Power Plant Automation

YUTECH

TM

SINCE 1978

YUTECH

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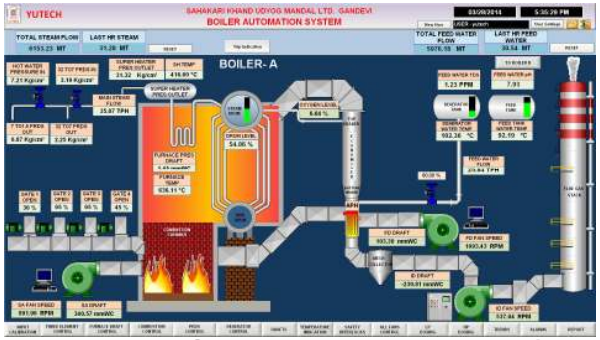

Servicing the Sugar Industry since 1978

Agenda

- Need for Automation
- Automation Approach
- Automation Examples
- Why choose **YUTECH**
- Case Study and Value Analysis
- Concluding Remarks

Need for Automation

Energy savings by improved throughput, gain in performance and efficiency

Achieve the minimum cost of operations by streamlining operations and increasing Throughput

Save costs and money by optimising the resources like Steam, Fuel, Power and water.

Advantages of YUTECH Design

Boiler Automation and Load Balancing System:

- YUTECH Load Balancing Algorithm facilitates Continuous Maintained Steam Generation and Uniform Steam Flow.
- YUTECH Draft Fan Speed Algorithm facilitates Excellent Combustion Conditions hence Increased Efficiency thus Optimum Boiler Capacity Utilization and Reduced Carbon Footprint.
- Increased Steam to Fuel Ratio hence Fuel Saving.
- Reduced Thermal Shocks hence Longer Life Expectancy.

Loops of Boiler Automation

- De Aerator Level and Pressure Control.
- Three Element Control with Drum Pressure Compensation.
- Combustion Control.
- Load Balancing of two or more Boilers.
- Soot Blower Controls.
- Attemperator Control.
- Fuel and Ash Handling Control.
- Cooling Tower Control.
- DM Plant Control.
- Hotwell Control.
- Steam and Water Analytical System (SWAS)
- Continuous Blowdown (CBD) Level Control
- Intermediate Blowdown (IBD) Level Control

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Load Balancing of Two or more Boilers

It is often seen that in spite of having high end DCS / PAC / PLC Controls, the load balancing of multiple Boilers is always an issue and so is Combustion Control. This leads to several stresses and losses in Steam Generation including excess Fuel Consumption.

YUTECH's Most Important and Essential Features:

Draft Fan Speed Algorithm:

YUTECH has developed an Algorithm to set optimum speeds for the given Load Condition to ensure the best Combustion Condition.

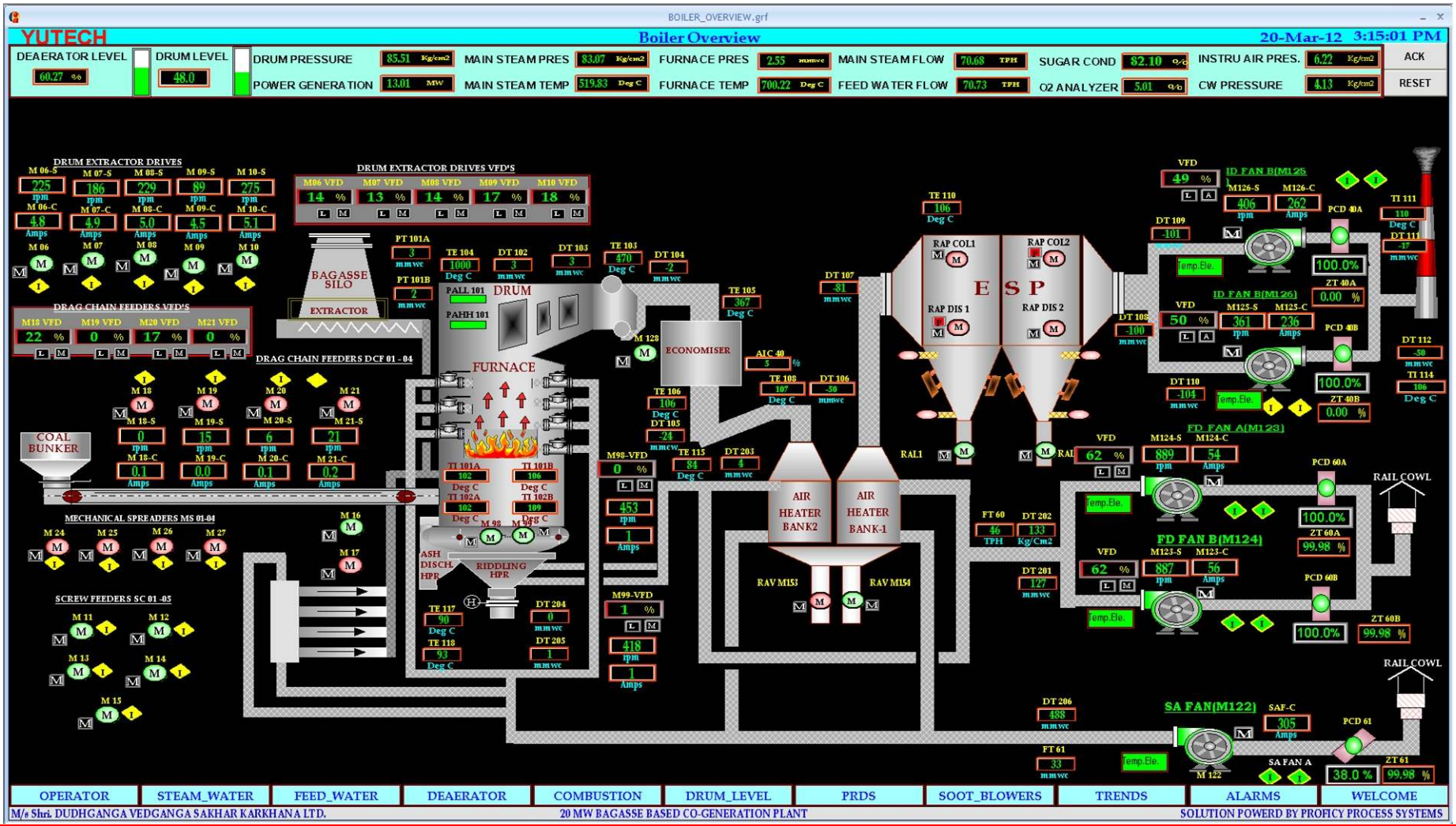
Boiler Load Balancing Algorithm of Two or more Boilers:

YUTECH has also developed a Special Totally Dedicated Algorithm for Load Balancing of Two or more Boilers.

Result:

- Optimum Combustion Saves Fuel and improves Carbon Footprint by way of reducing CO while reducing Excess Air to the Furnace thus also saving Power for Draft Fans.
- All Boilers run at exactly the same desired loads and Steam Pressures of each Boiler are always within 0.05 Bar of each other.

Screen Shot Overall Boiler



Screen Shot Overall Boiler

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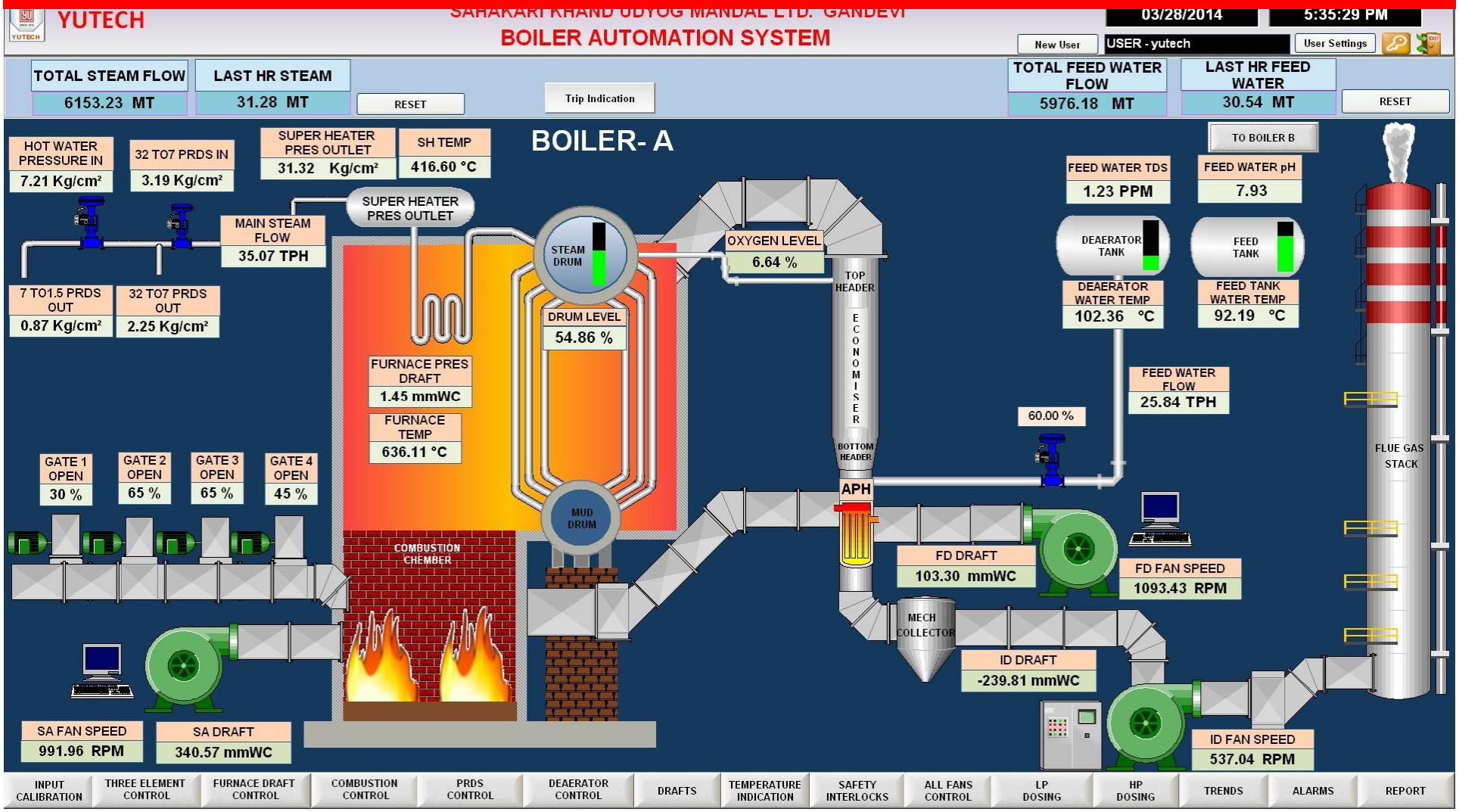
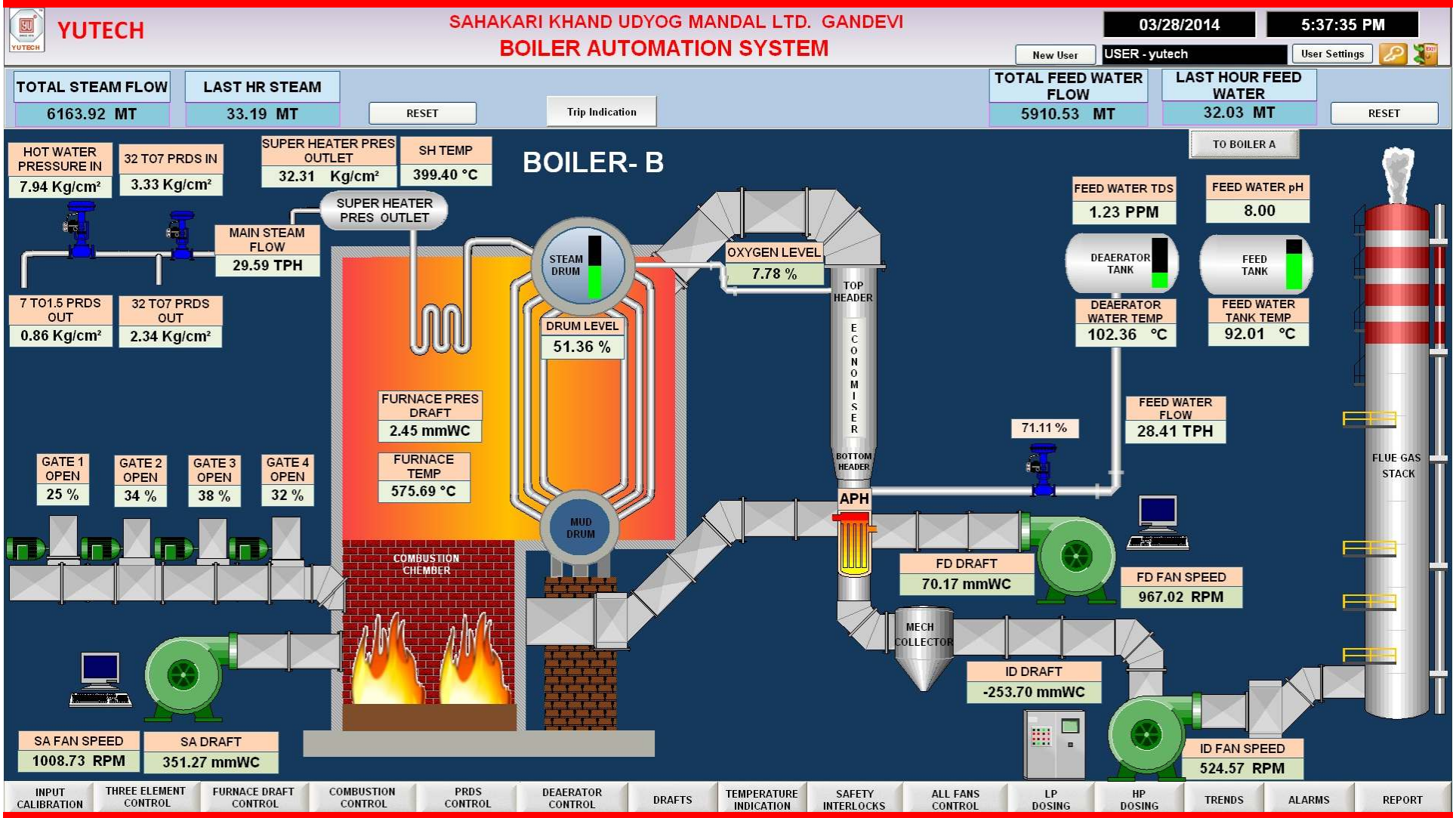


