ACCELERATING INNOVATION

Automating A Fired Heater in Less Than 3 Weeks with DeltaV FLEX

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EMERSON EXCHANGE 2025
ACCELERATING INNOVATION

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Ekona Power

Founded in 2017, Ekona Power is a Burnaby-based company focused on developing innovative, clean, and cost-effective reactor technology for scalable industrial hydrogen production. Their novel methane pyrolysis process converts natural gas into hydrogen and solid carbon, which significantly reduces greenhouse gas emissions, when compared with conventional steam methane reforming processes.

Ekona Power’s Burnaby Pilot R&D Lab

Agenda

John Paul Demetrio	Overview
John Paul Demetrio	The Challenge
Andrew Yick	The Solution (PK Flex)
John Paul Demetrio	The Solution (FARC)
John Paul Demetrio / Andrew Yick	Further Improvements

Overview

- R&D Burnaby Lab Batched Reactor Process
  - Consists of Proper Sequences/Stages
  - Involving Intricate Subsystem
  - Gas Supply to Process (N2 Purge, Feedstock, CH4, O2)
  - Transition to Methane at optimal Temperature for Reactor Combustion

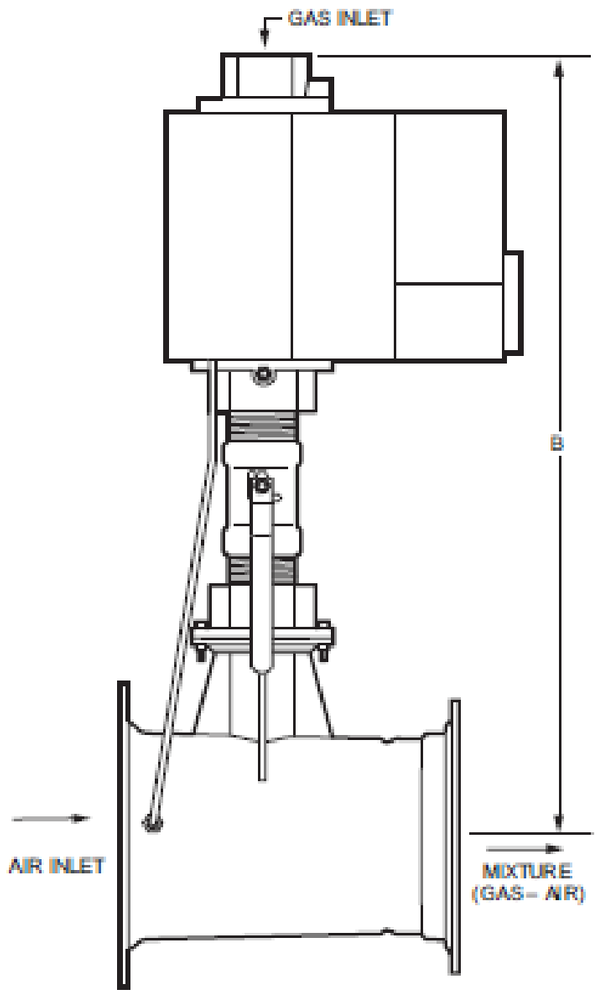
- Feedstock BMS Pre-Heater
  - Burner Management System Heater
  - Feedstock Heater
  - Essential during Testing Operations
  - Design adhered to CSA B149 Standards

Heater Control Panel

Feedstock Pre-Heater

Challenge

- Performance/Reliability Deficiencies
  - Mechanical Design
- Electrical
  - Vendor As-Built Panel Wiring deviated from As-Built Wiring Drawing
- Instrument Design Deficiencies
  - Faulty Switches Trip
  - Temperature Transmitters Adjustment (Thermowells)
  - Blower Design (Re-size)
- Lack of proper Fuel-Air Ratio Control and Monitoring
  - Combustion Air Supply Issues
  - Initial Supervisory Control System Limitations (Labview)



