

The logo for TECSERV, featuring the word "TECSERV" in a stylized blue font with a trademark symbol, enclosed within a black oval shape.

TECSERV™

The logo for STEEL SHIELD, featuring the words "STEEL SHIELD" in a blue serif font, with "SECONDARY CONTAINMENT SYSTEMS" in a smaller font below it.

STEEL SHIELD
SECONDARY CONTAINMENT SYSTEMS™

A nighttime photograph of an industrial facility, possibly a refinery or chemical plant, with large storage tanks and structures illuminated by bright lights. The scene is viewed through a large, curved, semi-transparent window that frames the text.

Automation for Better Tank Management

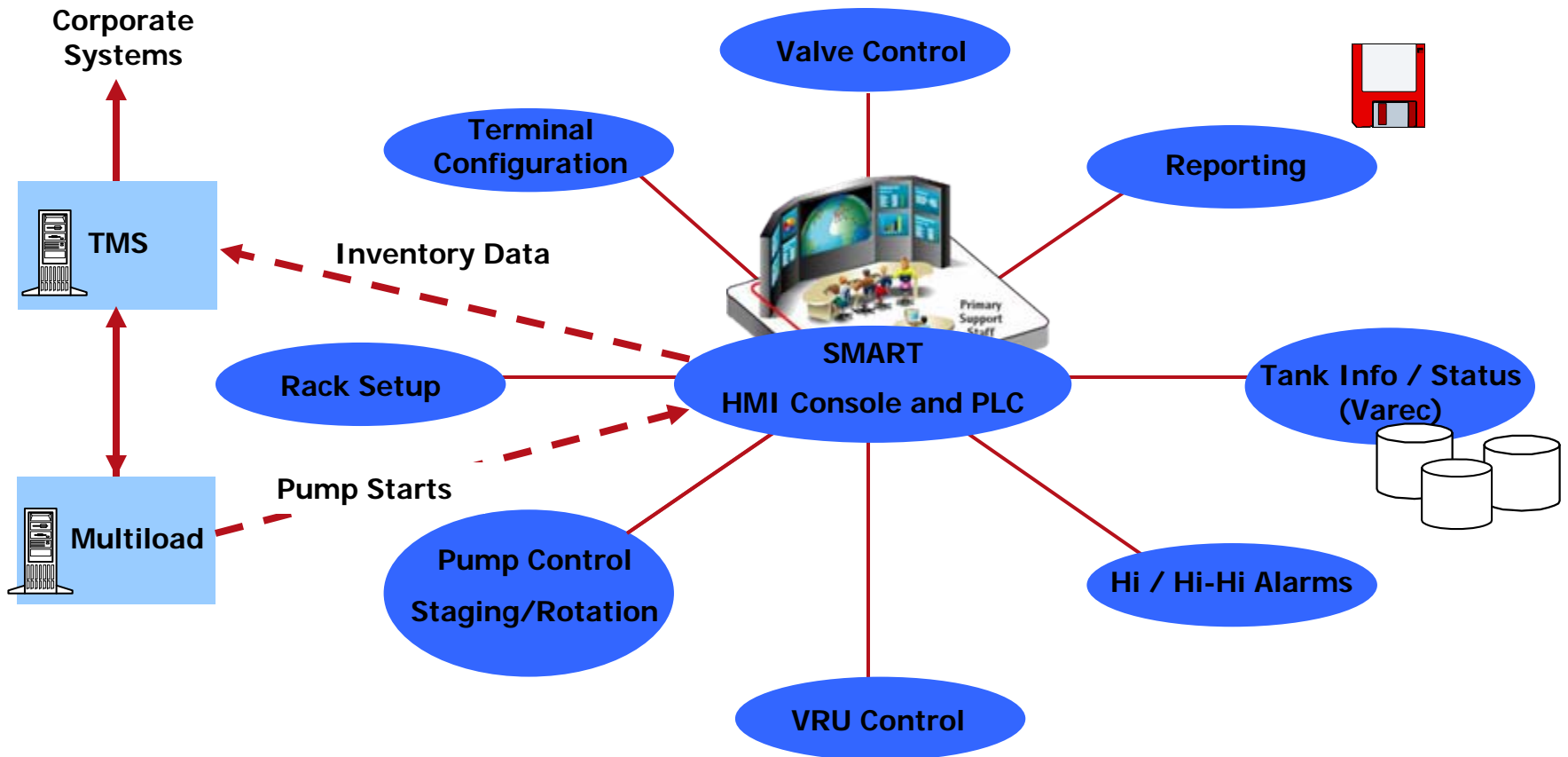
“Using technology to achieve better profitability”

Presented by Michael Crabb

www.tecservllc.com

NISTM – Houston – Sept 11, 2009

Terminal Automation Architecture



“Smart” Terminal Automation - Why should you care?

■ Advantages

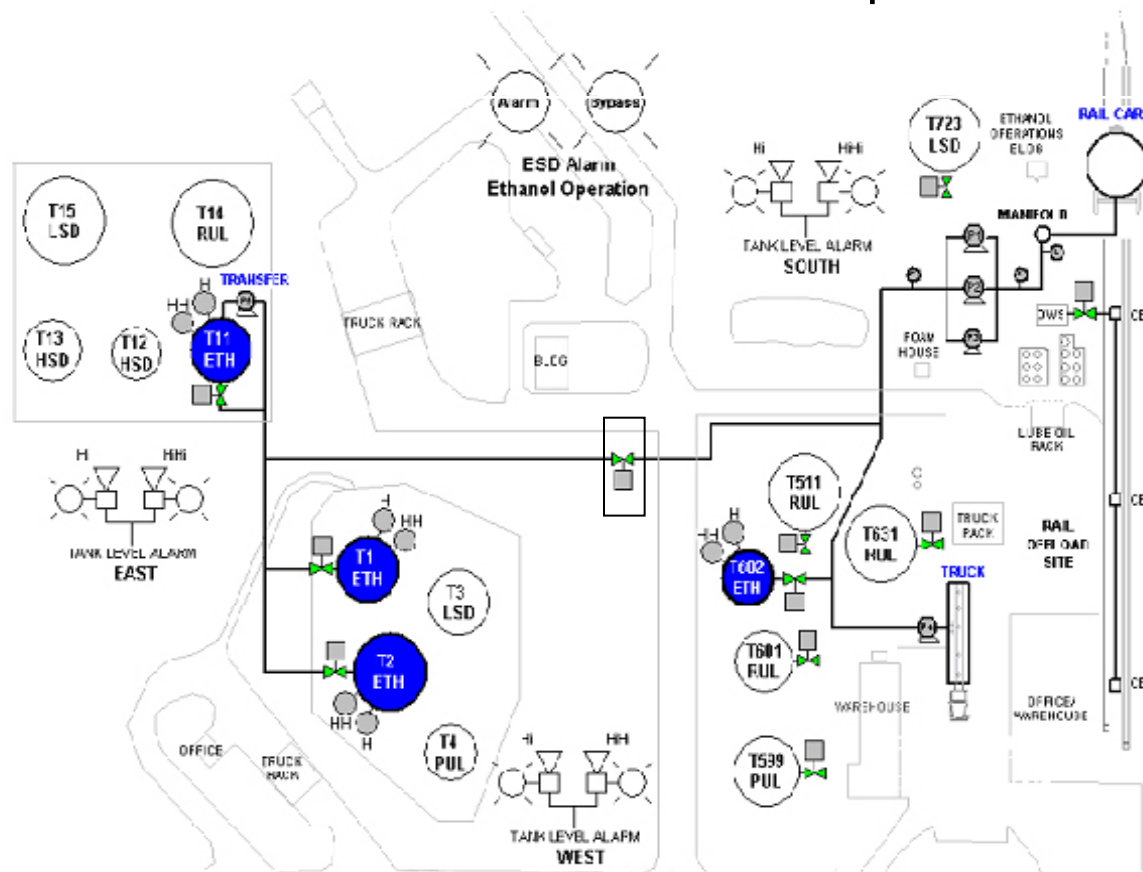
- Automatic supervision
- Reduction in inadvertent errors
- Auto Notification of alarm events
- Escalation of alarm events
- Automatic logging of events
- Audit trail of events & actions