Screen Shot Overall Boiler



Screen Shot Boiler Load Balancing

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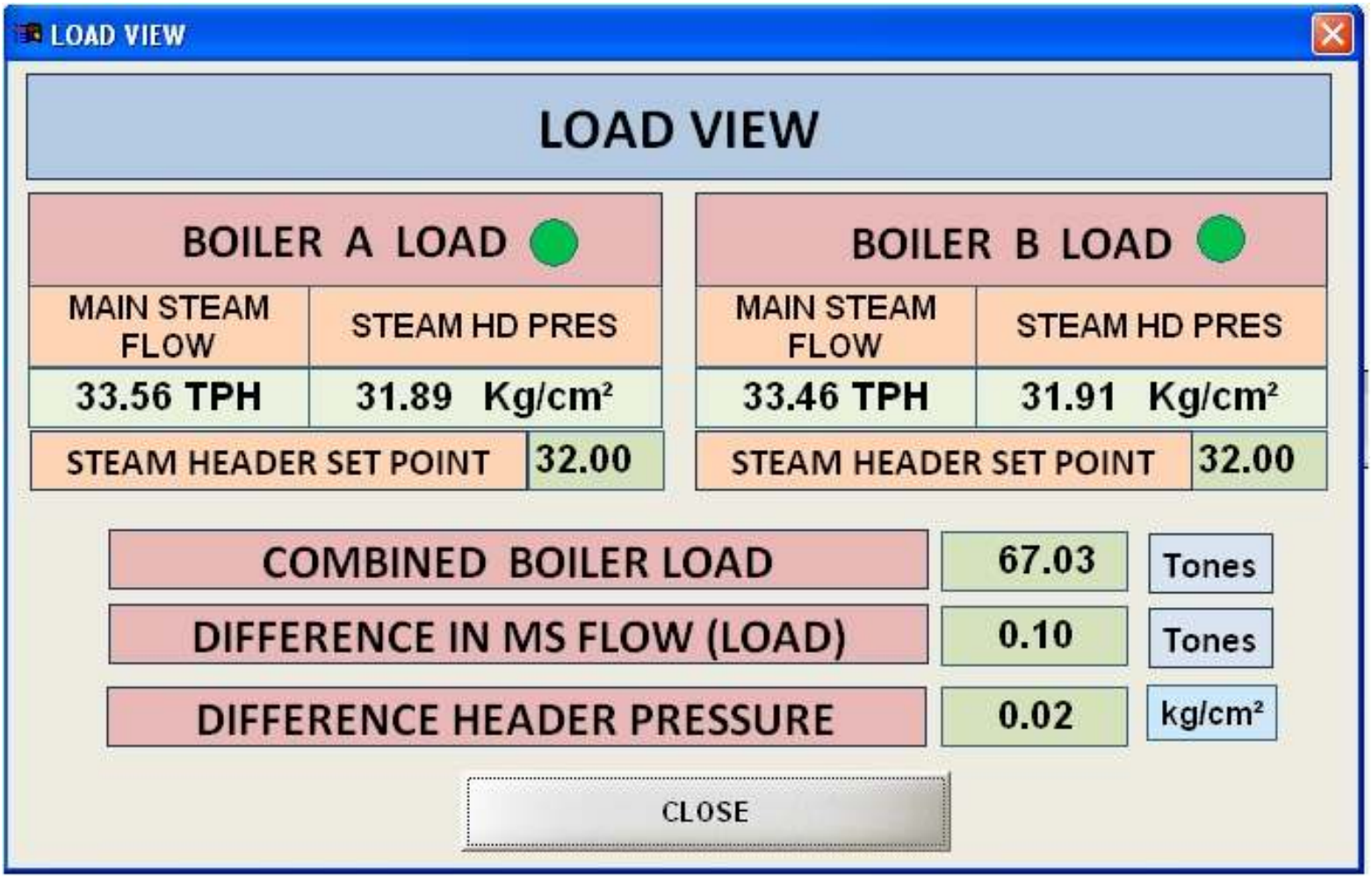
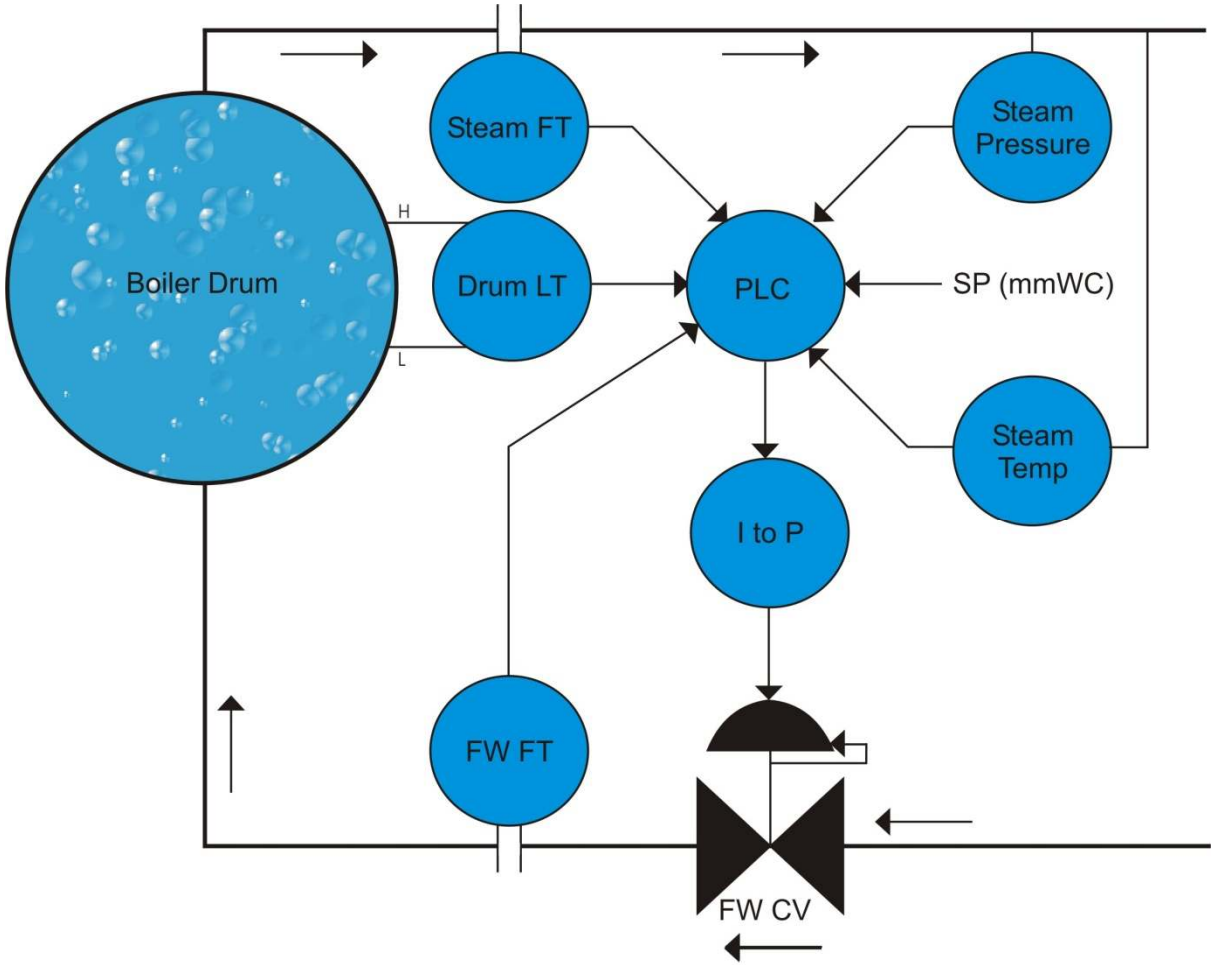
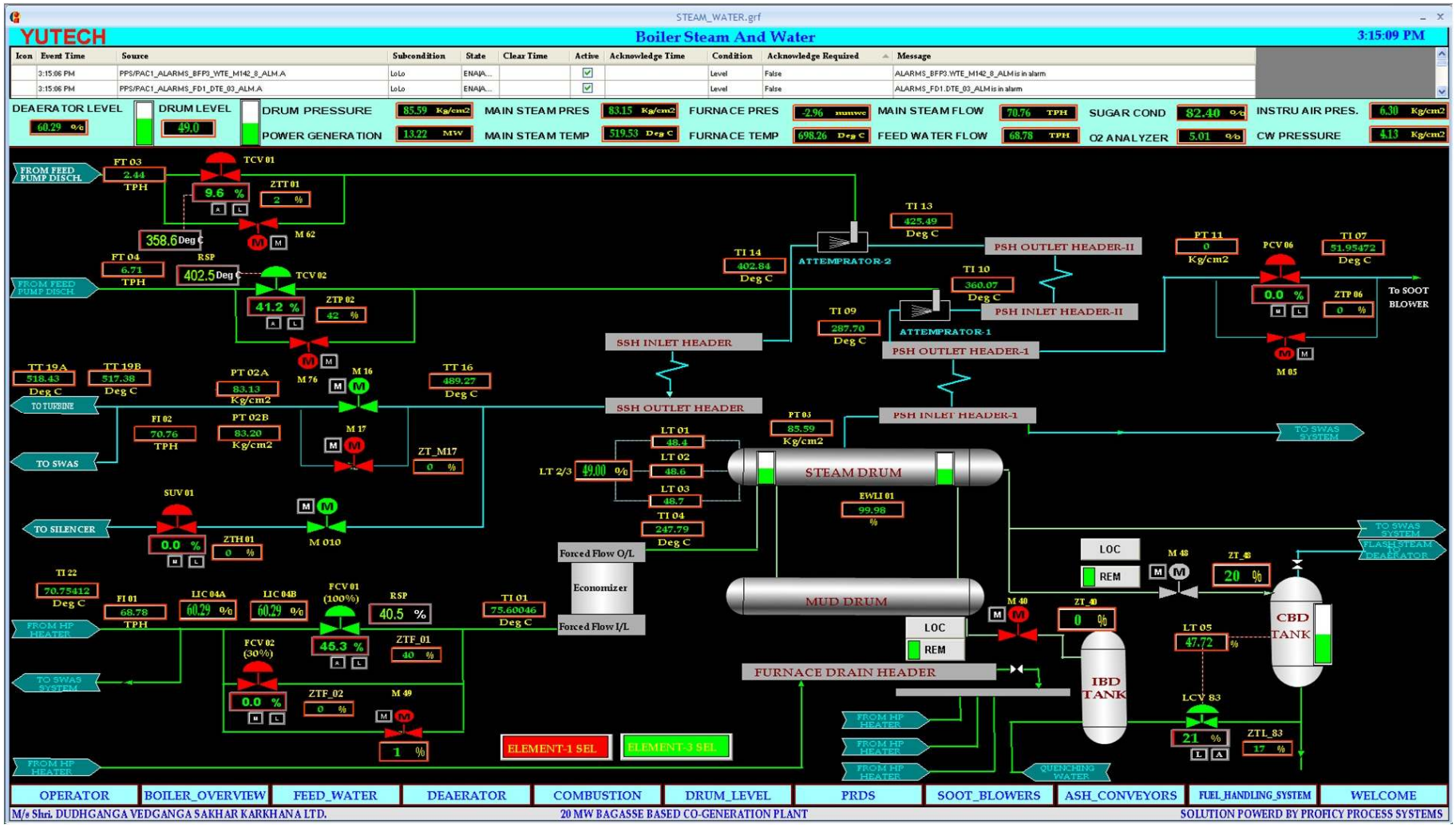


