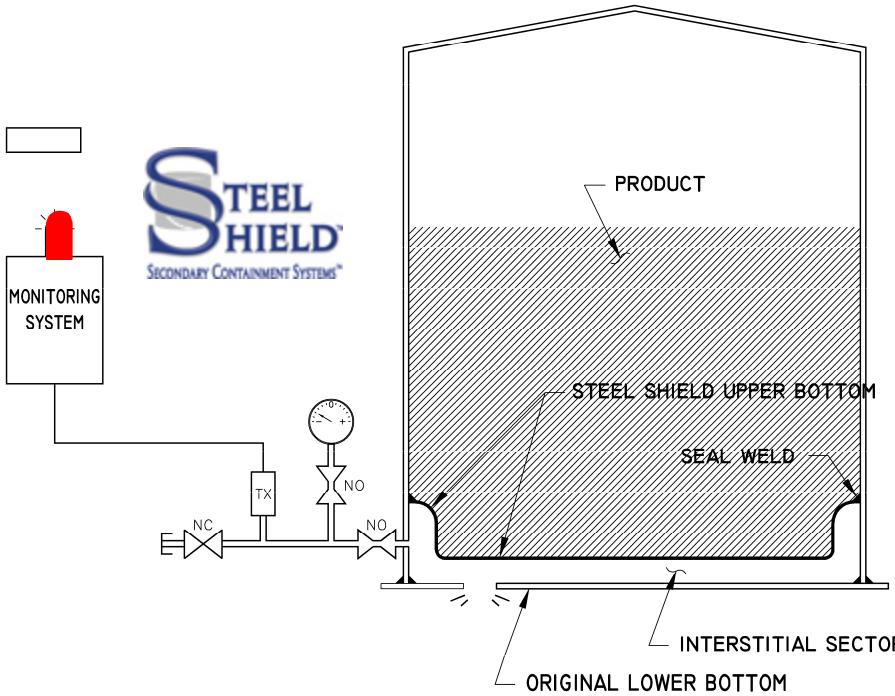
Automation (Environmental Monitoring – DBL bottom)

- Once we are monitoring the tank level and the external secondary containment – Why not monitor the under tank leak detection system too?



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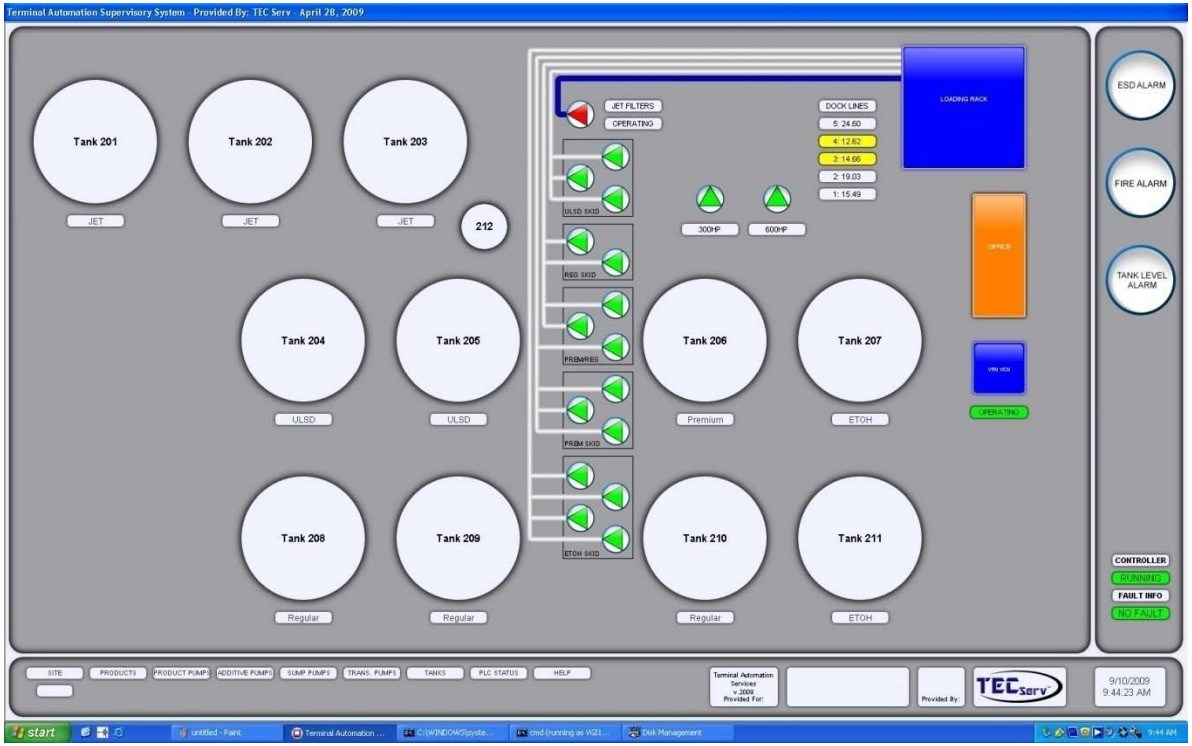
Automation (Environmental Monitoring – DBL wall pipe)

- The interstice of the double walled pipes can also easily be integrated into the automation system