■ 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

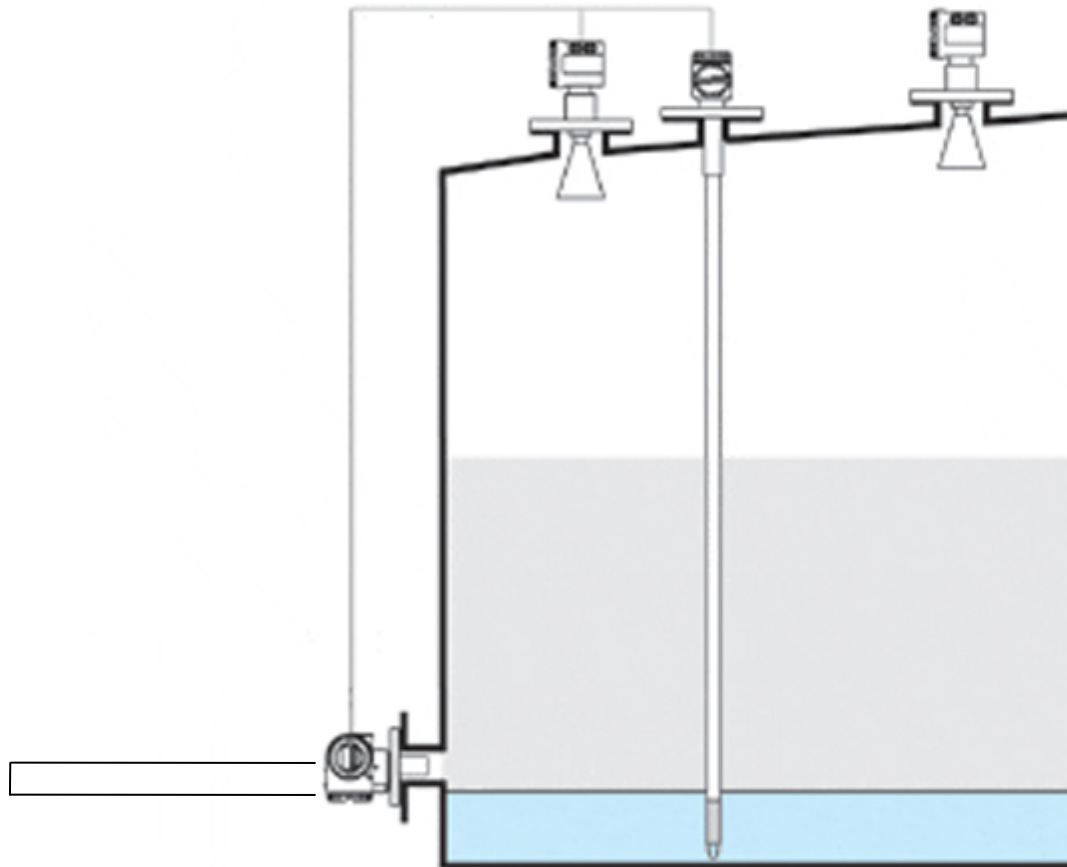
Typical Goals of Automation (“Old School”)

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



Automation (So Much More Could Be Achieved)

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



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



Automated Valves



Avoid Tank Overfill Spill



PLC



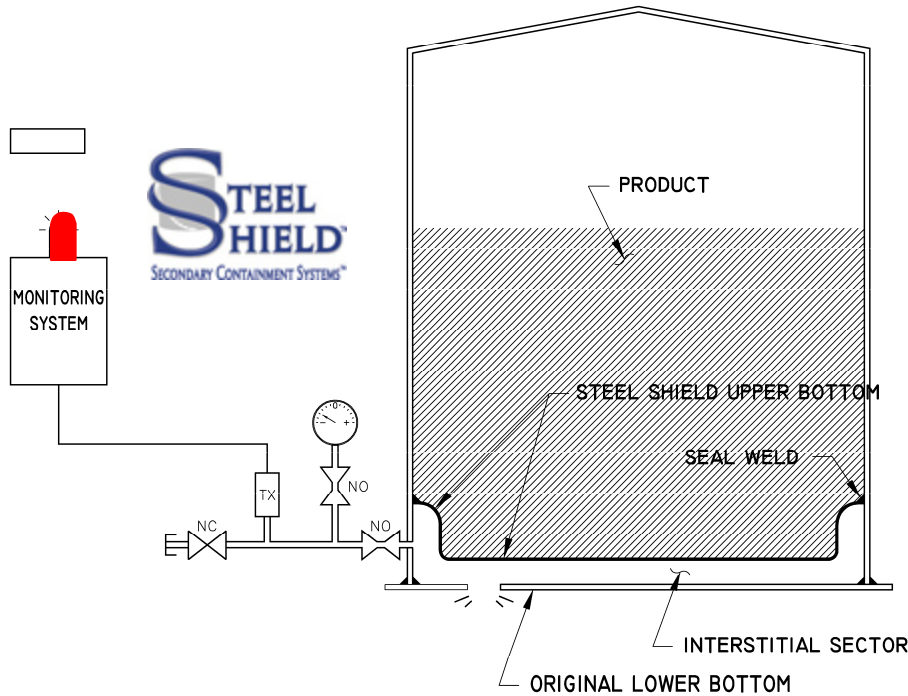
Automation (Additional secondary protection)