Gas/Air Servo Regulated Gas Valve

Pilot Plant System Requirements

Pilot Plant / R&D Requirements

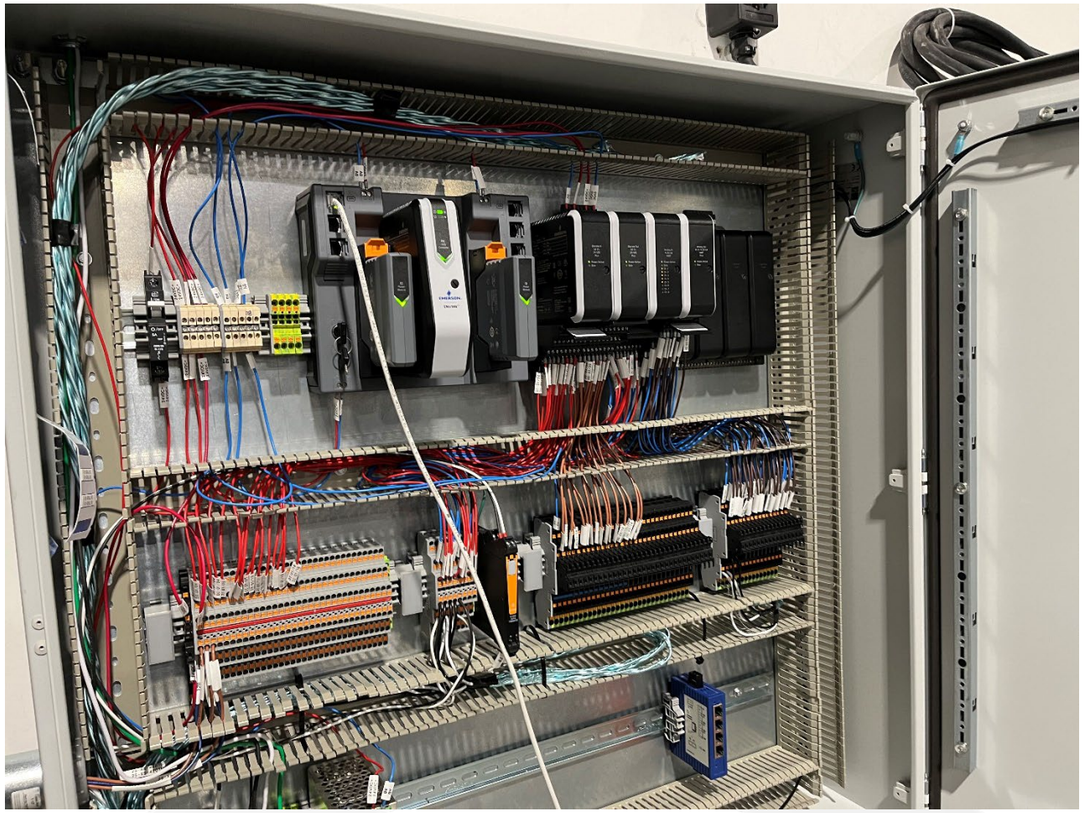
- Quick to source & deploy
- Scalable to other applications in pilot plant
  - Reactors
  - Fuel Handling
  - Utilities / balance of plant
- Reliability & Support

- Ekona evaluated two options
  - Option 1 – PK Standalone (Perpetual System)
  - Option 2 – PK FLEX (Subscription System)

PK Controller	P01 Devices	PN Devices	# Signals
PK100	16	50	4096
PK300	32	100	8192
PK750	64	150	16384
PK1500	128	250	32768