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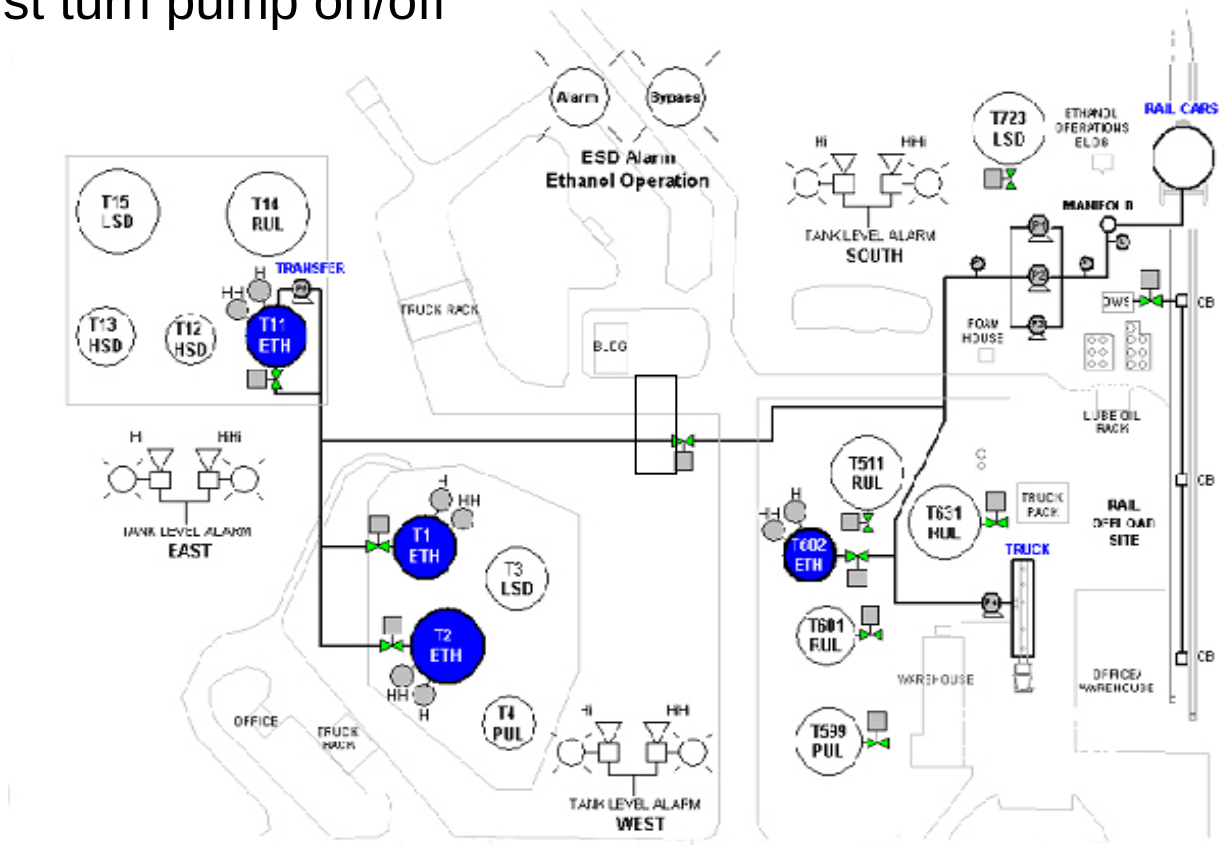
Pump Management

- Traditional PLC (the “old days”)
  - Just turn pump on/off



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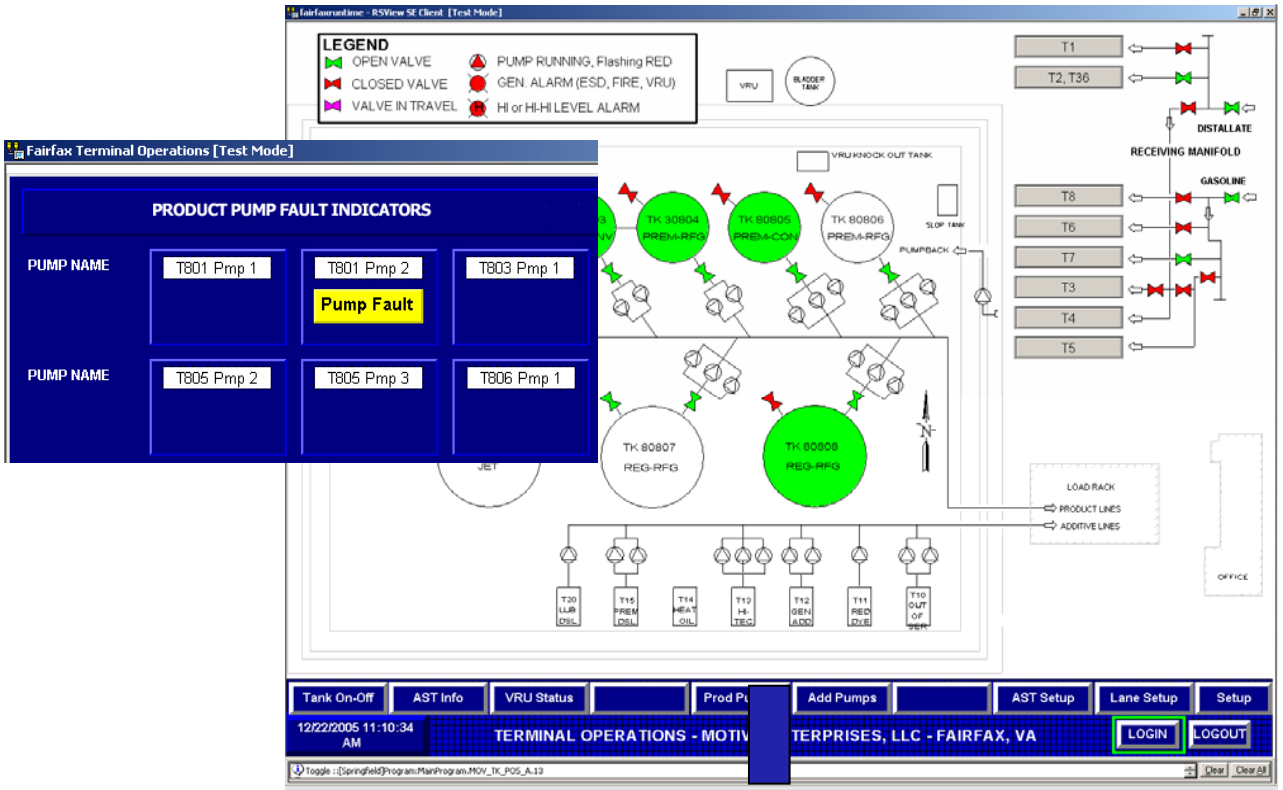
Pump Management

- Better
  - Rotate pumps (multi-pump)
  - Stage pumps on/off (multi-pump)
  - Indicate and alert when pumps continue to run beyond norms



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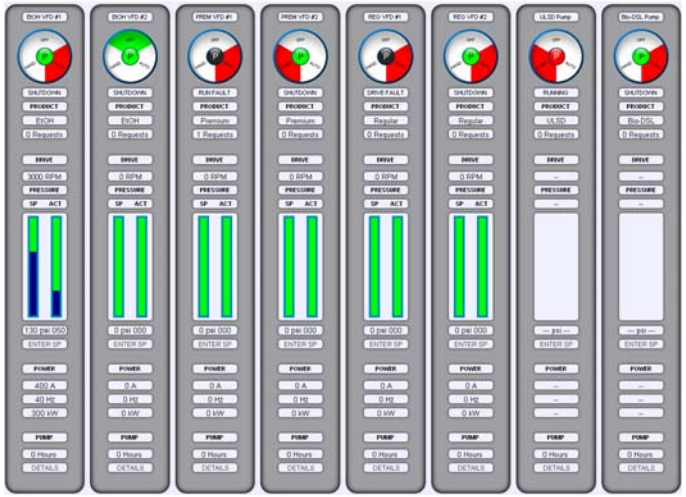
Pump Management – Integrate VFDs

- Best
  - Intelligent control of pump via Variable Frequency Drives (VFD)
  - Allows more precise application of power and smoother operation
  - Much better control of process
  - Extends motor life
  - Dramatic Reduction in electric usage
    - 12.5 ¢/KWH average (most of the country)
    - 30.0 ¢/KWH California