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



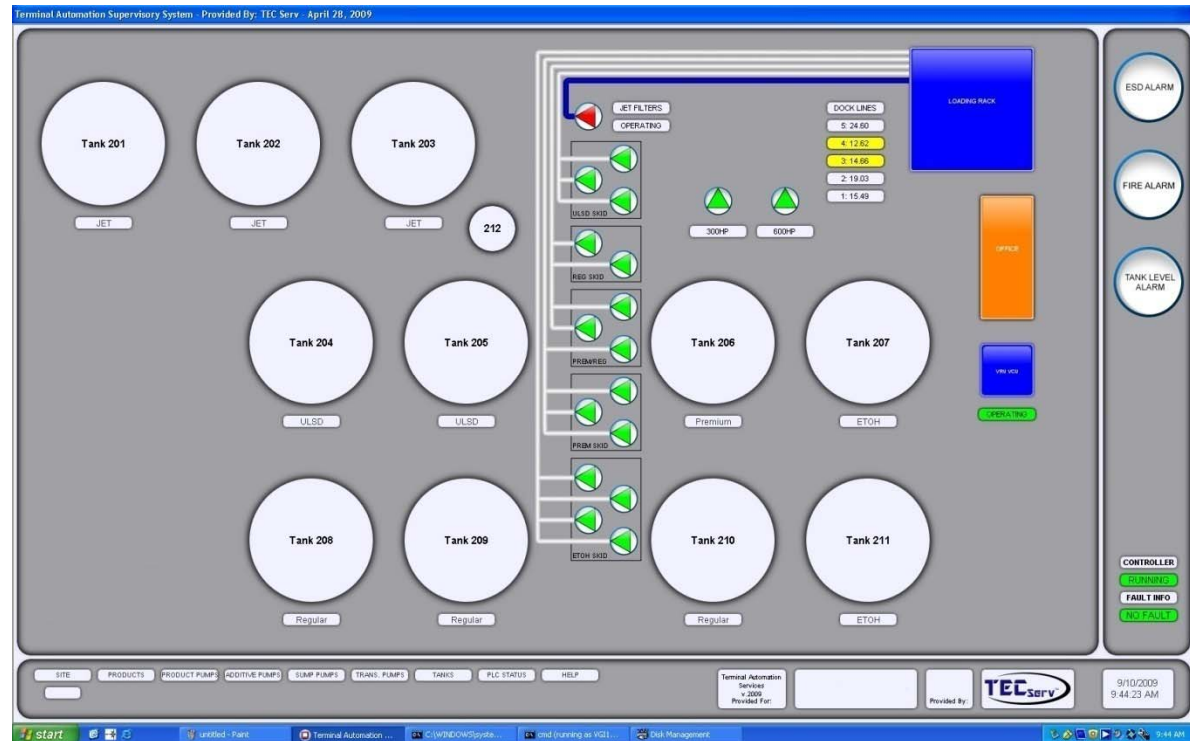
Automation (Environmental Monitoring – DBL bottom)

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



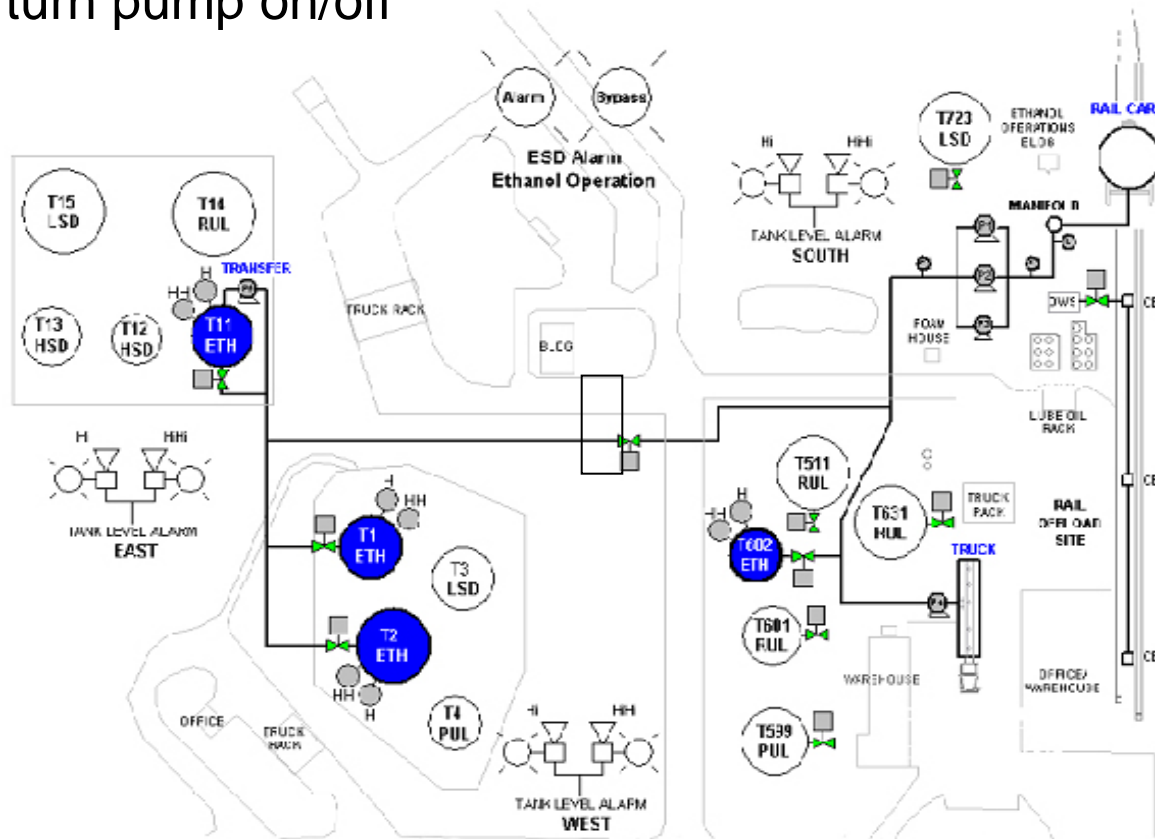
Automation (Environmental Monitoring – DBL wall pipe)