Sprint to Install DeltaV Hardware

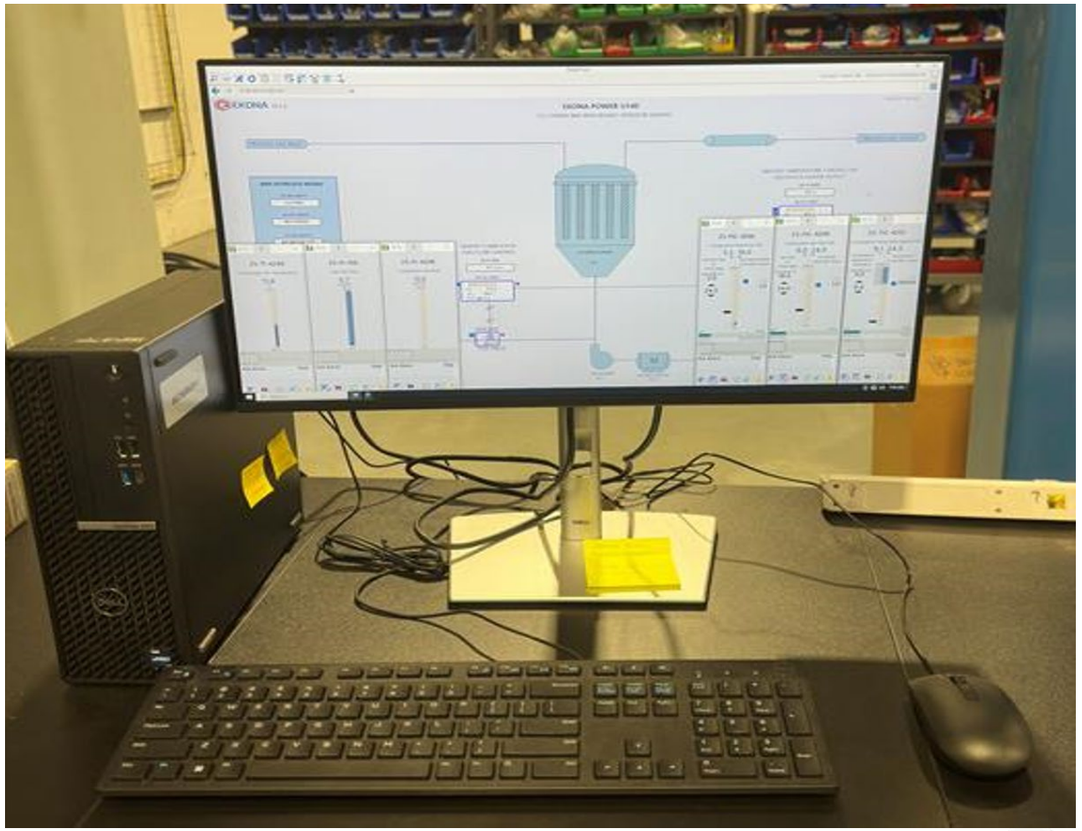
Retrofit of Spartan loaner demo parts



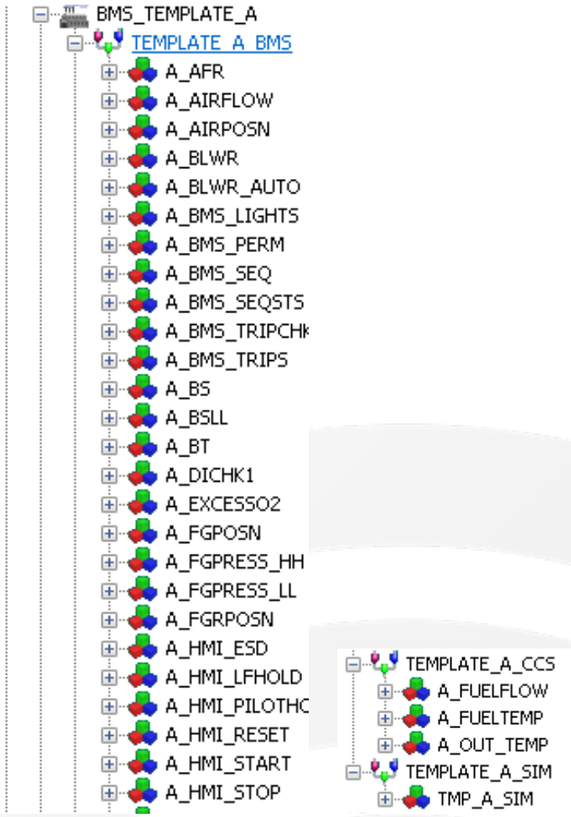
Accelerating Software Implementation

- Utilized Spartan FARC control logic template. Left future requirements (O2) inside templates
- Narrative / SAMA diagrams (Ekona)
- Transmitters – re-ranged to match DCS range.