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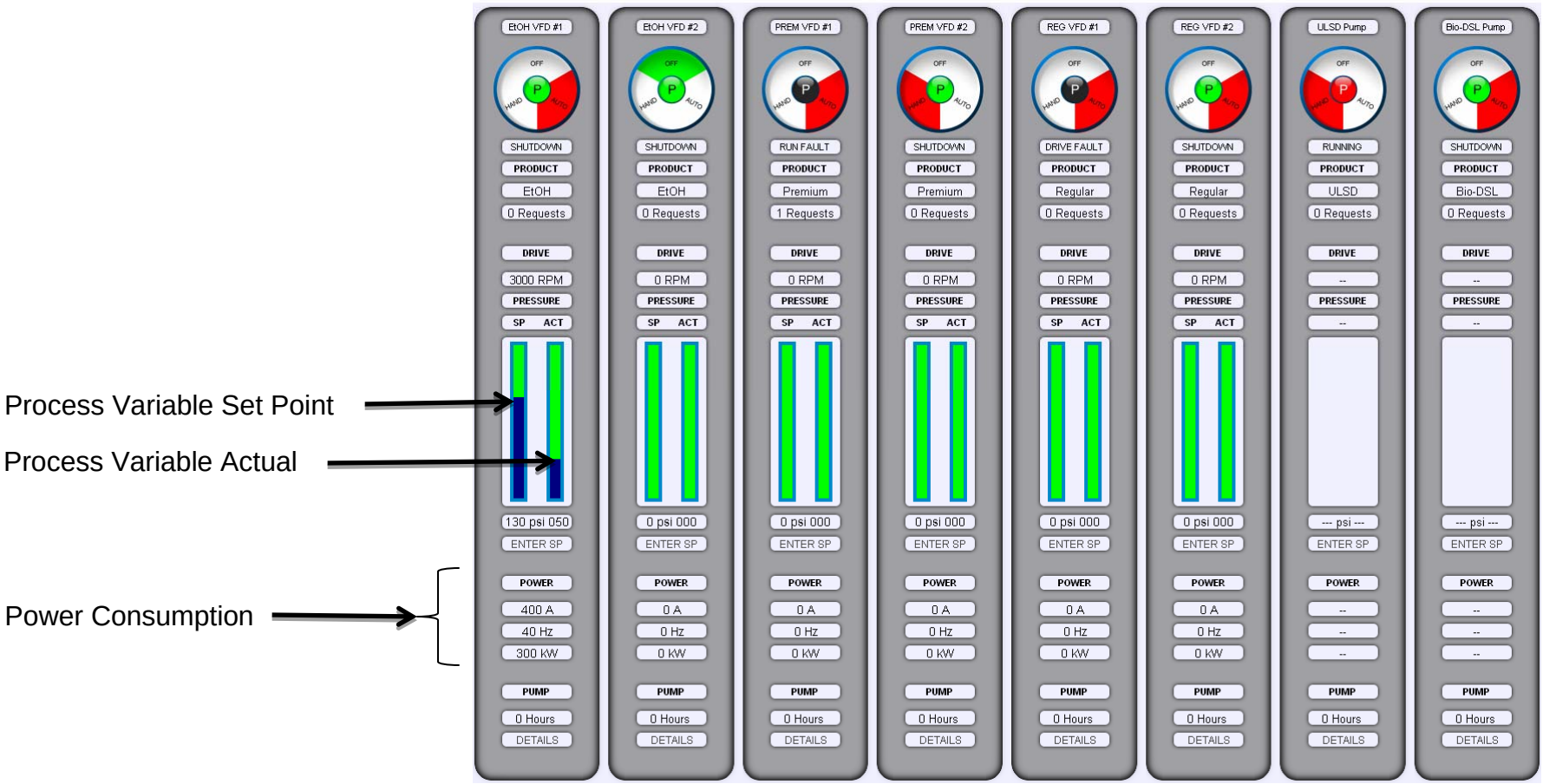
Pump Management – VFD control

- Intelligent control of pump via Variable Frequency Drives (VFD)



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Typical Tasks for Automation Supervisor (Fuel Terminal)

- Control Loading and Offloading
  - Railcars
  - Ships and Barges
- Transfer operations
  - Tank to Tank
  - Terminal to Terminal
  - Terminal to Pipeline
- Normal Terminal Operation Supervision
  - Pumps, valves, levels
- Fueling Process Control
  - Monitor and control – include life, health and safety systems to insure proper operation in potentially hazardous configurations.

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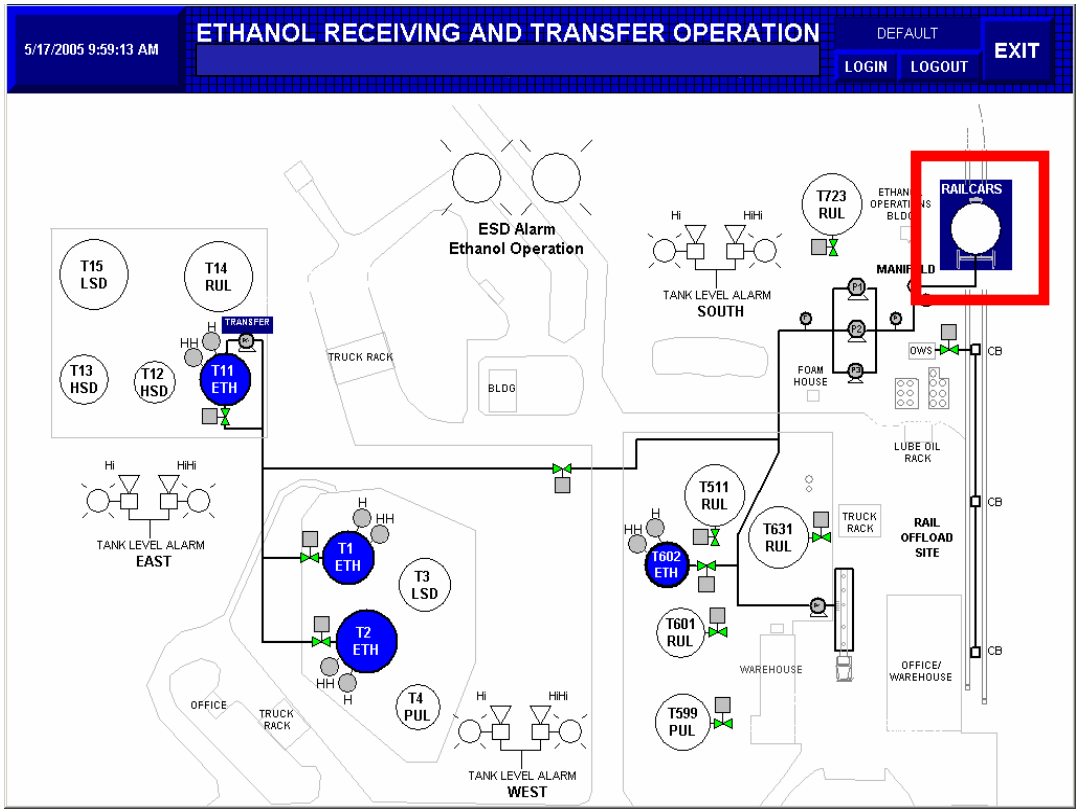
Control Loading and Offloading Operations

- Railcars
- Ships and Barges
- Same procedure for tank to tank, etc.



