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Intelligent Liquid Pipelines & Terminal Operations

Attaining synergy value from the Integration of AVEVA Enterprise SCADA and the AVEVA™ PI System™

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Outline

Enbridge at-a-Glance

The Evolution of the PI System & Enterprise SCADA Integration

Intelligent Pipeline Use Cases:

- Use of PI AF Templates & PI Vision for Enhanced Visualization
- Flow path Analytics

Perspectives on best practices & Lessons learned

Enbridge at-a-Glance

Enbridge is North America's leading energy infrastructure company

Liquids Pipelines

- ~28,661 km/17,809 mi of pipe
- Moving 3 million barrels/day

30%
of crude oil produced in North America

Natural Gas Pipelines

- 118,763* km/73,796* mi of pipe
- Moving 25.7 Bcf/day

20%
of the natural gas consumed in the U.S.

Natural Gas Utilities

- 3.9 million retail customers
- Serving 670+ communities

75%
of Ontario residents' energy needs delivered

Renewable Power

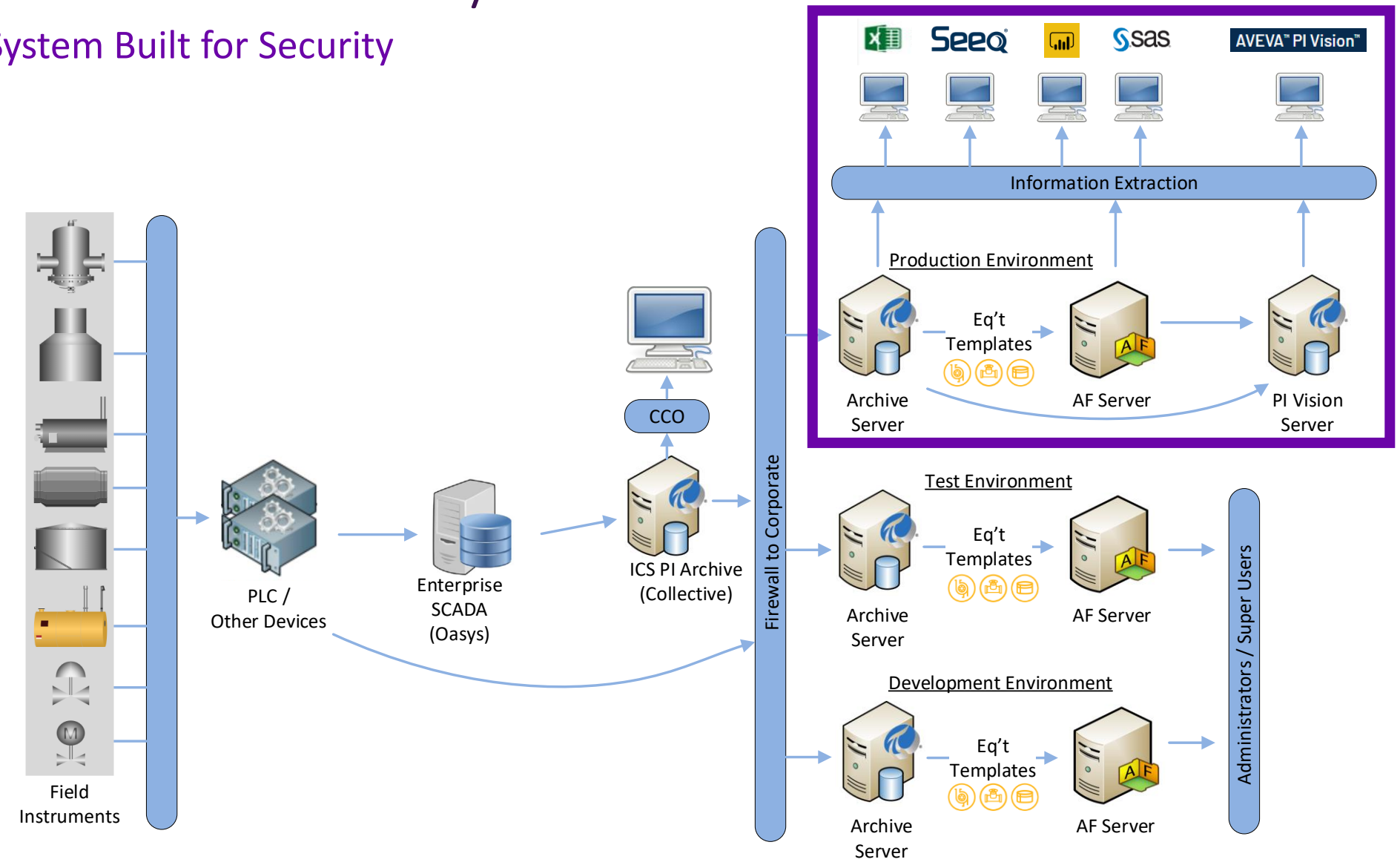
- 45+ renewable power facilities
- 2,174 MW generating capacity