Solution (FARC)

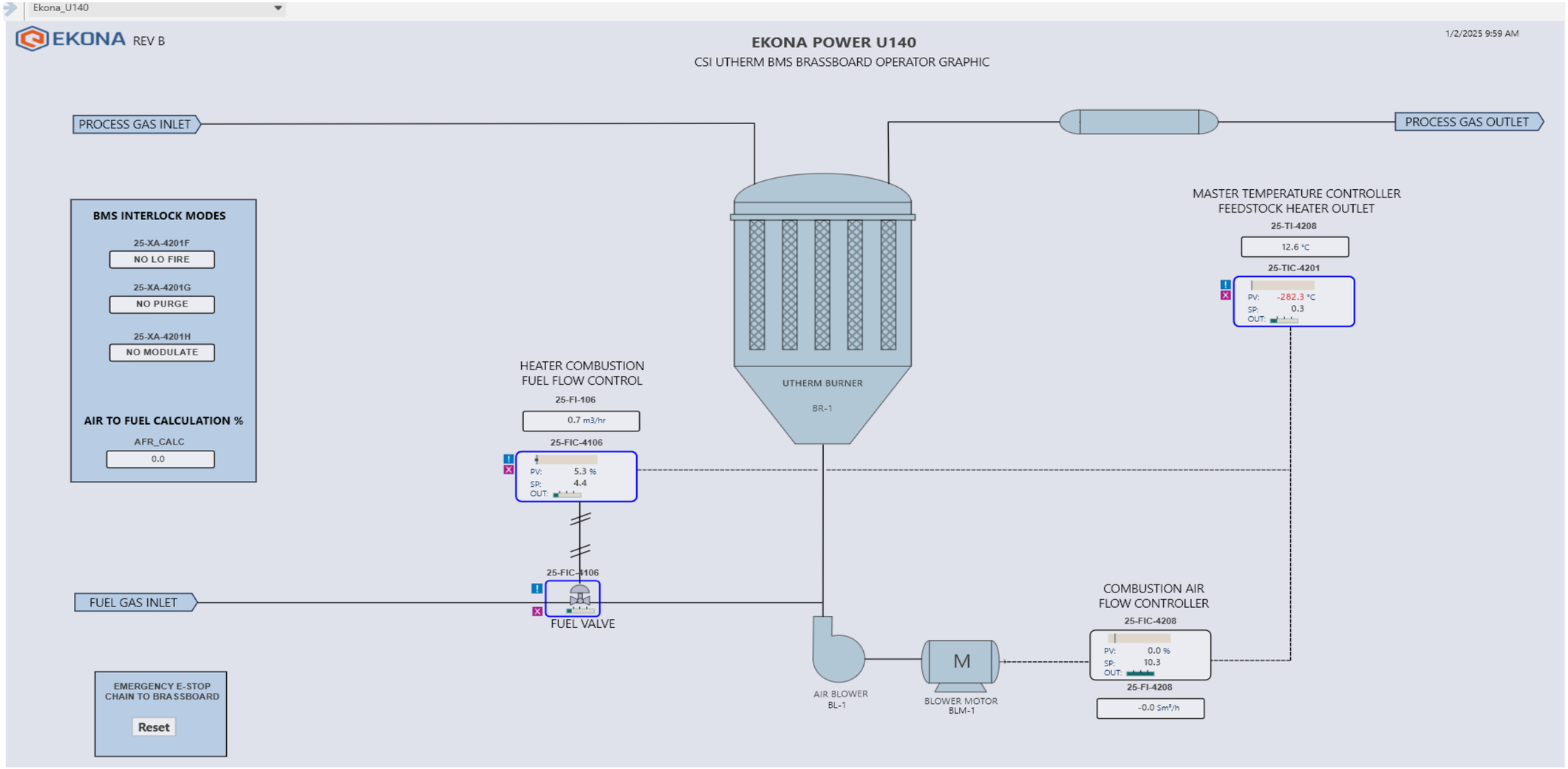


Ekona DeltaV Operator Workstation