3 Element Control

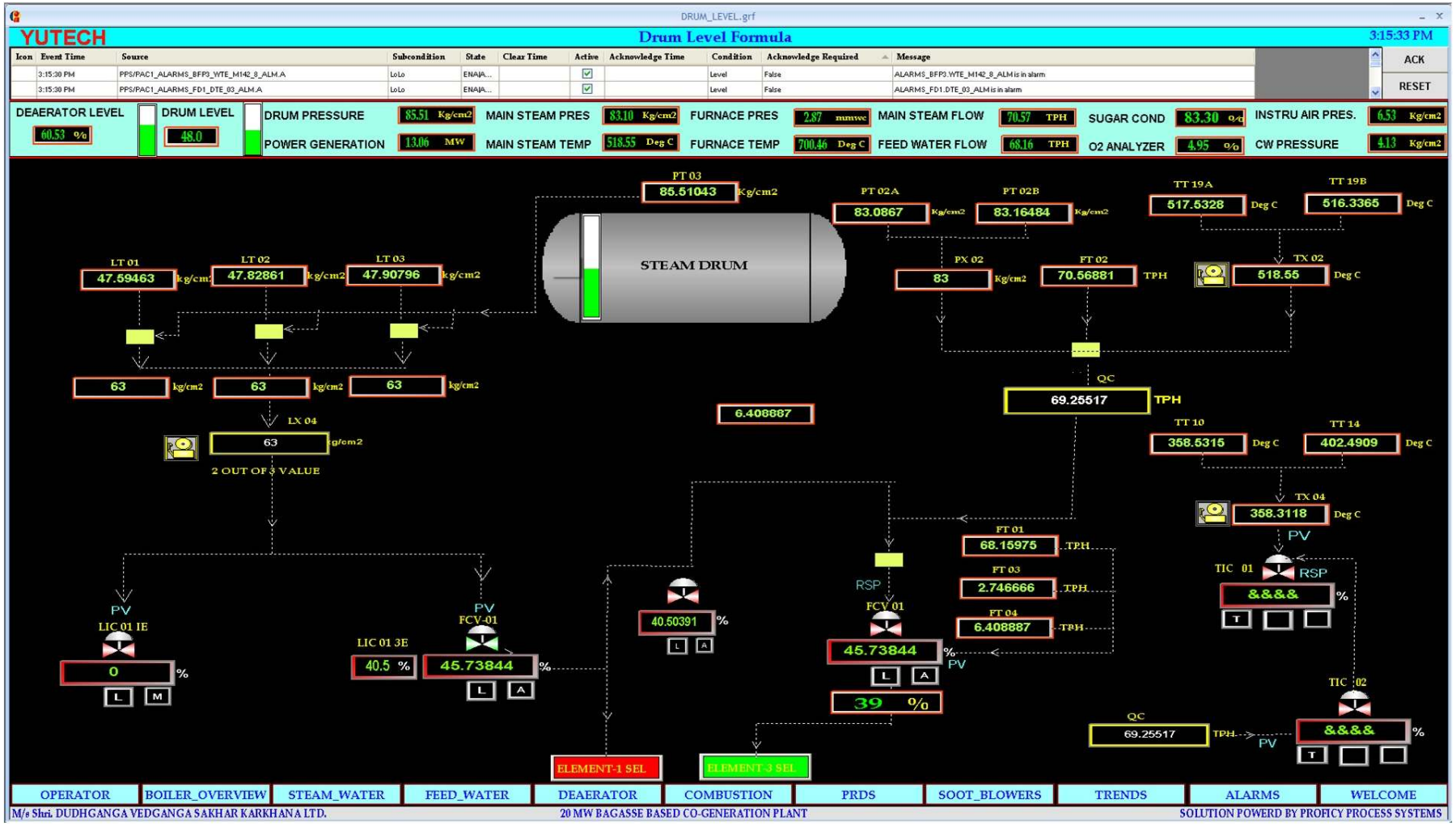


Advanced Three Element Control

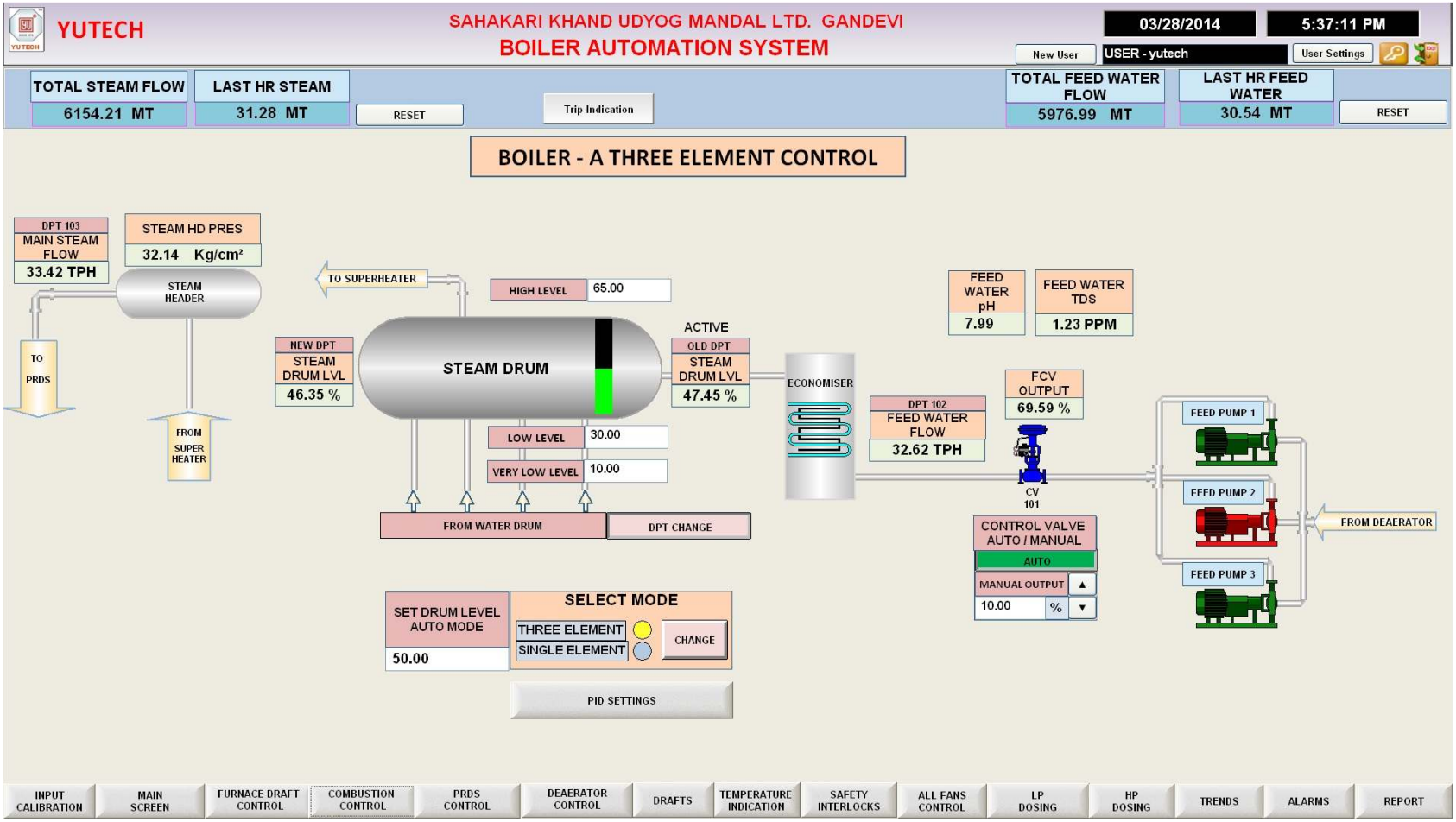
Screen Shot Boiler Steam and Water Controls