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



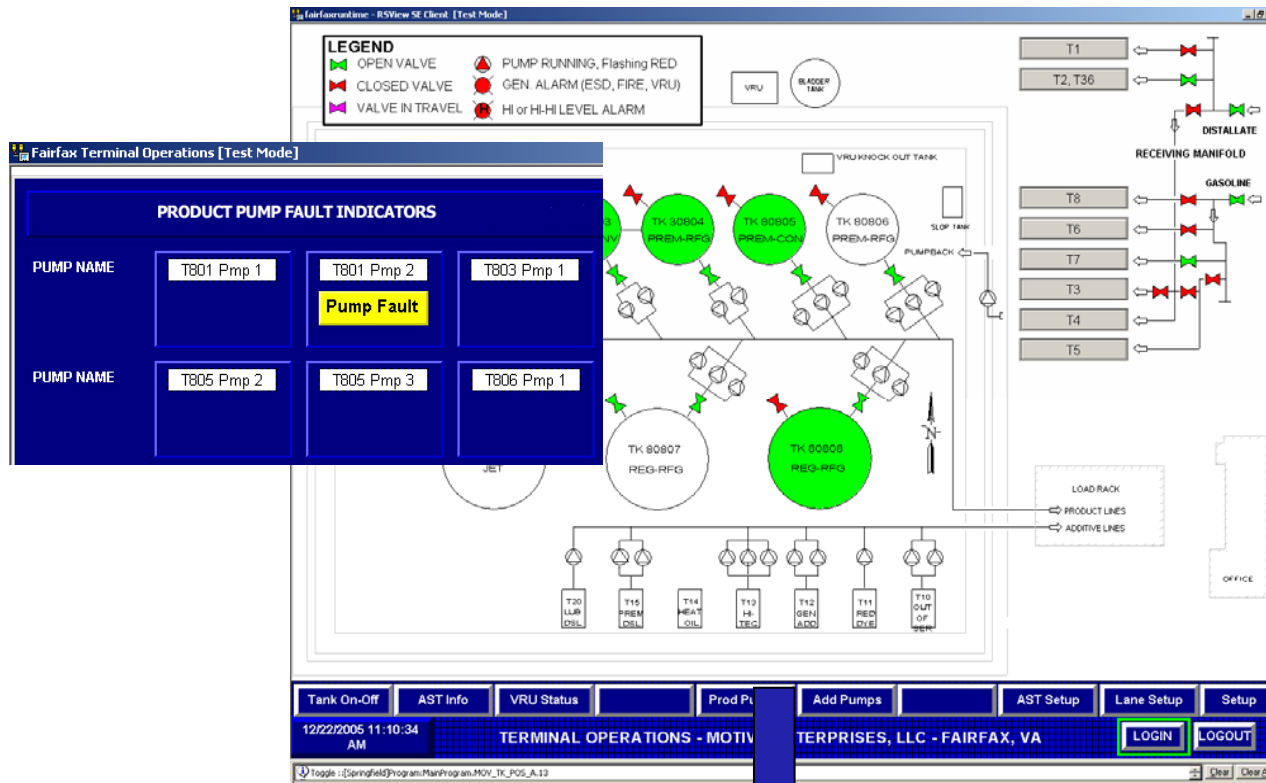
Pump Management

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



Pump Management

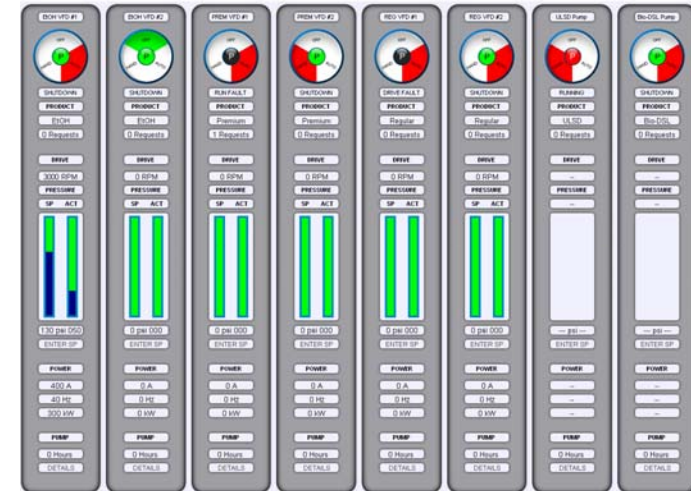
- Better
 - Rotate pumps (multi-pump)
 - Stage pumps on/off (multi-pump)
 - Indicate and alert when pumps continue to run beyond norms