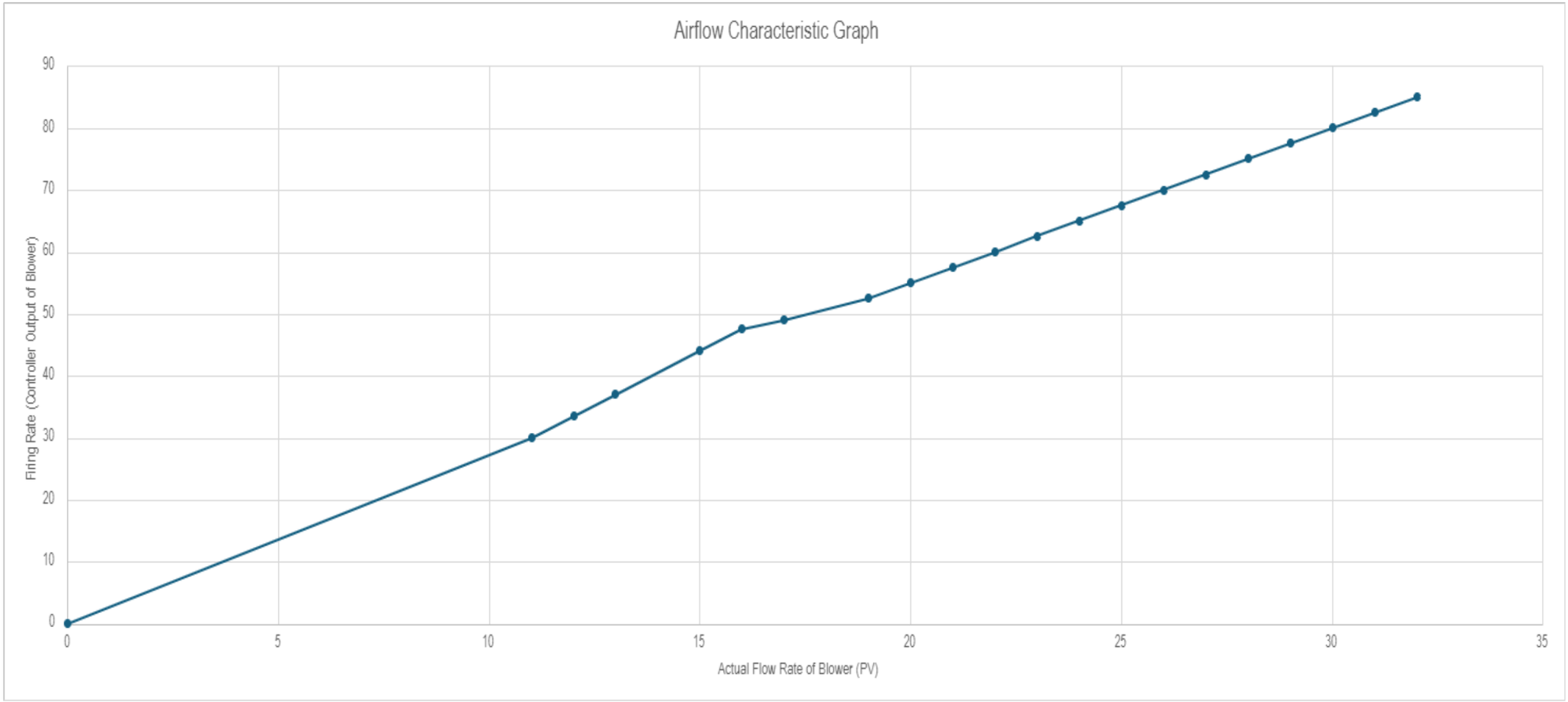
Spartan DeltaVBMS Template Library

Solution (FARC)