RAIL CAR ETHANOL OFFLOAD
FLOW CHART

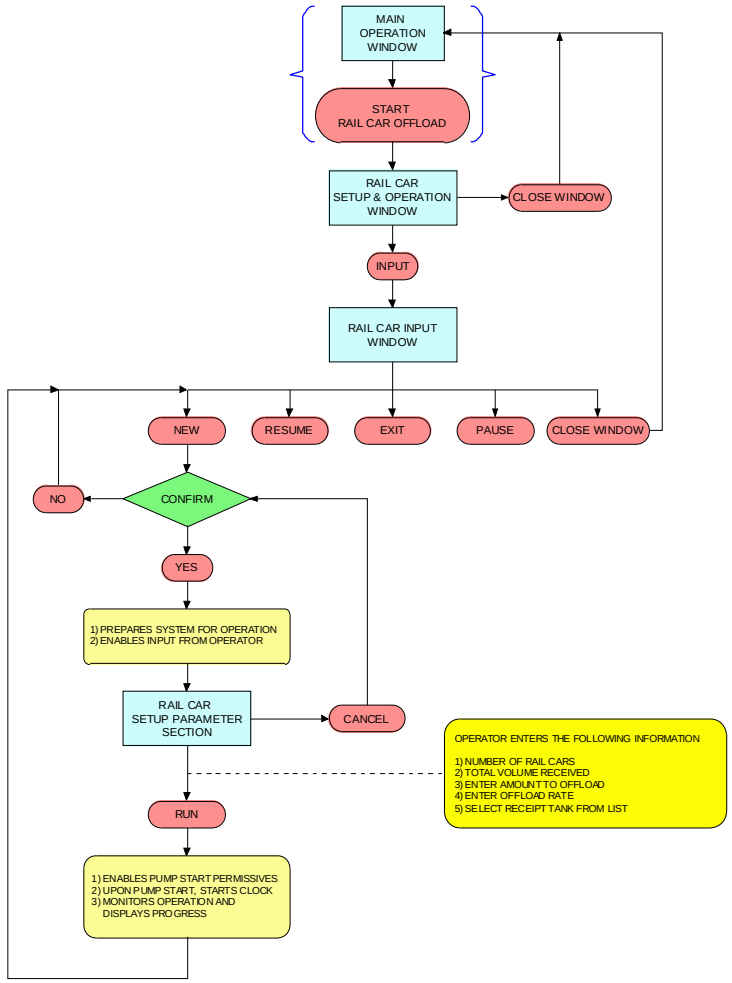


FIG 1 SETUP AND RUN NEW OPERATION

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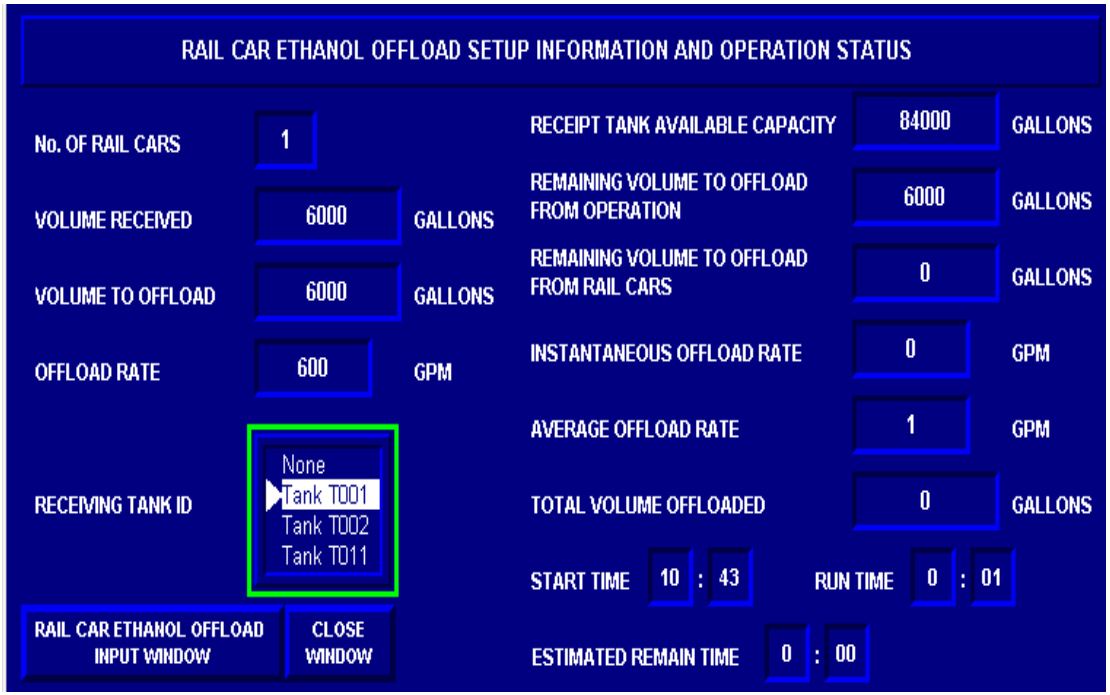
Control Loading and Offloading Operations

- Set up process
- System intelligently determines capacities flow rates, and estimated completion time