Pump Management – Integrate VFDs

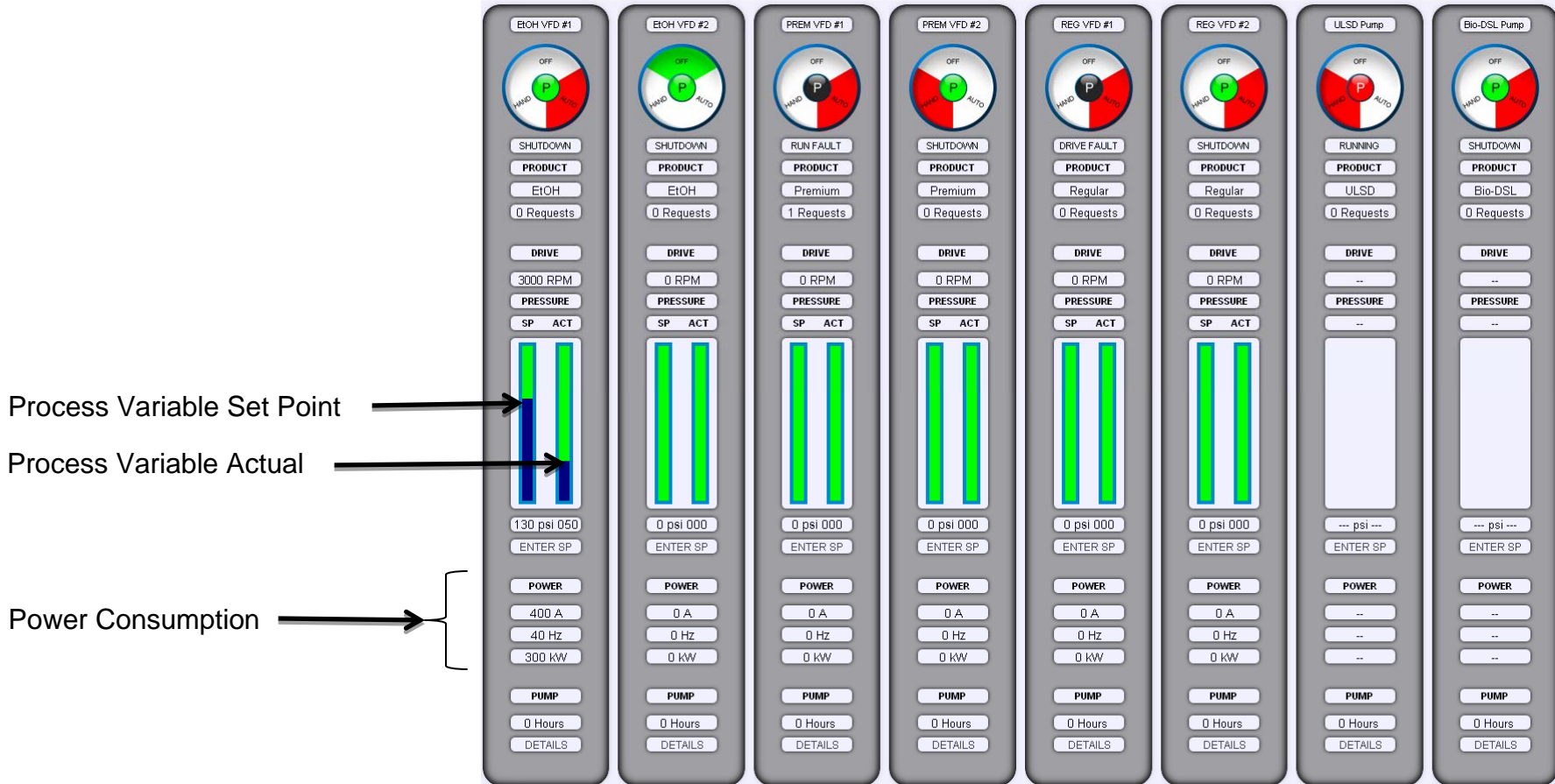
■ Best

- 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



Pump Management – VFD control

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

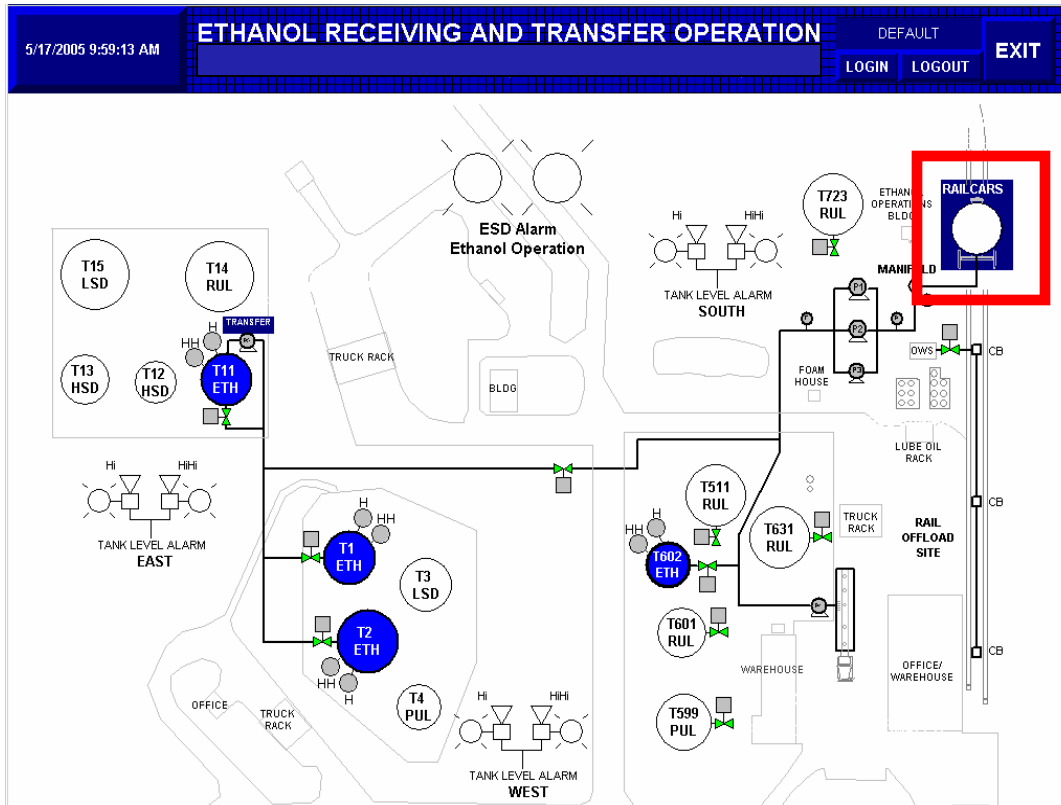


Typical Tasks for Automation Supervisor (Fuel Terminal)

- 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.