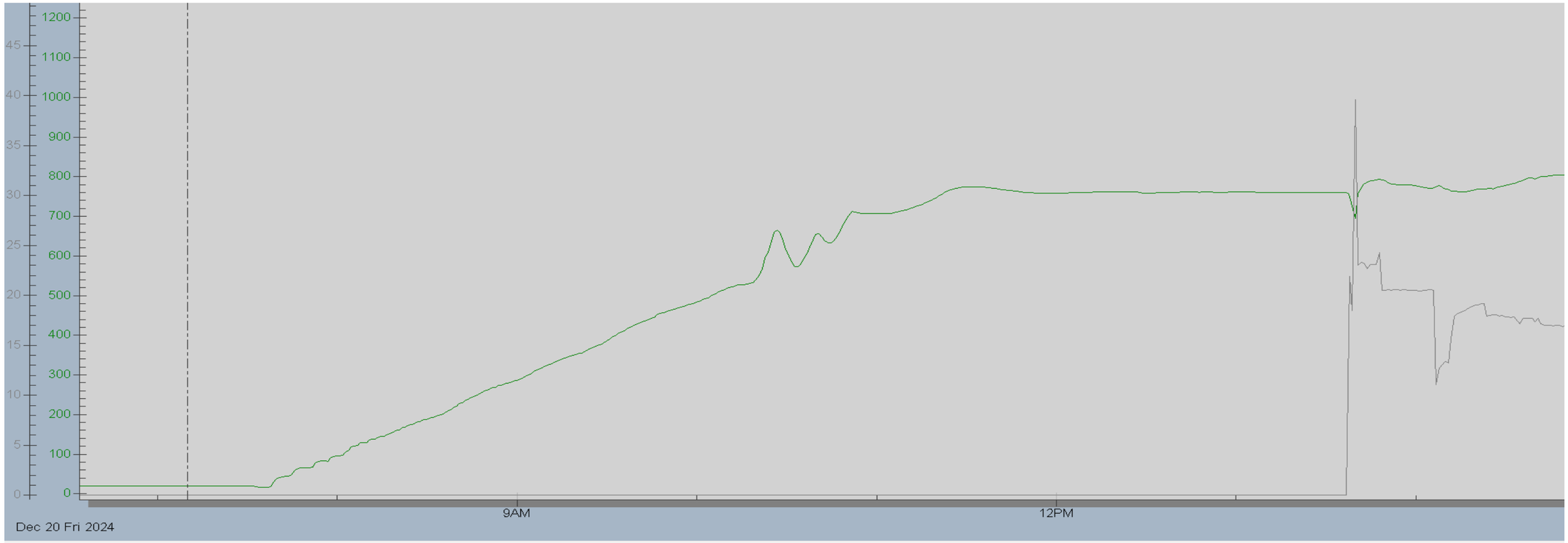
Feedstock Heater HMI Graphic – DeltaV Live

Solution (FARC)



Air Curve Tuning in Relation to Firing Rate - Graph

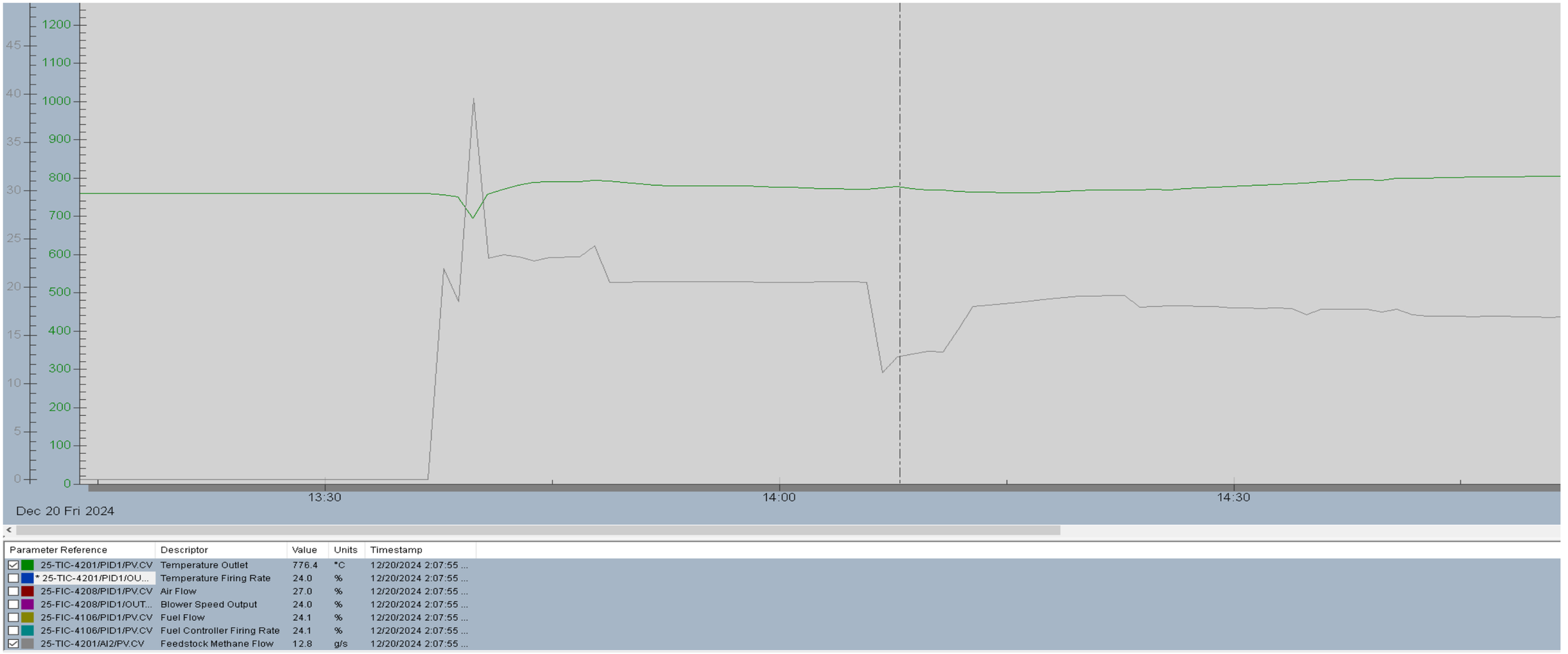
Solution (FARC)