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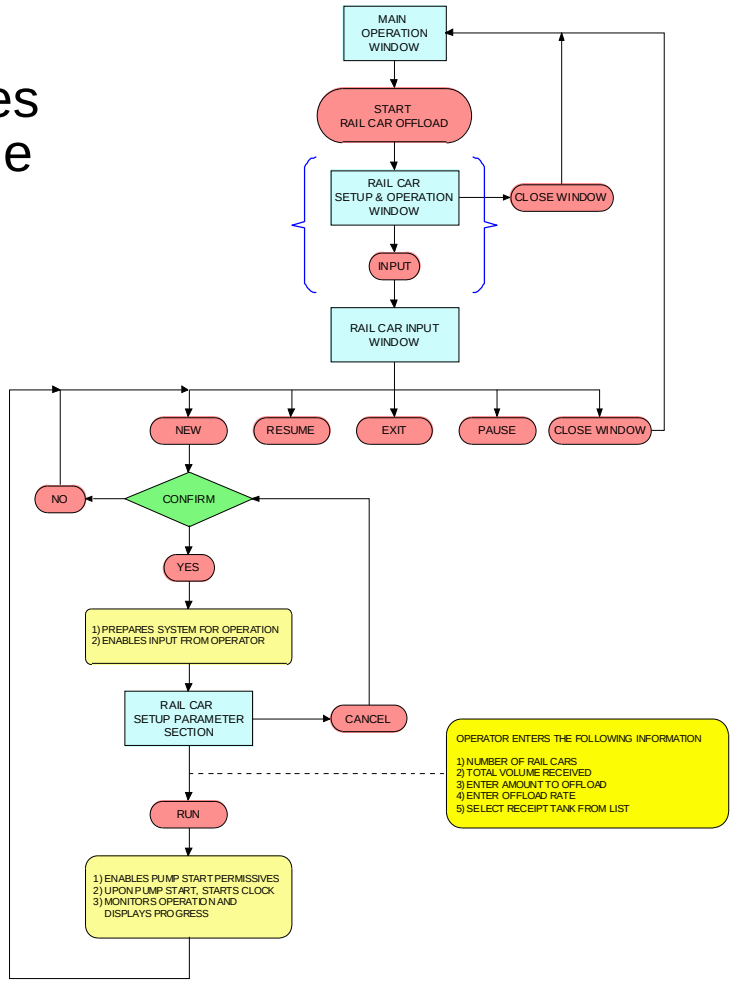

FIG 1 SETUP AND RUN NEW OPERATION

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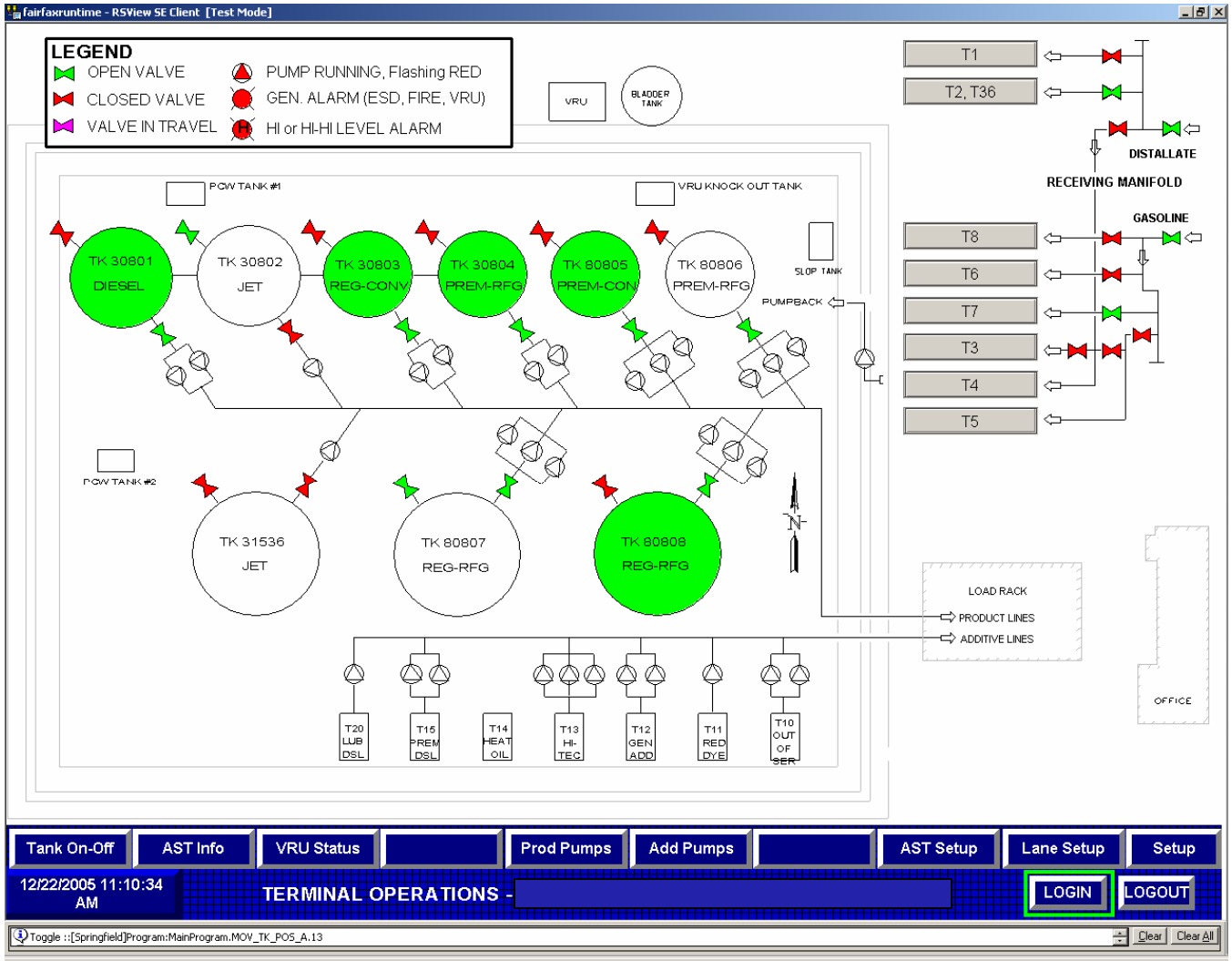
Typical Terminal Operations

- Control Pumps
- Indicate Valves and Tanks
- Identify Alarms, Hi Level, ESD. Fire, etc.