Control Loading and Offloading Operations

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



RAIL CAR ETHANOL OFFLOAD FLOW CHART

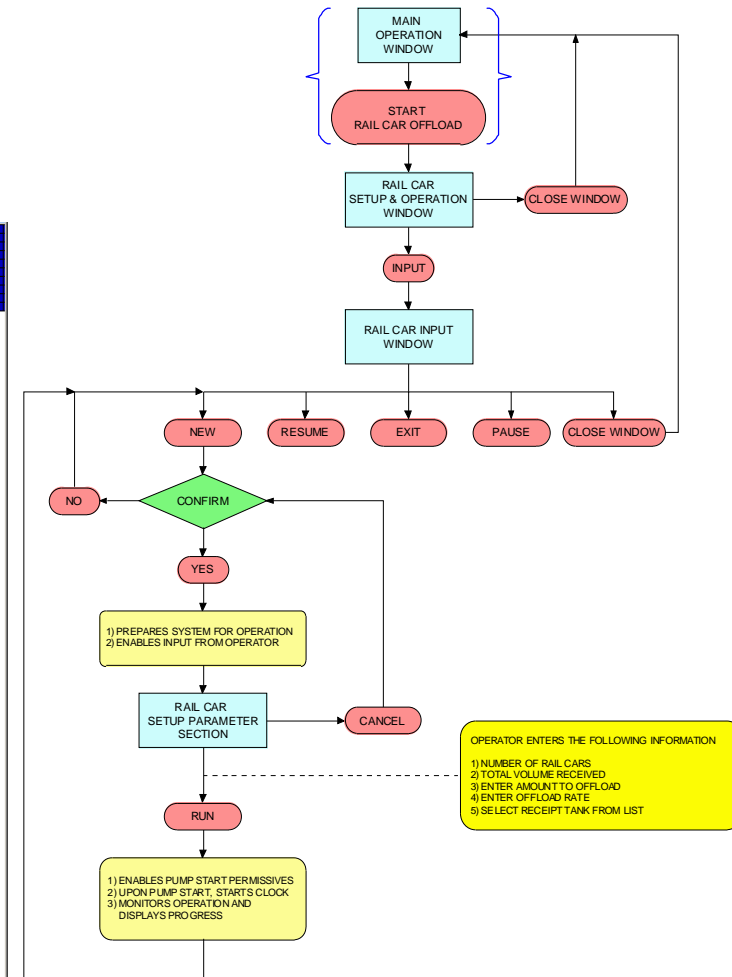


FIG 1 SETUP AND RUN NEW OPERATION

Control Loading and Offloading Operations

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

RAIL CAR ETHANOL OFFLOAD SETUP INFORMATION AND OPERATION STATUS			
No. OF RAIL CARS	<input type="text" value="1"/>	RECEIPT TANK AVAILABLE CAPACITY	<input type="text" value="84000"/> GALLONS
VOLUME RECEIVED	<input type="text" value="6000"/> GALLONS	REMAINING VOLUME TO OFFLOAD FROM OPERATION	<input type="text" value="6000"/> GALLONS
VOLUME TO OFFLOAD	<input type="text" value="6000"/> GALLONS	REMAINING VOLUME TO OFFLOAD FROM RAIL CARS	<input type="text" value="0"/> GALLONS
OFFLOAD RATE	<input type="text" value="600"/> GPM	INSTANTANEOUS OFFLOAD RATE	<input type="text" value="0"/> GPM
RECEIVING TANK ID	<div style="border: 2px solid green; padding: 2px;"> None Tank T001 Tank T002 Tank T011 </div>	AVERAGE OFFLOAD RATE	<input type="text" value="1"/> GPM
		TOTAL VOLUME OFFLOADED	<input type="text" value="0"/> GALLONS
		START TIME	<input type="text" value="10"/> : <input type="text" value="43"/>
		RUN TIME	<input type="text" value="0"/> : <input type="text" value="01"/>
		ESTIMATED REMAIN TIME	<input type="text" value="0"/> : <input type="text" value="00"/>
<input type="button" value="RAIL CAR ETHANOL OFFLOAD INPUT WINDOW"/> <input type="button" value="CLOSE WINDOW"/>			

RAIL CAR ETHANOL OFFLOAD FLOW CHART

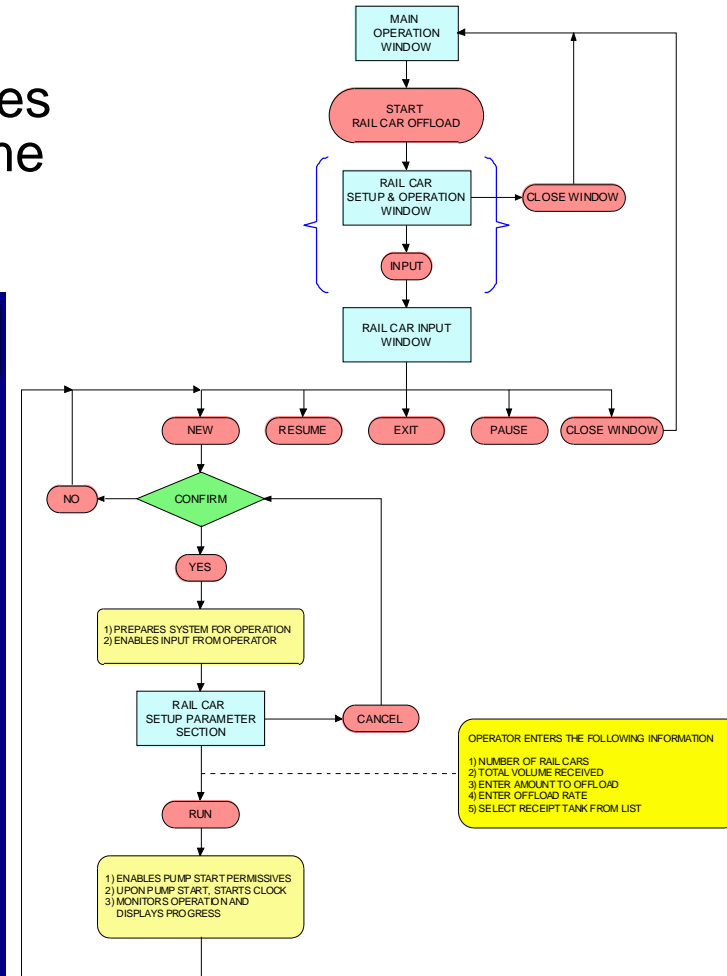
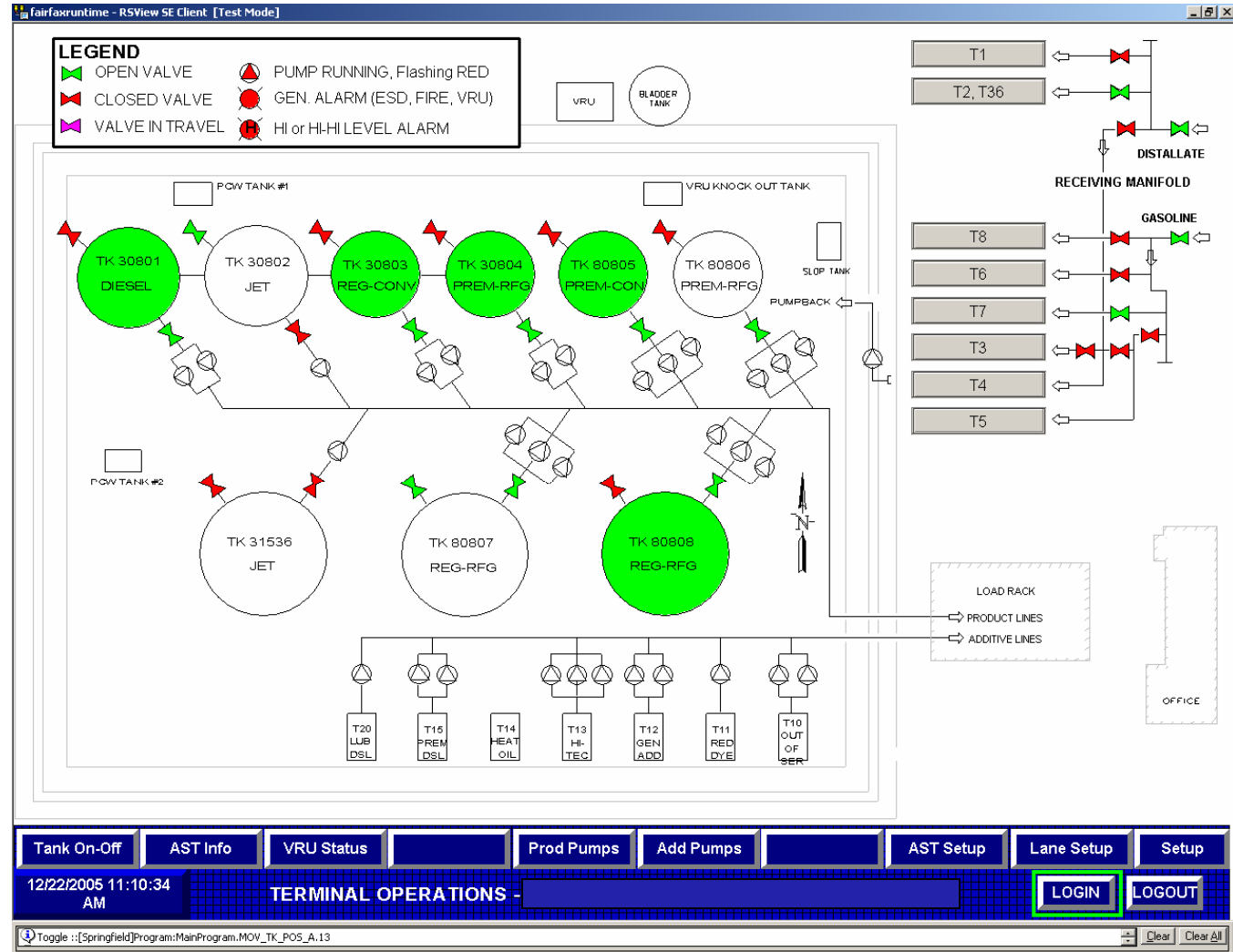