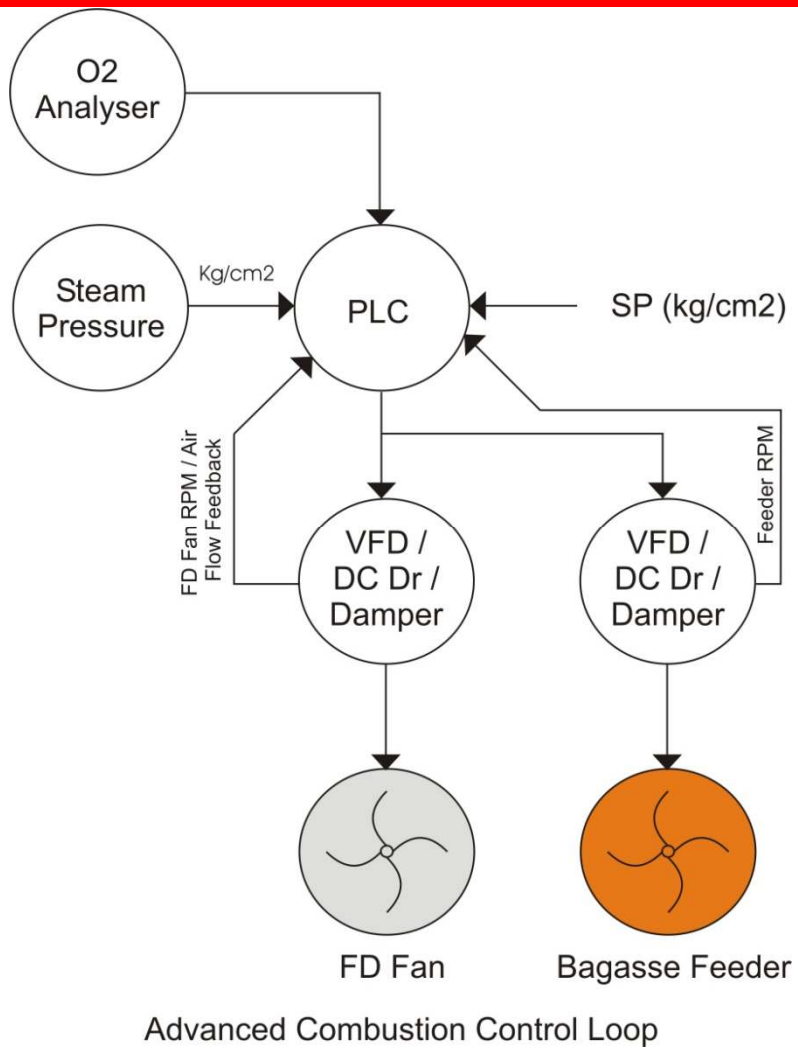
Screen Shot of 3 Element Controls



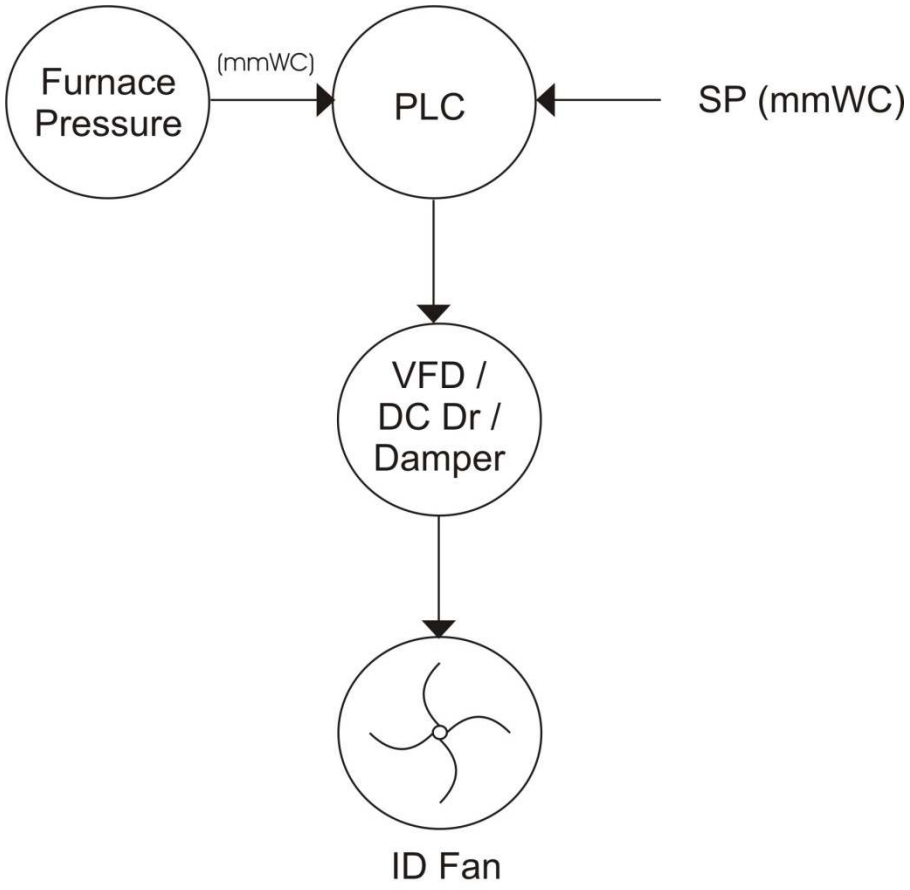
Screen Shot of 3 Element Controls



Combustion Controls



Advanced Combustion Control Loop



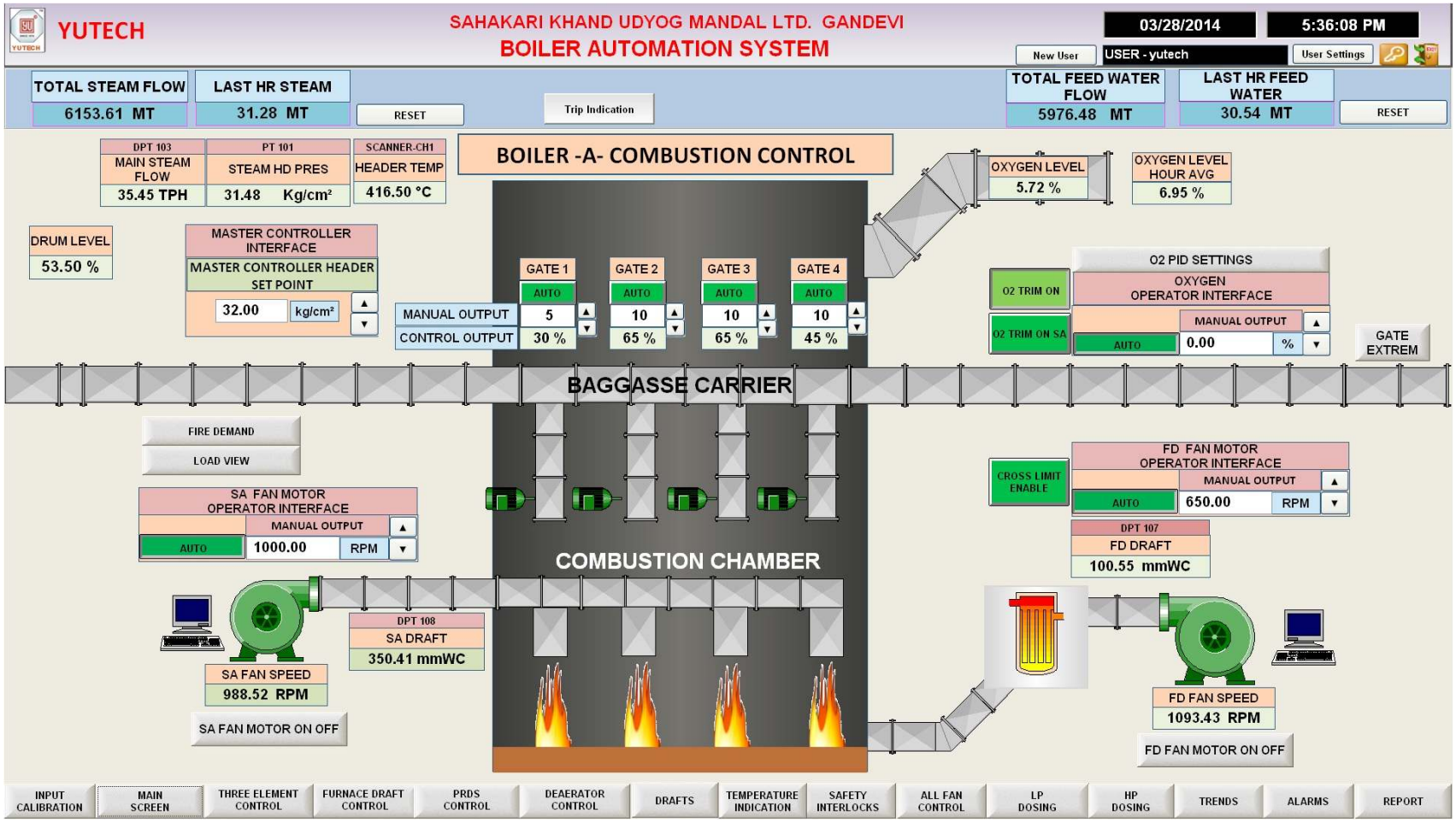
ID Fan Control Loop

Screen Shot Combustion Controls

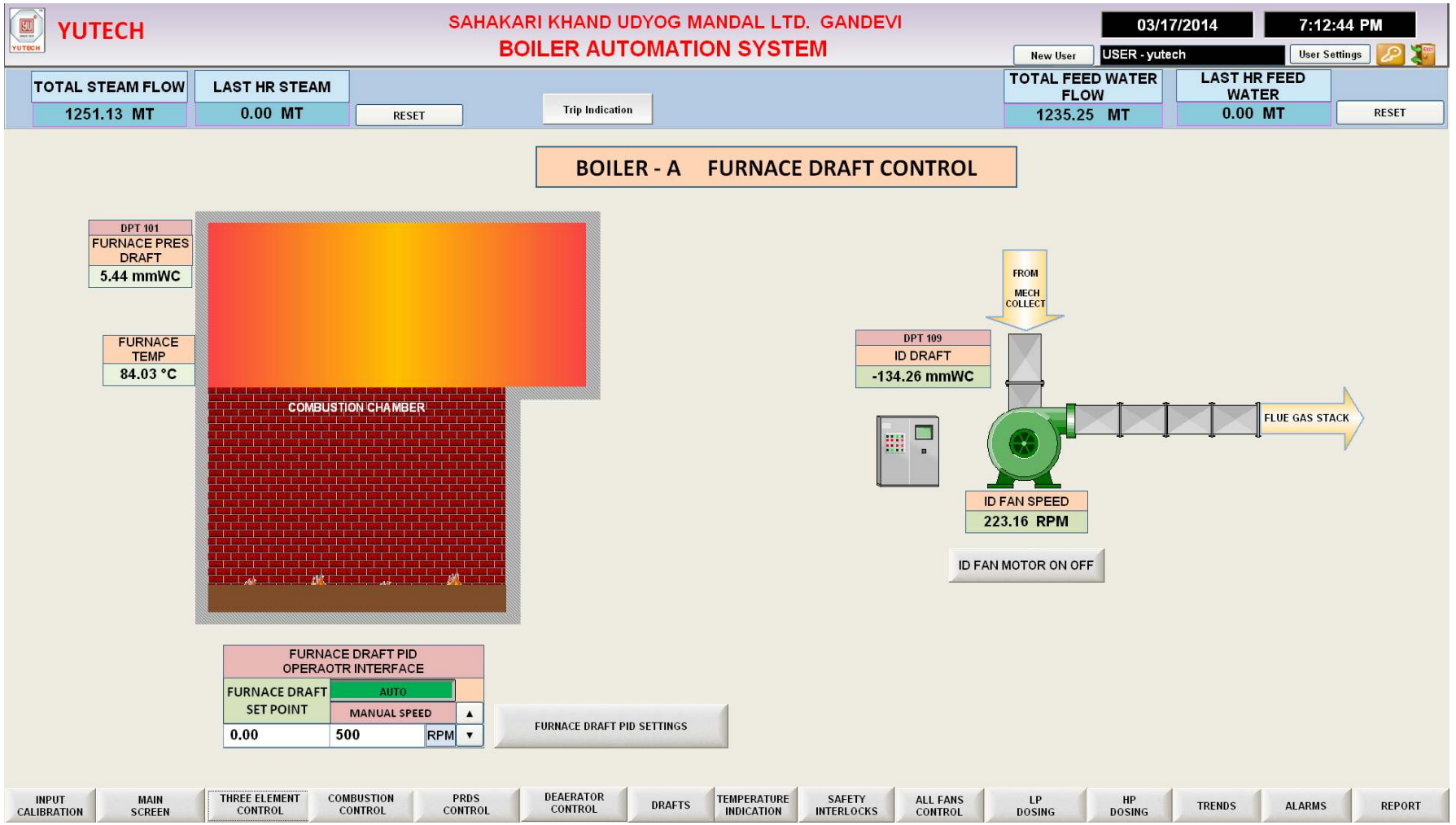
YUTECH having developed the Combustion Control Loop with Draft Fan Speed Algorithm take Great Pride in claiming huge Fuel Savings:

- All fuel Gates, Rotary Feeders, Hoppers are controlled in Fully Automatic Mode with Position or RPM Feedback.
- All Draft Fans are controlled in Fully Automatic Mode with Variable Speed Drives.
- YUTECH Draft Fan Speed Algorithm sets all the Fans at Exact Speeds to create the best suited Combustion Environment.
- Combustion Control gets its Command from the Boiler Load to maintain Set Load.
- If Two or more Boilers have a common SH Steam Header then YUTECH Load Balancing System maintains Steam Pressures of all the Boilers within 0.05 Bar of each other.