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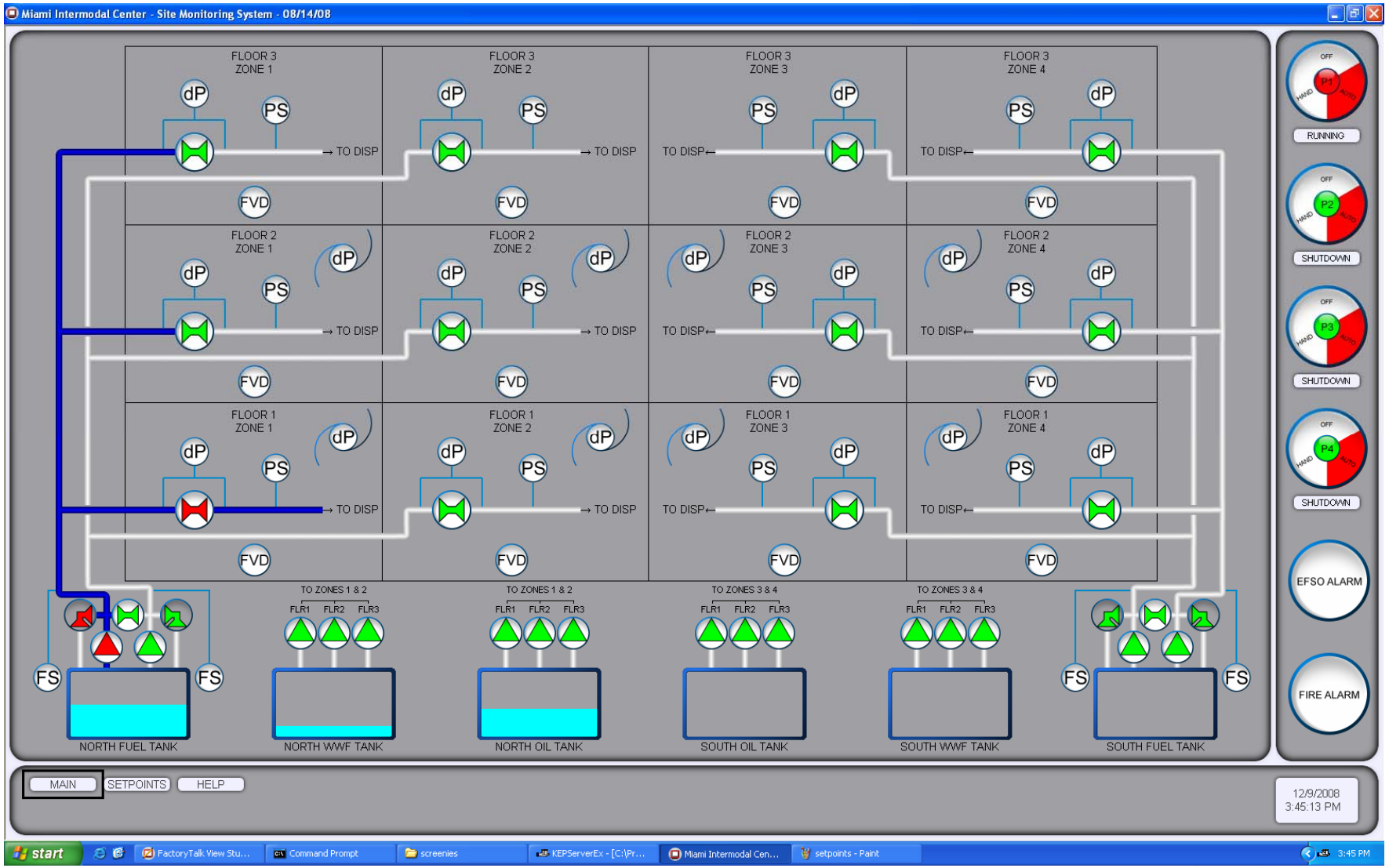
Process Control



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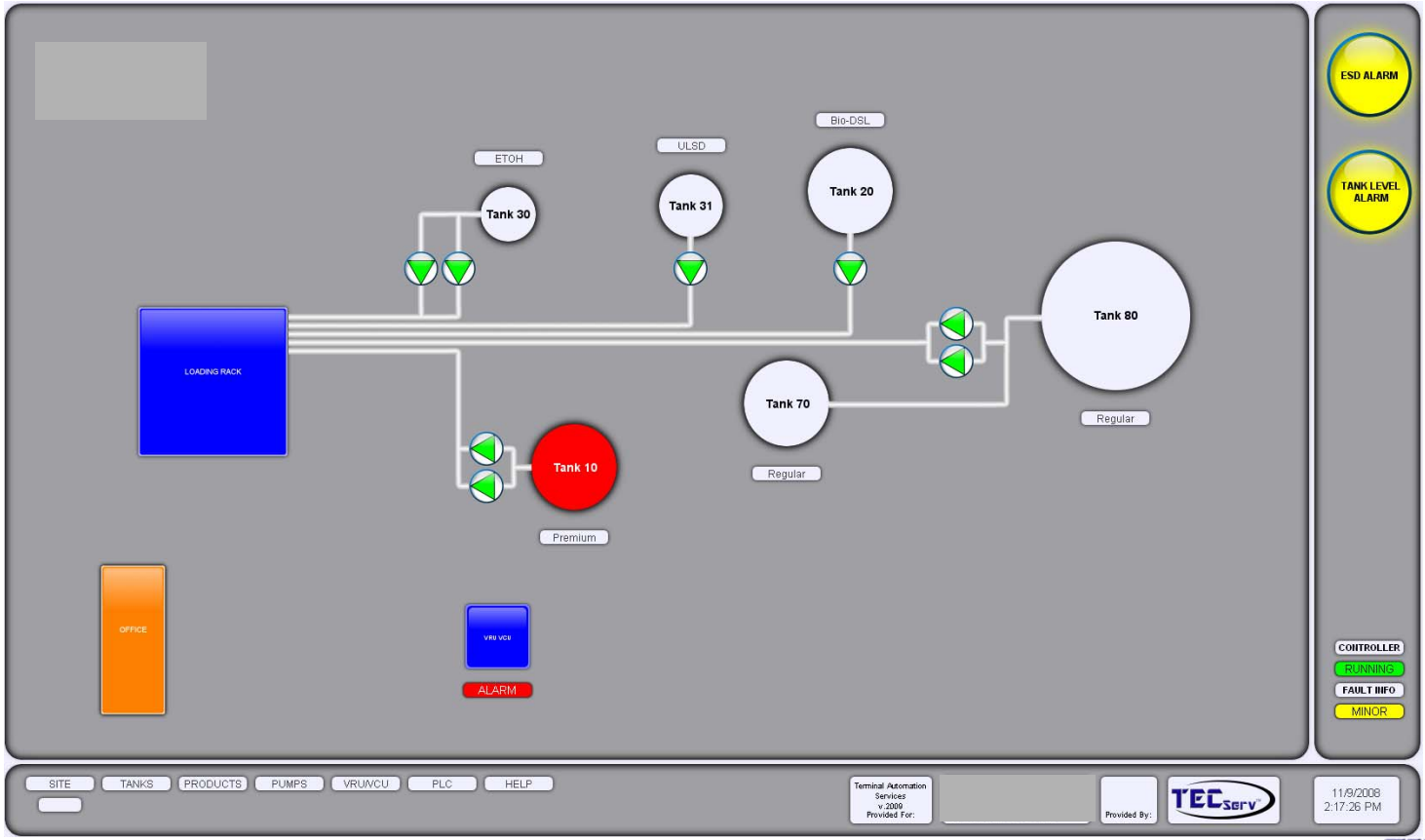
Evolution of the Operator interface

- Screens have gone from technical and complex to “friendly” and more graphically appealing.
  - Operators seem to be more willing to use and trust the friendlier formats.