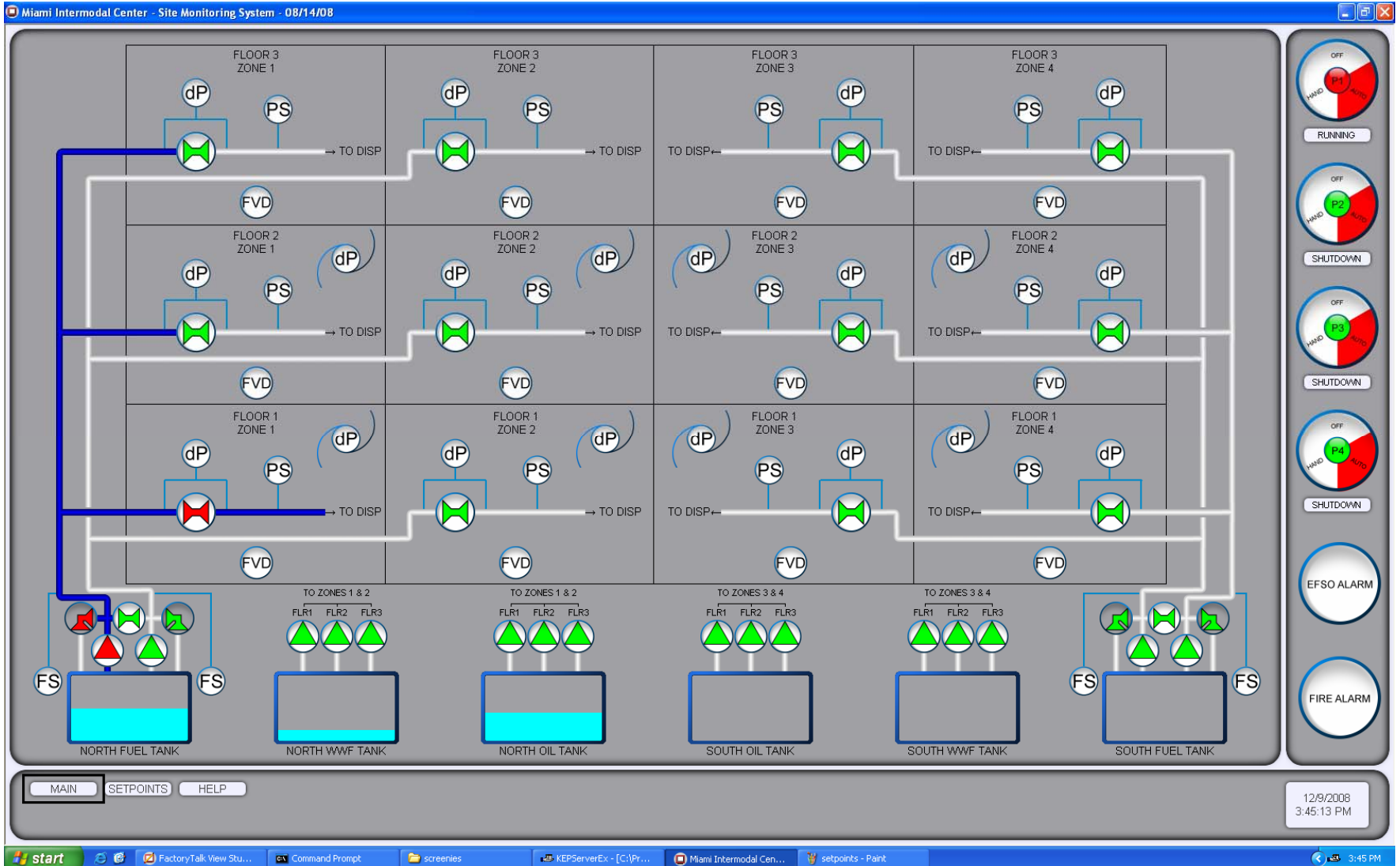
FIG 1 SETUP AND RUN NEW OPERATION

Typical Terminal Operations

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

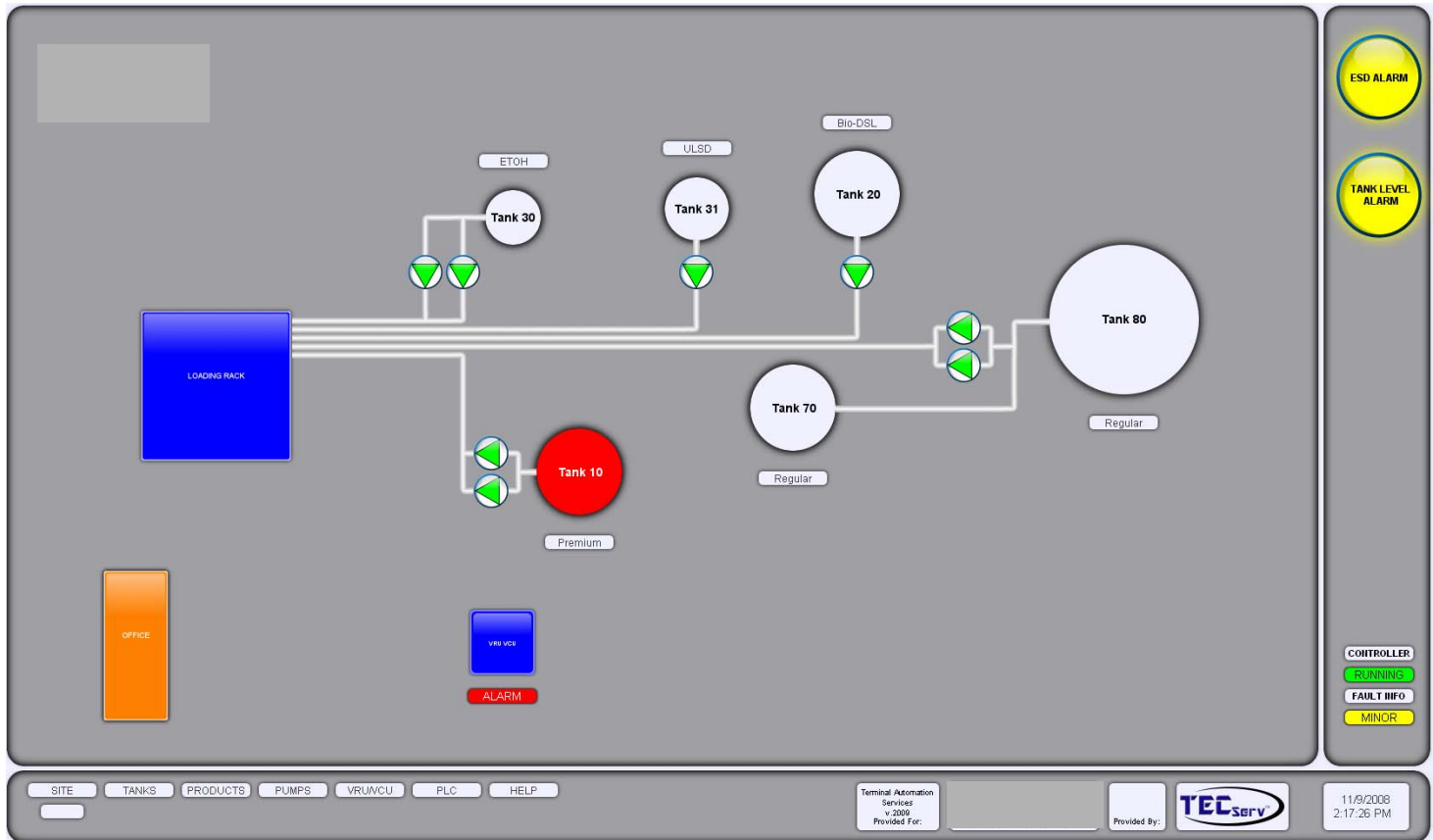


Process Control



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.



Evolution of the Operator interface – Imbedded HELP

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

The screenshot displays an operator interface for a terminal automation system. The main interface features a central diagram of a 'LOADING RACK' connected to three tanks: 'Tank 30' (labeled 'ETOH'), 'Tank 31' (labeled 'ULSD'), and 'Tank 10' (labeled 'Premium'). Tank 10 is highlighted in red, indicating a Hi-Hi Alarm. The interface includes navigation buttons for 'OFFICE' and 'VRUVCU', and a status panel on the right with 'CONTROLLER' (RUNNING), 'FAULT INFO', and 'MINOR' indicators. A bottom navigation bar contains buttons for 'SITE', 'TANKS', 'PRODUCTS', 'PUMPS', 'VRUVCU', 'PLC', and 'HELP'. An embedded help window titled 'SpartanburgManual.pdf - Adobe Acrobat Pro' is open, showing the '1.5 Tanks' section. The help text explains that tank alarm statuses are color-coded: WHITE for No Alarm, YELLOW for Hi Alarm, and RED for Hi-Hi Alarm. It also provides instructions on how to acknowledge alarms and access the Tanks screen.

1.5 Tanks:

Tanks, product information and status of Tank Level alarms are displayed on the Site screen. This allows for the terminal operator to quickly and easily determine what product the tank is providing, what name the tank is being referenced by, and the status of the tank. In Figure 1.5.1, below, are shown the color coded alarm states for a tank on the Site screen. WHITE = No Alarm, YELLOW = Hi Alarm and RED = Hi-Hi Alarm