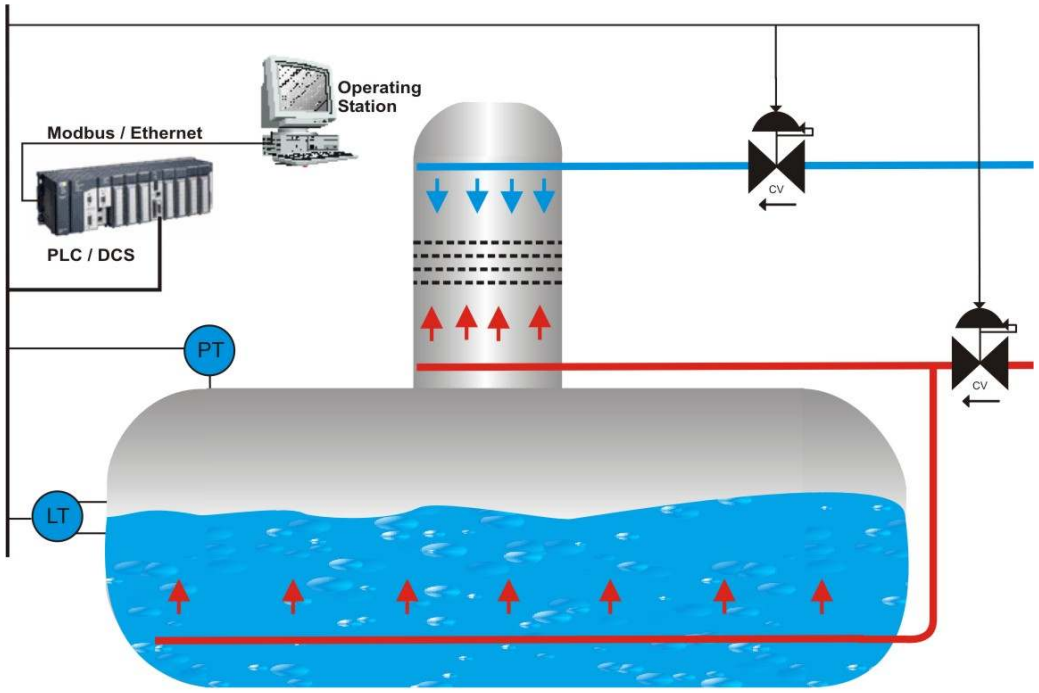
Screen Shot Combustion Controls



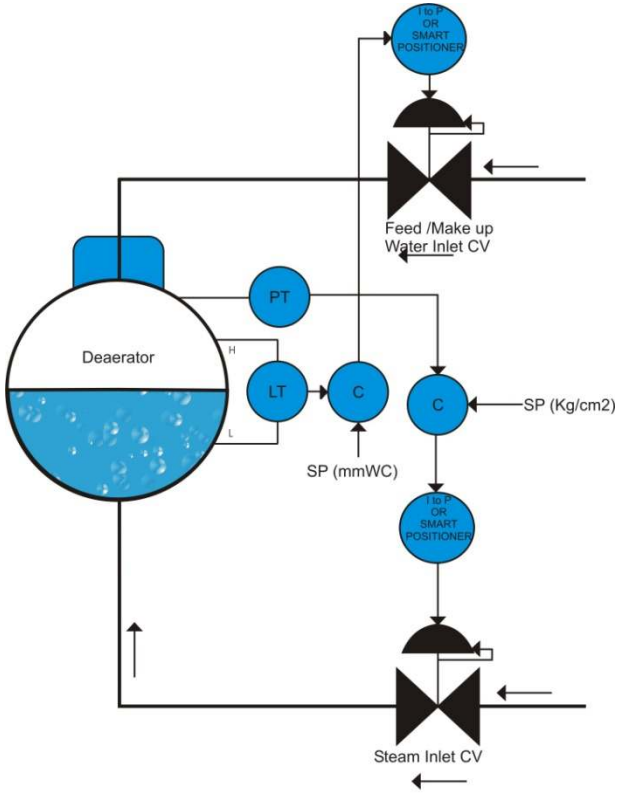
Screen Shot Combustion Controls



De Aerator Overall Schematic and Line Diagram

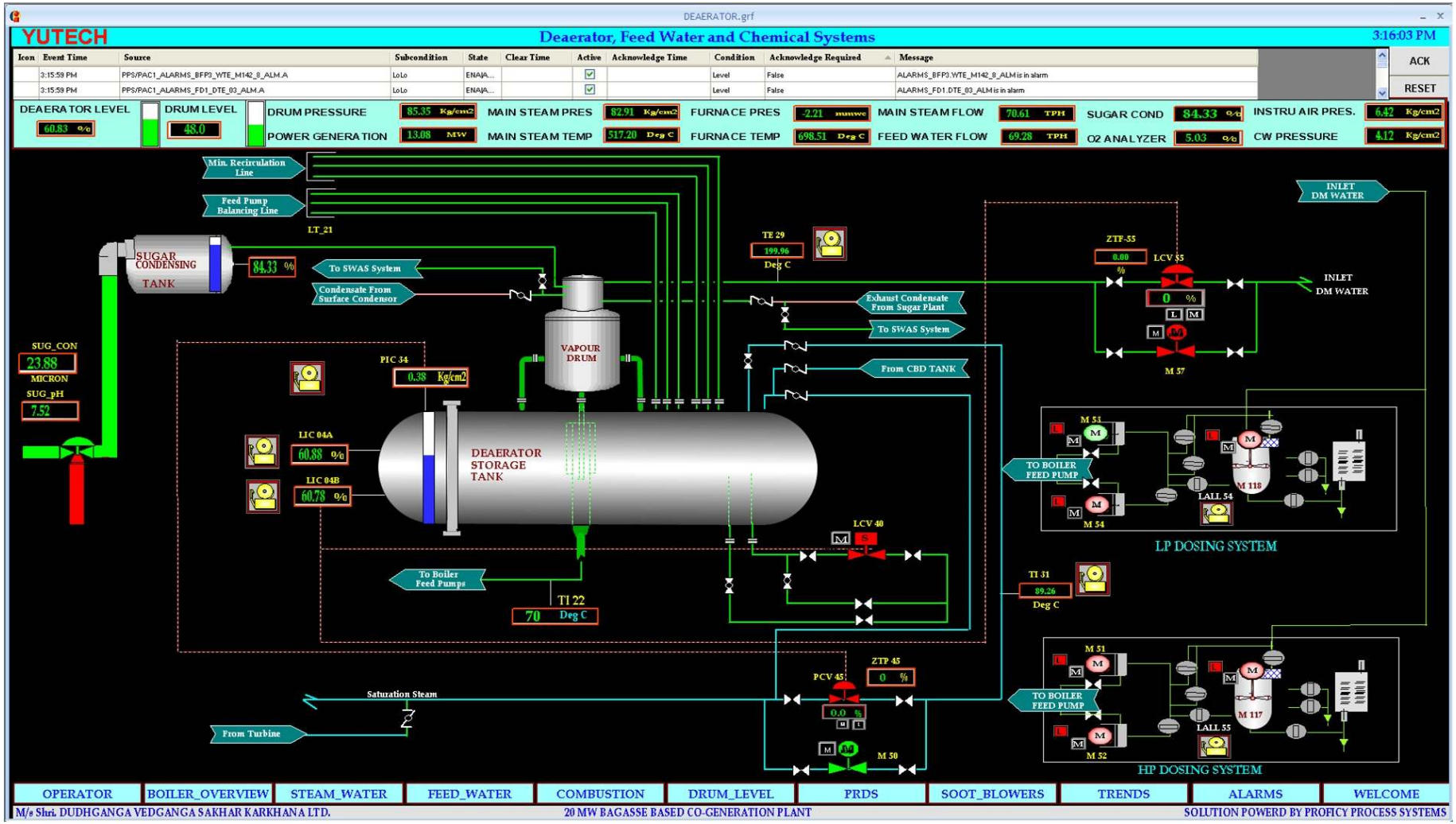


Deaerator Pressure and Level Control

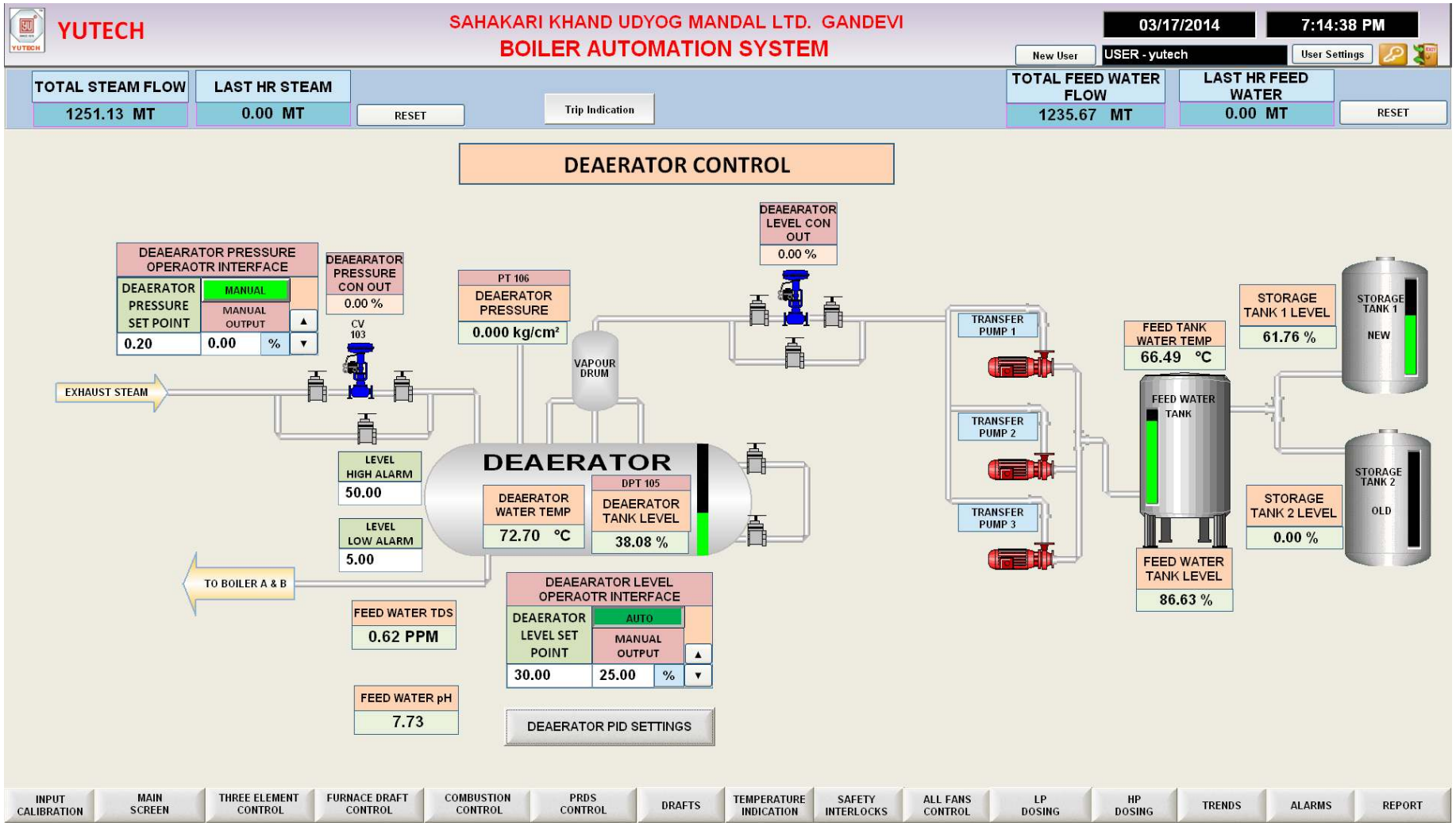


Boiler Deaerator Control

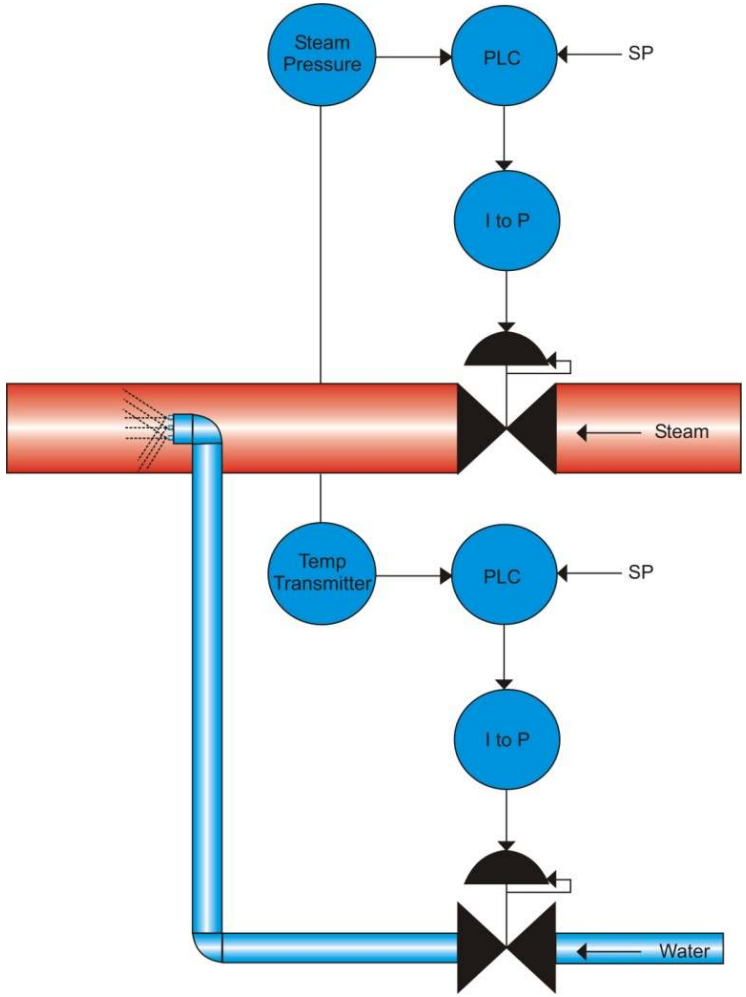
Screen Shot De Aerator Controls



Screen Shot De Aerator Controls

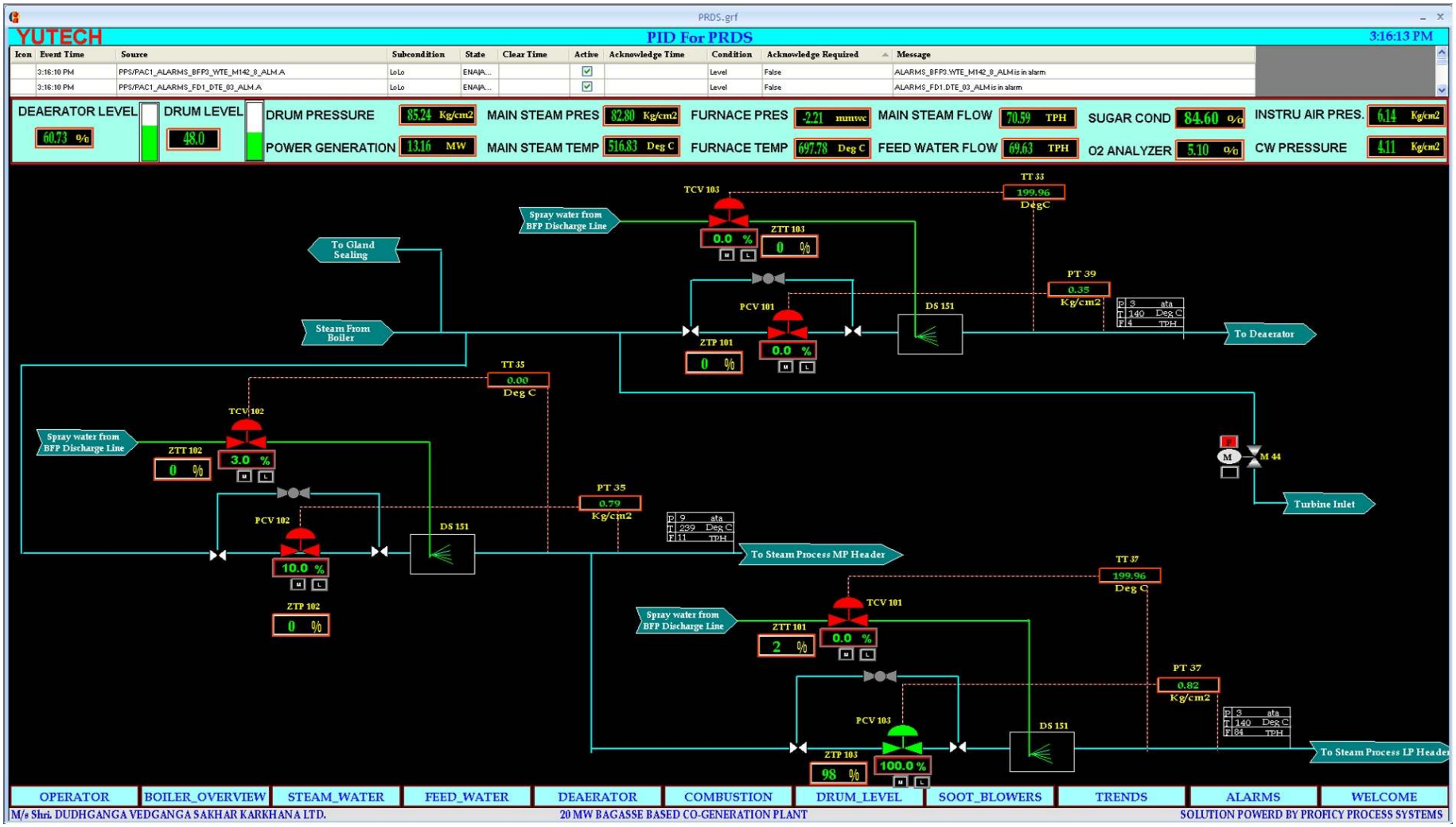


Pressure Reducing and De-Superheating Station (PRDS)