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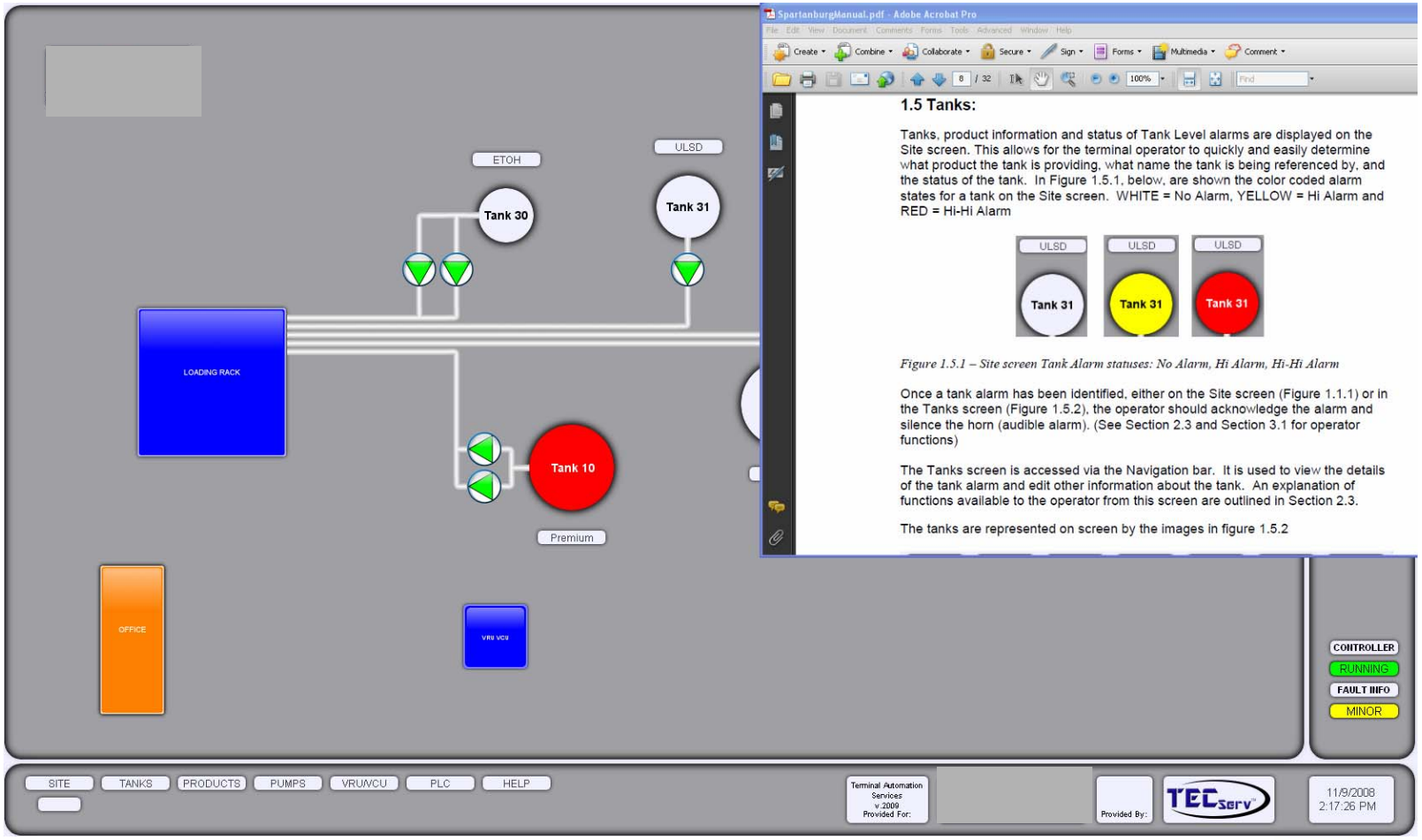
Evolution of the Operator interface – Imbedded HELP

- Troubleshooting and technical procedures can easily be imbedded within the system.



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Evolution of Operator interface – lessons learned

- First Impulse is to consolidate as much data as possible
  - This is a mistake – makes the system complex, intimidates the operator and reduces the confidence in the system.
- Make the system as friendly as possible for the operator.
  - Provide the information necessary to do the job but don't try to replicate other systems total information.
  - For example – one company completely replicated the data for truck loading from Toptech TMS on to the PLC HMI. Operators were confused as to where to change TMS parameters.
  - Only bring information over that is necessary for the operator to understand the "health" of the terminal and/or not easily accessible thru a "native" interface.
  - Example is VRU screen on next page

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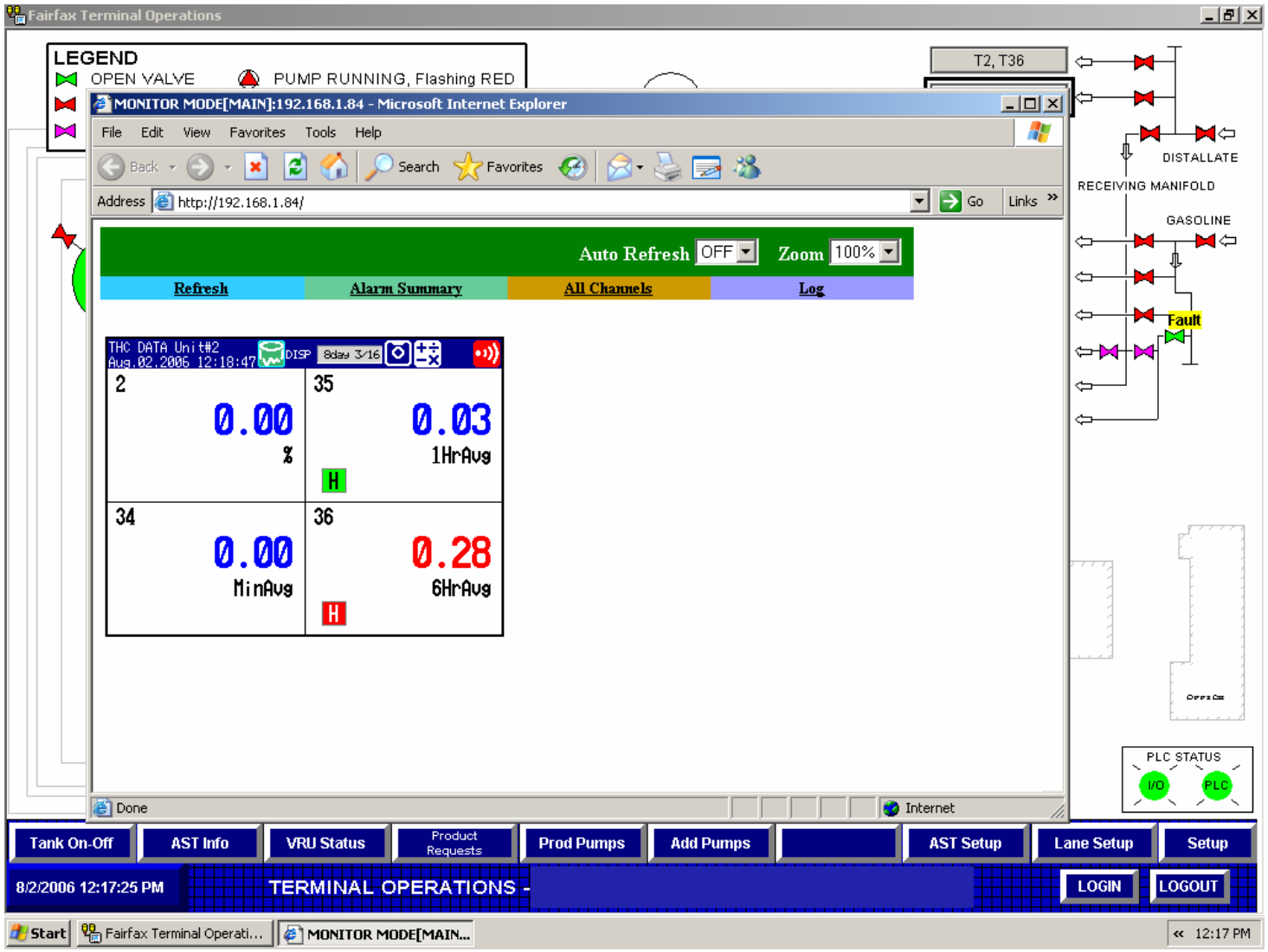
Evolution of Operator interface – lessons learned (con't)