Parameter Reference	Descriptor	Value	Units	Timestamp
25-TIC-4201/PID1/PV.CV	Temperature Outlet	19.6	°C	12/20/2024 7:09:51 ...
* 25-TIC-4201/PID1/OU...	Temperature Firing Rate	24.0	%	12/20/2024 7:09:51 ...
25-FIC-4208/PID1/PV.CV	Air Flow	2.1	%	12/20/2024 7:09:51 ...
25-FIC-4208/PID1/OUT...	Blower Speed Output	24.0	%	12/20/2024 7:09:51 ...
25-FIC-4106/PID1/PV.CV	Fuel Flow	4.2	%	12/20/2024 7:09:51 ...
25-FIC-4106/PID1/PV.CV	Fuel Controller Firing Rate	4.2	%	12/20/2024 7:09:51 ...
25-TIC-4201/AI2/PV.CV	Feedstock Methane Flow	-0.0	g/s	12/20/2024 7:09:51 ...

Testing Operation Heater Ramp (Air & N2 Transitioning) - Trend

Solution (FARC)



Parameter Reference	Descriptor	Value	Units	Timestamp
25-TIC-4201/PID1/PV.CV	Temperature Outlet	776.4	°C	12/20/2024 2:07:55 ...
* 25-TIC-4201/PID1/OU...	Temperature Firing Rate	24.0	%	12/20/2024 2:07:55 ...
25-FIC-4208/PID1/PV.CV	Air Flow	27.0	%	12/20/2024 2:07:55 ...
25-FIC-4208/PID1/OUT...	Blower Speed Output	24.0	%	12/20/2024 2:07:55 ...
25-FIC-4106/PID1/PV.CV	Fuel Flow	24.1	%	12/20/2024 2:07:55 ...
25-FIC-4106/PID1/PV.CV	Fuel Controller Firing Rate	24.1	%	12/20/2024 2:07:55 ...
25-TIC-4201/AI2/PV.CV	Feedstock Methane Flow	12.8	g/s	12/20/2024 2:07:55 ...

Heater Temperature during N2 to CH4 Transition (Feedforward Implementation) - Trend

Further Improvements?

- Ensure System Autonomy with Minimal Supervision
  - Currently the DeltaV has done a great job in automating our Heater to be robust with minimal supervision and troubleshooting during testing operations
- Retrofit Entire R&D Testing Lab System Control Room to DeltaV
- Organize control panel wire labelling of Utherm Vendor Panel.
  - Ease for future Troubleshooting
- Enhancement Orientated
  - Allocate Time to continue to Fine-Tune Process Parameters (Gain, Integral, FF Gain)
  - Utilize Tuning Practices (ZN, Lambda)

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Thank You