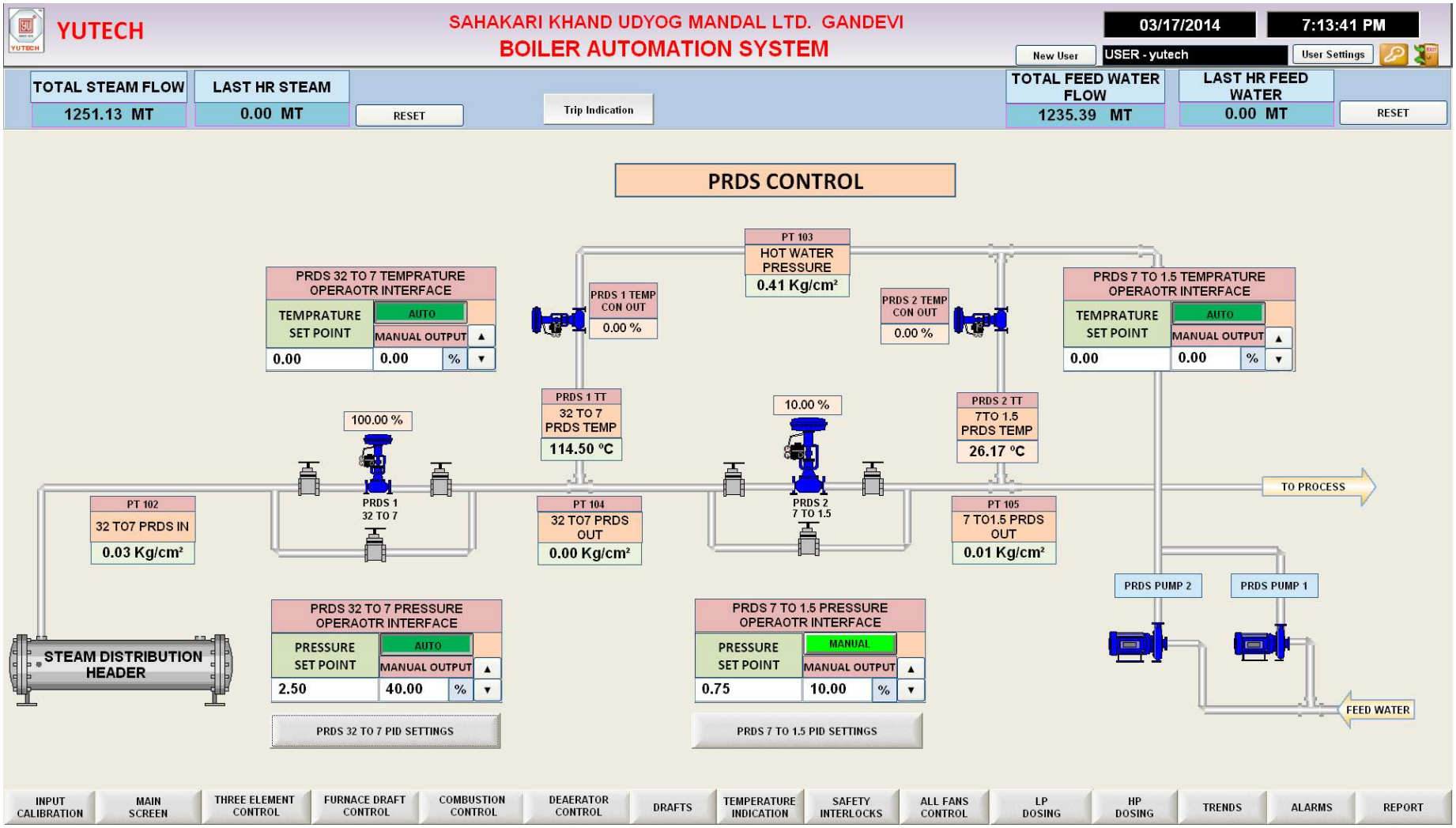


PRDS Control

Screen Shot of PRDS



Screen Shot of PRDS



Field Instruments Installation

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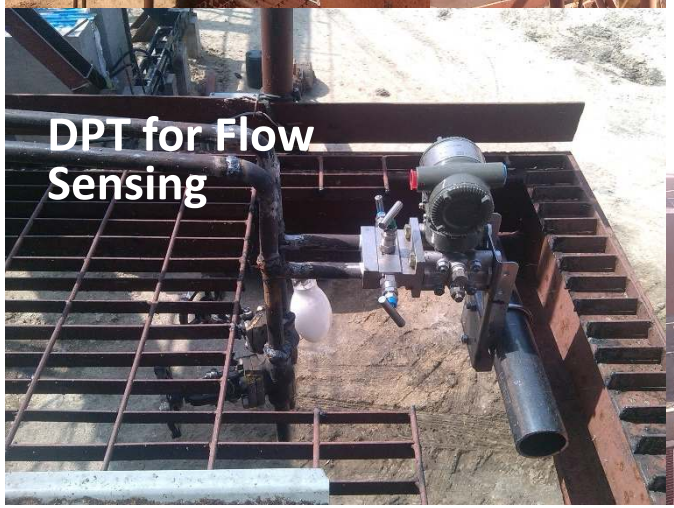
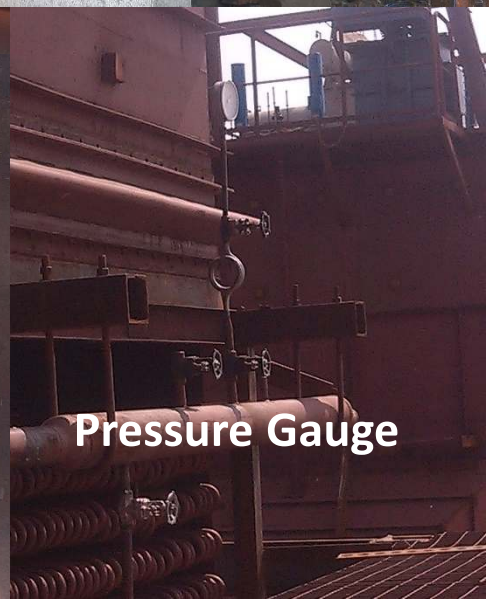
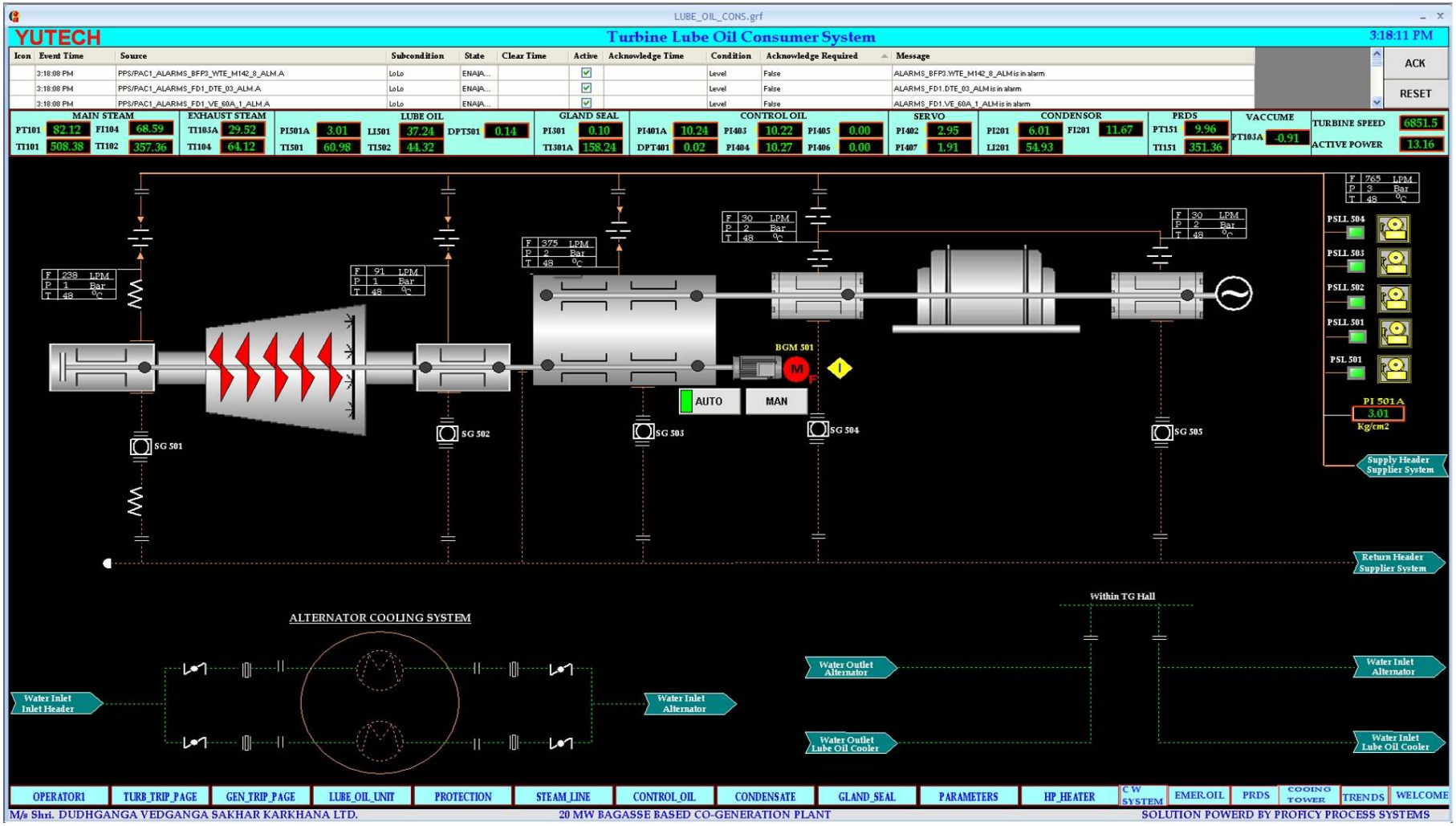