Figure 1.5.1 – Site screen Tank Alarm statuses: No Alarm, Hi Alarm, Hi-Hi Alarm

Once a tank alarm has been identified, either on the Site screen (Figure 1.1.1) or in the Tanks screen (Figure 1.5.2), the operator should acknowledge the alarm and silence the horn (audible alarm). (See Section 2.3 and Section 3.1 for operator functions)

The Tanks screen is accessed via the Navigation bar. It is used to view the details of the tank alarm and edit other information about the tank. An explanation of functions available to the operator from this screen are outlined in Section 2.3.

The tanks are represented on screen by the images in figure 1.5.2

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

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

LEGEND

- OPEN VALVE
- PUMP RUNNING, Flashing RED

MONITOR MODE[MAIN]:192.168.1.84 - Microsoft Internet Explorer

Address: http://192.168.1.84/

Auto Refresh: OFF | Zoom: 100%

Refresh | Alarm Summary | All Channels | Log

THX DATA Unit#2
Aug. 02, 2006 12:18:47

2	0.00 %	35	0.03 1HrAvg
34	0.00 MinAvg	36	0.28 6HrAvg

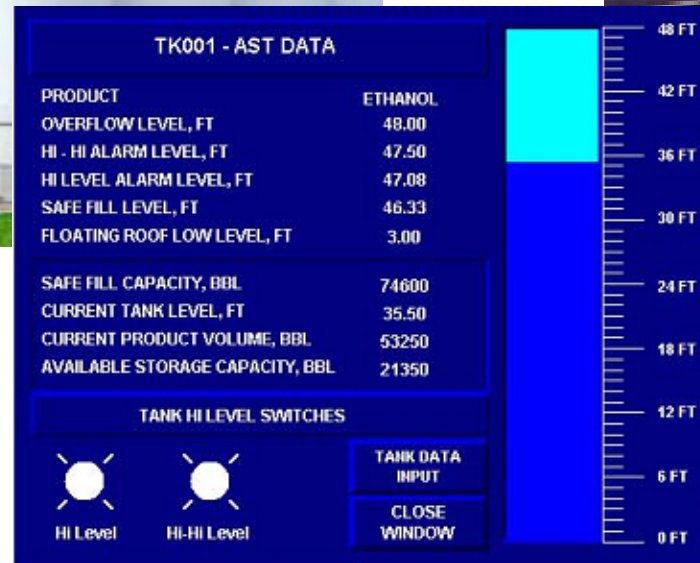
Schematic Diagram Labels: T2, T36, DISTALLATE, RECEIVING MANIFOLD, GASOLINE, Fault, Open Gas, PLC STATUS (I/O, PLC)

Navigation Bar: Tank On-Off, AST Info, VRU Status, Product Requests, Prod Pumps, Add Pumps, AST Setup, Lane Setup, Setup

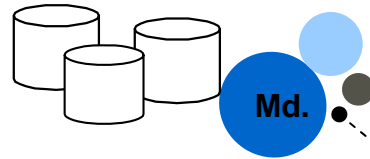
Terminal Operations - 8/2/2006 12:17:25 PM | LOGIN | LOGOUT

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

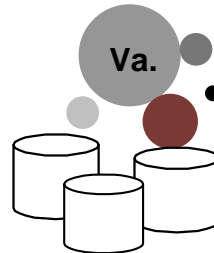


Terminal Automation of the Future



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.



Integrated Supervision

Central Tech Support



Ga

Fla

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

Questions.....?



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