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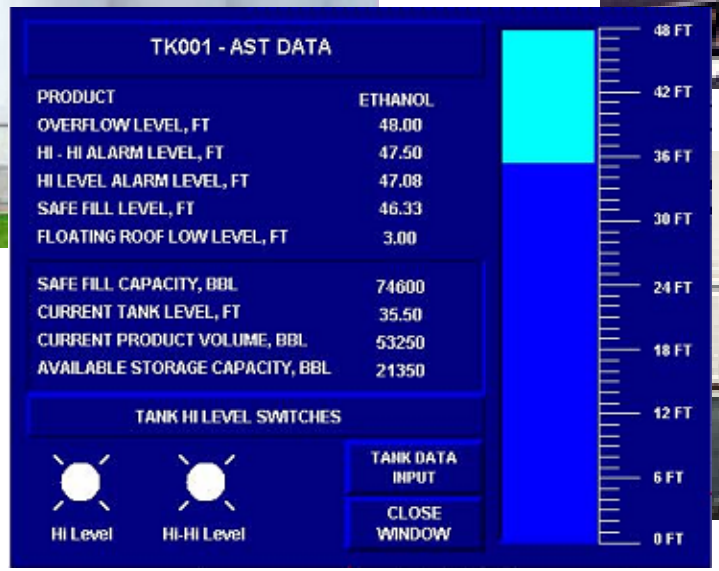
Automation (can you have too much information ?)

- Integration with other automated systems
  - Could bring some challenges depending on the system and sophistication of the user



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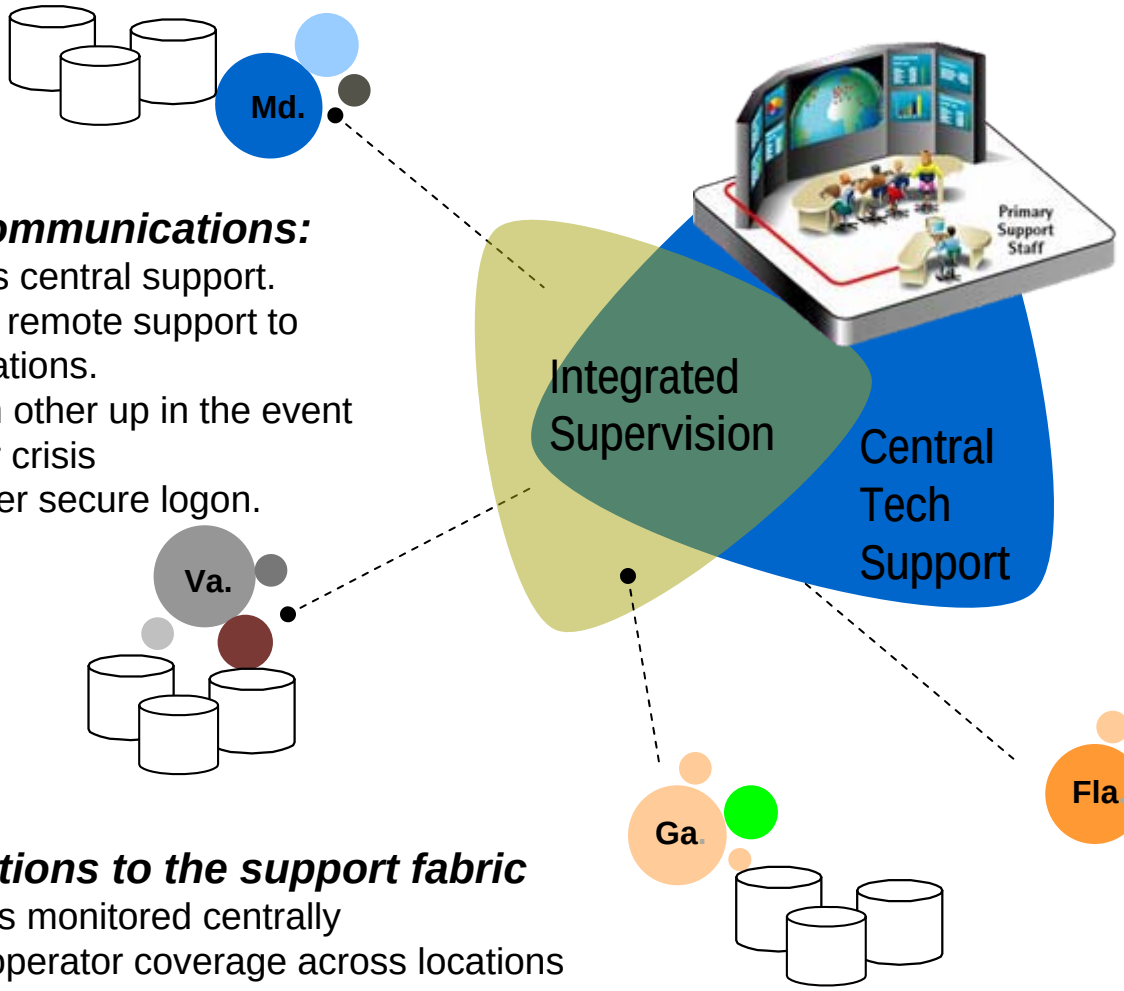
Terminal Automation of the Future



Integrated Terminal Communications:

- Allow Terminals to access central support.
- Central monitoring allows remote support to assist local terminal operations.
- Terminals may back each other up in the event of personnel shortages or crisis
- Web available status under secure logon.

Flexibly add Locations to the support fabric

- Multiple alarm points monitored centrally
- Provide enhanced operator coverage across locations
- Reduce or prevent accidents before they occur

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Questions…..?

Contact Info:
Michael Crabb
954-524-2809
mcrabb @ tecservllc.com
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