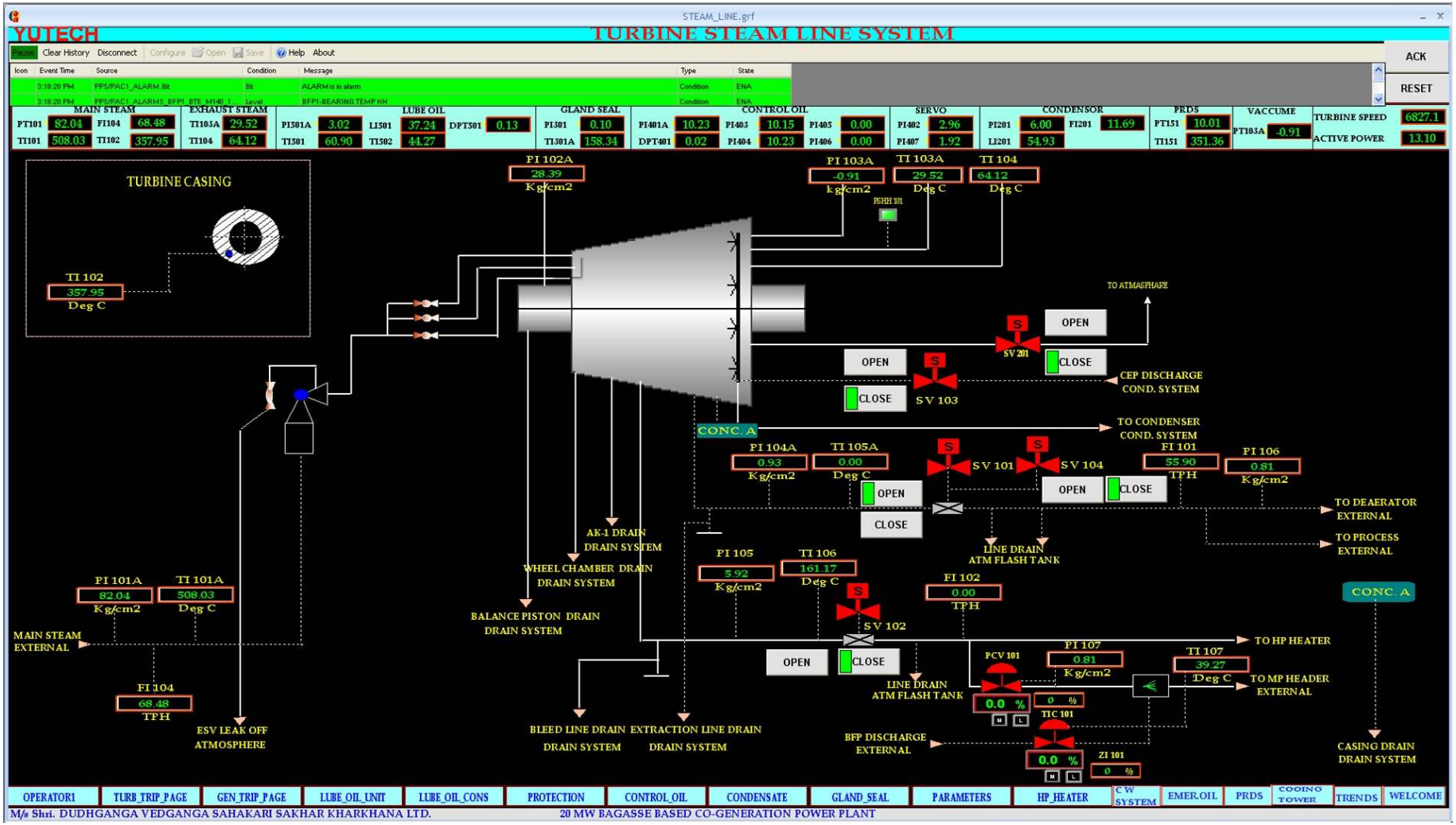


CoGen Power Plant and Field Instruments Installation

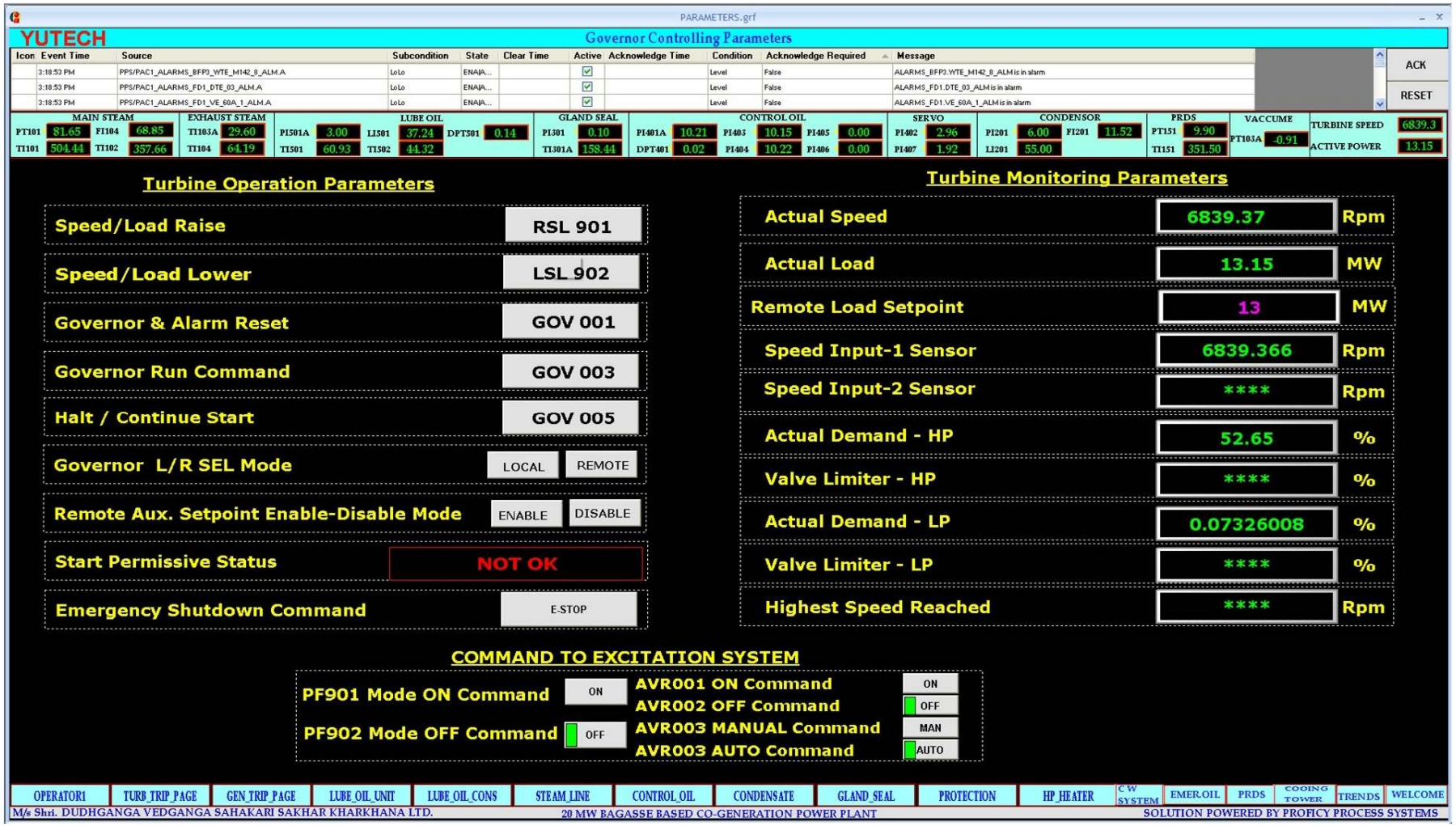
Screen Shot Turbine Protection System



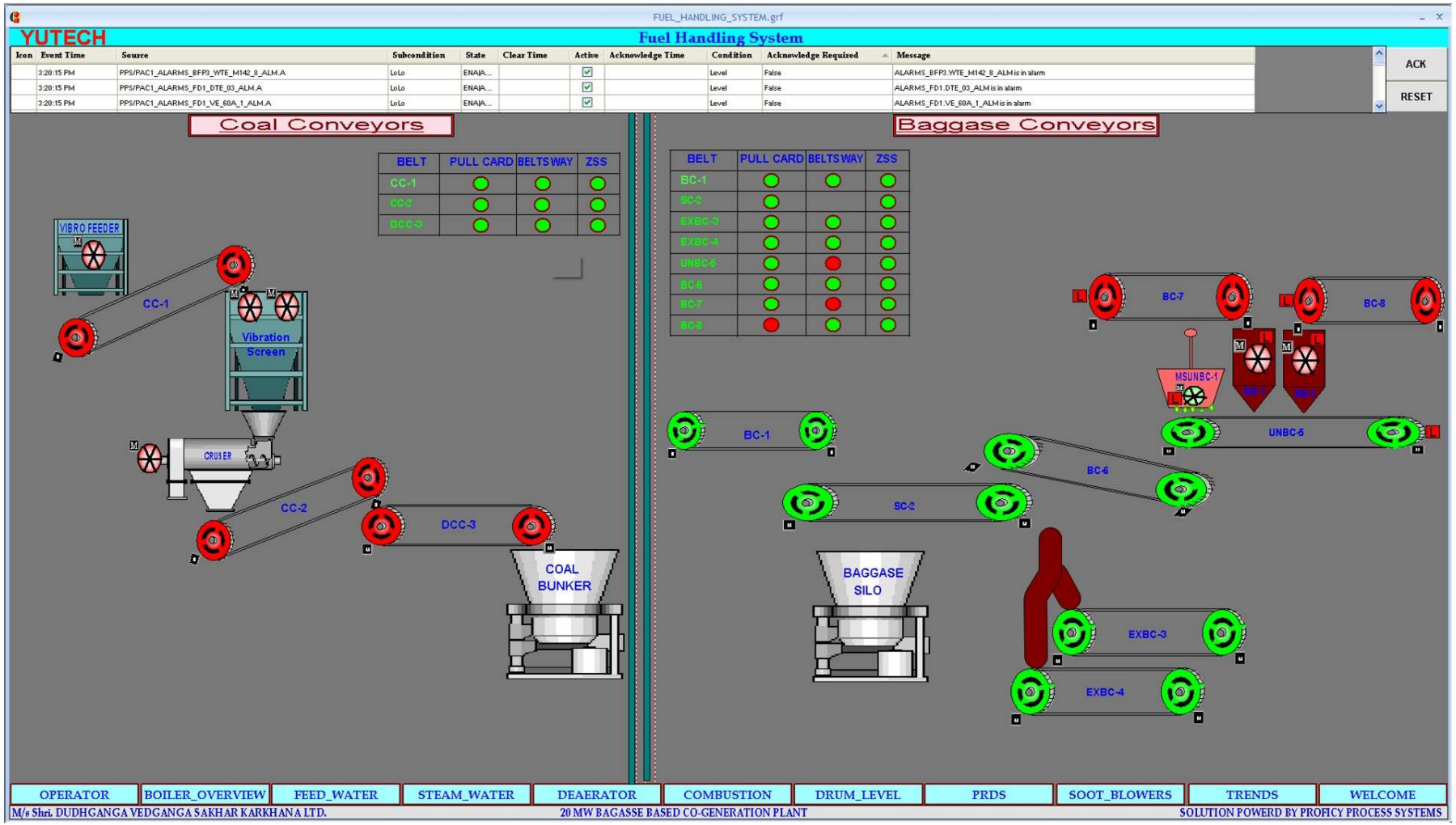
Screen Shot Turbine Steam Line Controls



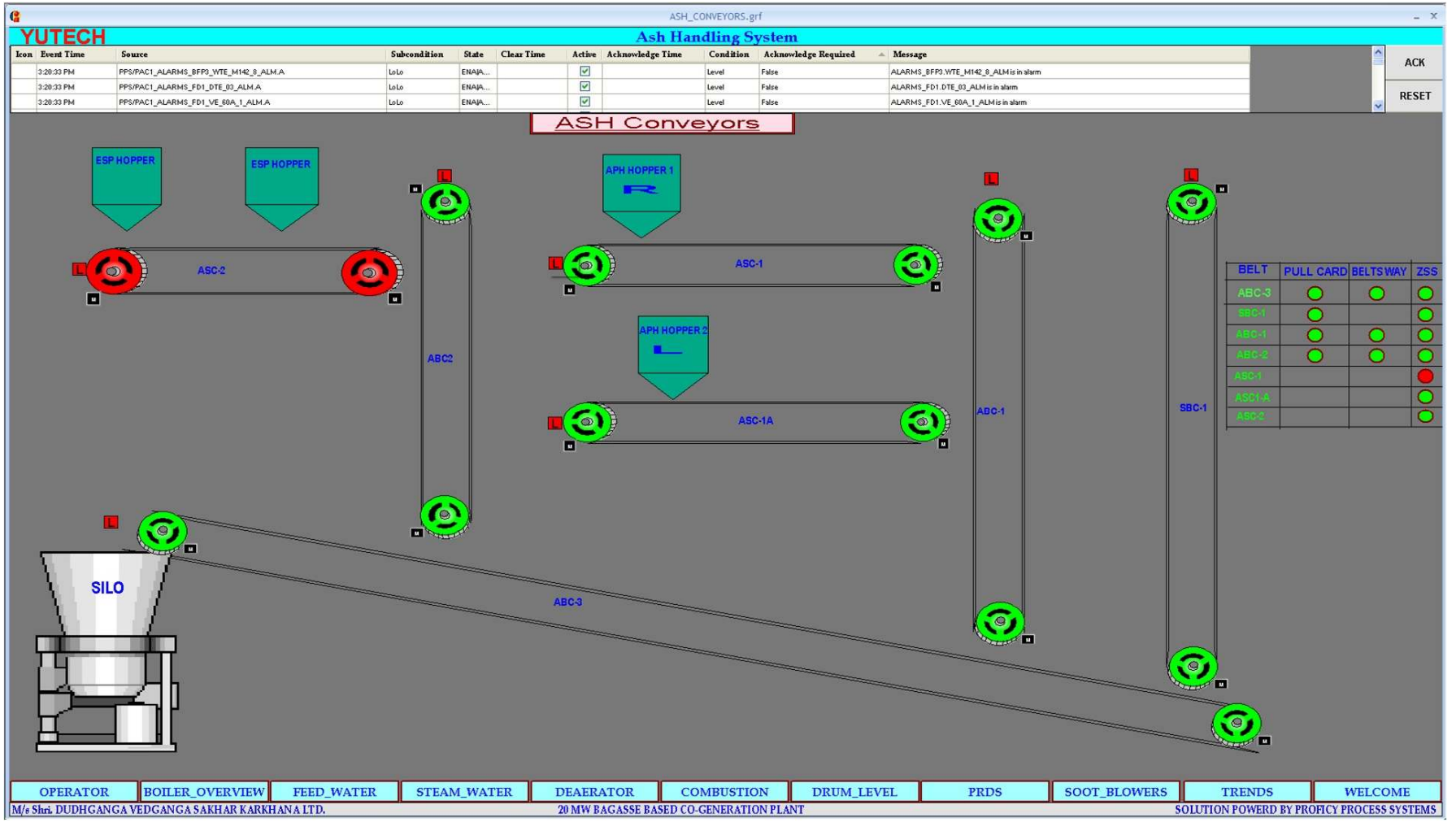
Screen Shot Turbine Governor Parameters



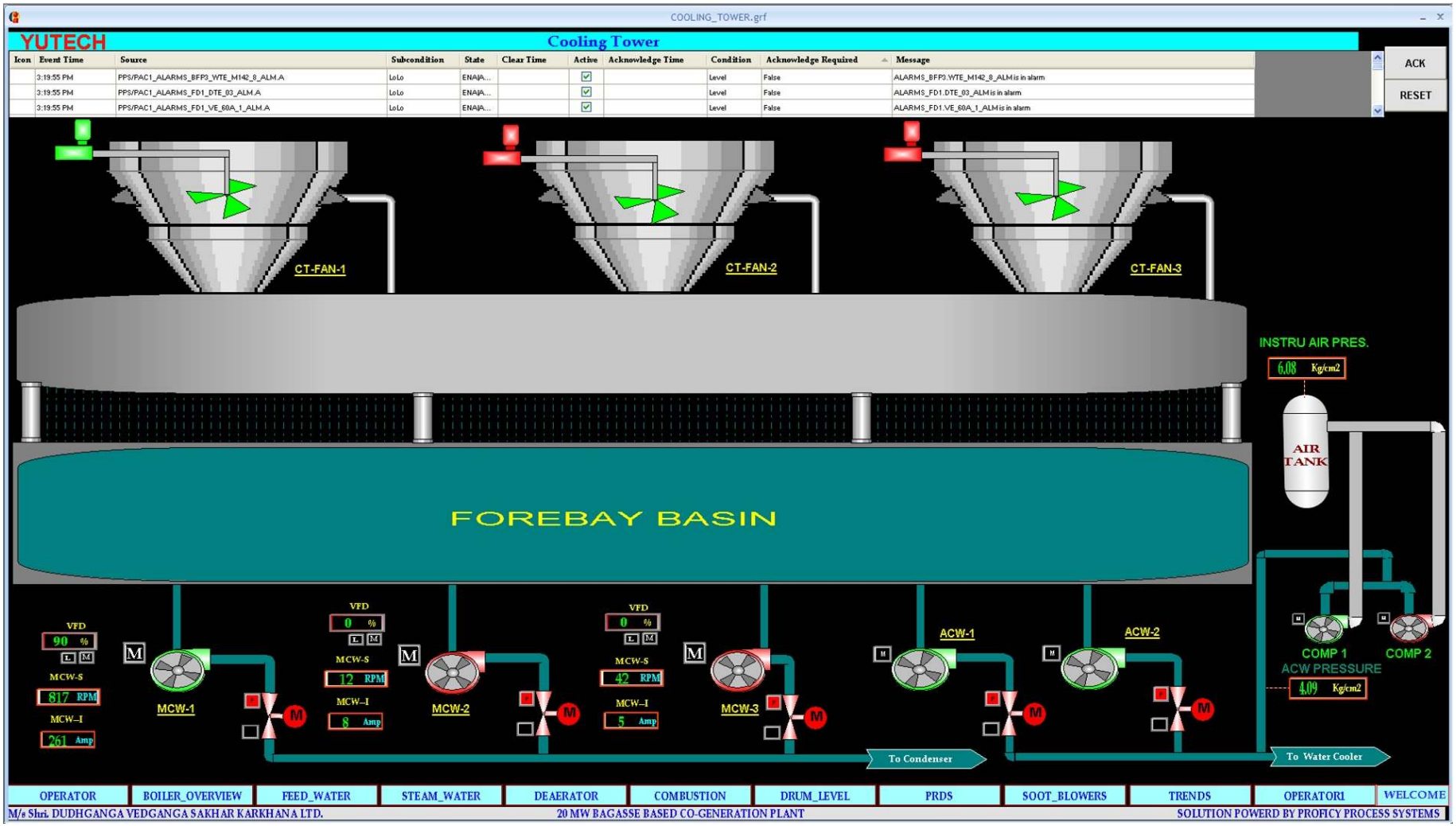
Screen Shot Fuel Handling System



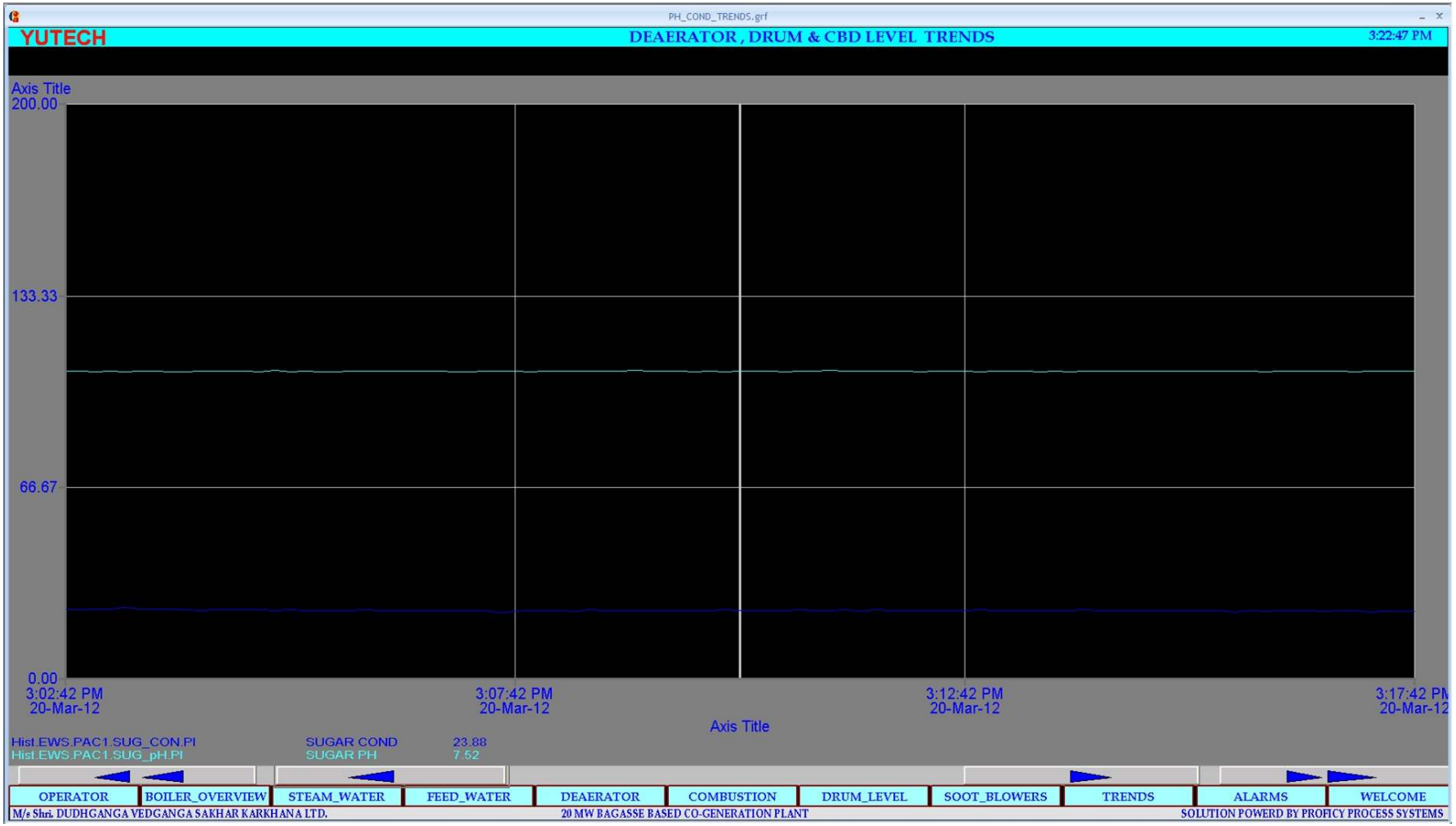
Screen Shot Ash Handling System



Screen Shot Cooling Tower Controls



Screen Shot Trends



Centralized Sugar Plant Automation Control Rooms:

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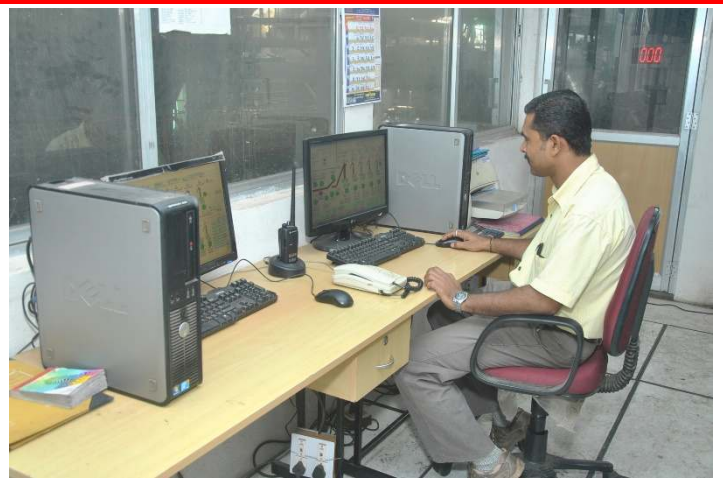
Centralized Sugar Plant Automation Control Rooms:



Centralized Sugar Plant Automation Pictures:

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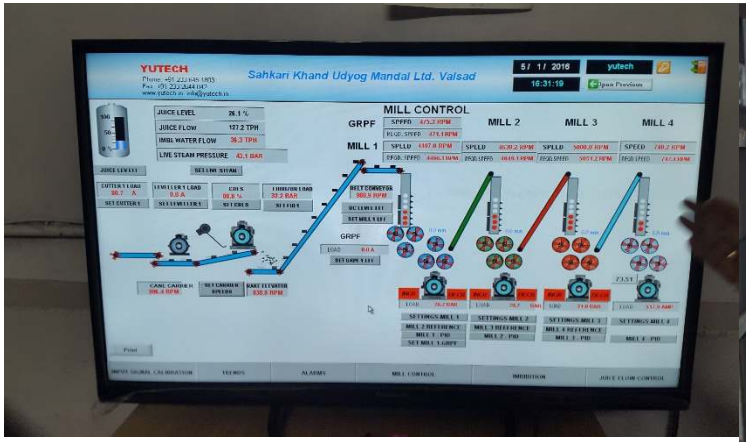

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Superior Quality Norms and Protection for Automation Systems:

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- ✓ UPS System
- ✓ Built-In Panel Isolation Transformer for Mains Power Supply
- ✓ RCD for Mains Power Supply
- ✓ MCB for Each Power Distribution Head
- ✓ EMI / RFI Filter for Mains Power Supply
- ✓ Switching Surge Arrestor for Controller Power Supply Head
- ✓ Isolation Barrier for all Analogue I/Os
- ✓ Potential Free Relay for all Digital I/Os
- ✓ Fuse TBs for all Digital I/Os

Concluding Remarks

Proper Combustion reaction in the Furnace Improves Boiler Efficiency, this in turn improves Steam to Fuel Ratio and leads to Fuel Saving. This can be demonstrated by Equation below:

$$\text{Steam to Fuel Ratio} = \frac{\text{Fuel GCV x Boiler Efficiency}}{H - h}$$

Where

H = Enthalpy of Superheated Steam

h = Enthalpy of Feed Water

Our focus on maintaining higher temperature at De-Aerator further improves the above equation.

Concluding Remarks

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Power Plant Automations Ensure Higher Efficiency:

- Improved Efficiency by 3-5%.
- Improved Steam to Fuel Ratio due to increase in FW Temperature and increase in Boiler Efficiency (Please see Fuel Ratio Equation).
- Optimum Combustion Reduces Un-burnt Fuel Losses This is evident from:
  - Decrease in Oxygen and Increase in Carbon Dioxide Percentage in Flue Gas and at the same time reduction in Excess Air Percentage.
  - Reduction in Flue Gas Carbon Monoxide Percentage.
- Reduction in Excess Air means optimum usage of Fan Drives and thus Power Saving.
- Maintained Steam Drum Level with Pressure Compensation Ensures Optimum Steam Generation while compensating for Shrink and Swell in the Drum Level.

Concluding Remarks

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Power Plant Automations Further Ensure:

- Reduction in Clinker Formation due to good combustion condition.
- Reduces Thermal Shocks and Improves Life Expectancy.
- Energy Savings in Electricity, Fuel and Other Natural Resources.
- Equipment Protection.
- All Key Performance Indicators are Highlighted and Recorded.
- Faults are easily identified.
- Ensure Maximum Up Time.

YUTECH

THANK YOU!

For your time and Presence

SAVE FUEL

REDUCE CARBON FOOTPRINT

MAKE THE WORLD GREENER

AND YET, MAKE MONEY

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