966,000
homes powered by our assets

* Includes DCP Midstream assets

The Base - 2018 / 2019 +

A System Built for Security



PI System & Enterprise SCADA Details

Heavy use of PI AF & PI Vision Templates with Enterprise SCADA Integration

Enterprise SCADA

- **Consoles**:
  - 37
- **Telemetered Points:**
  - 440,000+
- **Field Devices:**
  - 3,000+
- **Poll Cycle:**
  - 5 seconds
- **Pipeline Operations Liquids**
  - Pipeline Objects: 54,000+
  - Automation Objects: 83,000+

PI System

- **# Servers:**
  - 14 servers in Production
  - (4 archive servers, 2 AF servers, 5 interface servers, 3 PI Vision servers)
- **# PI Tags:**
  - 700,000 and growing fast
- **# AF Elements:**
  - 96K Elements,
  - 550K Attributes,
  - 125K Analyses
- **# of AF Templates:**
  - 8 Event Frame templates,
  - 50 Element templates

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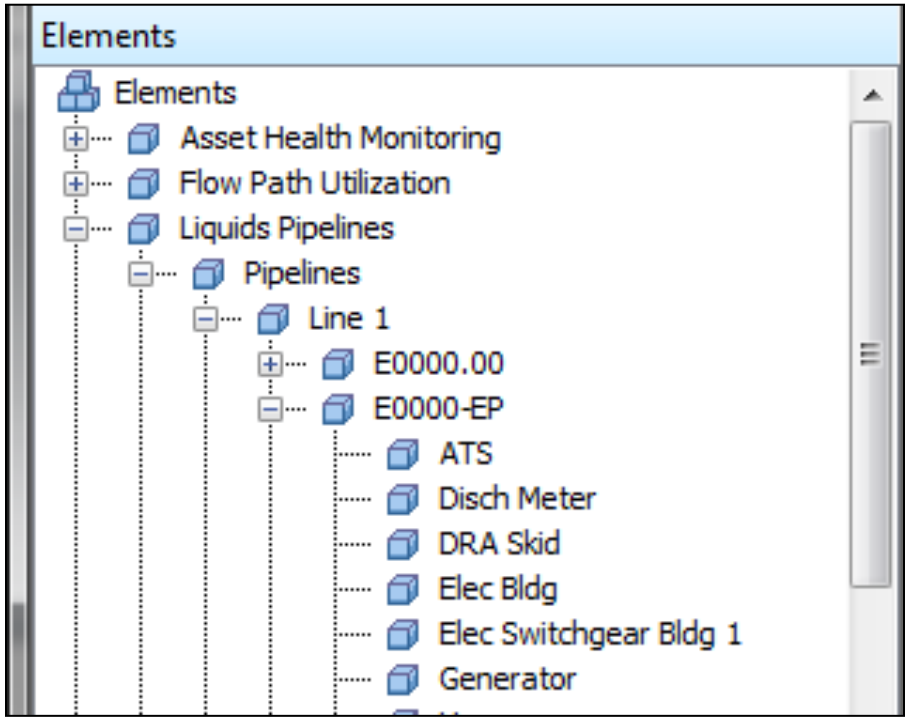
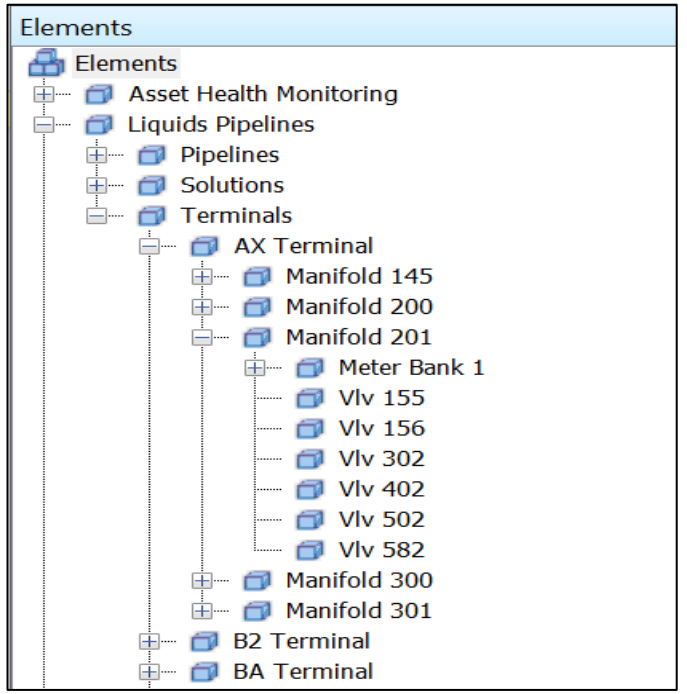
Configuring PI AF Strategically

Pipeline and Terminal Hierarchies

Traditional Asset Hierarchy

- Based on Corporate Maintenance System Hierarchy for location and equipment type





Use of PI AF Templates & PI Vision Linked to Enterprise SCADA for Enhanced Visualization

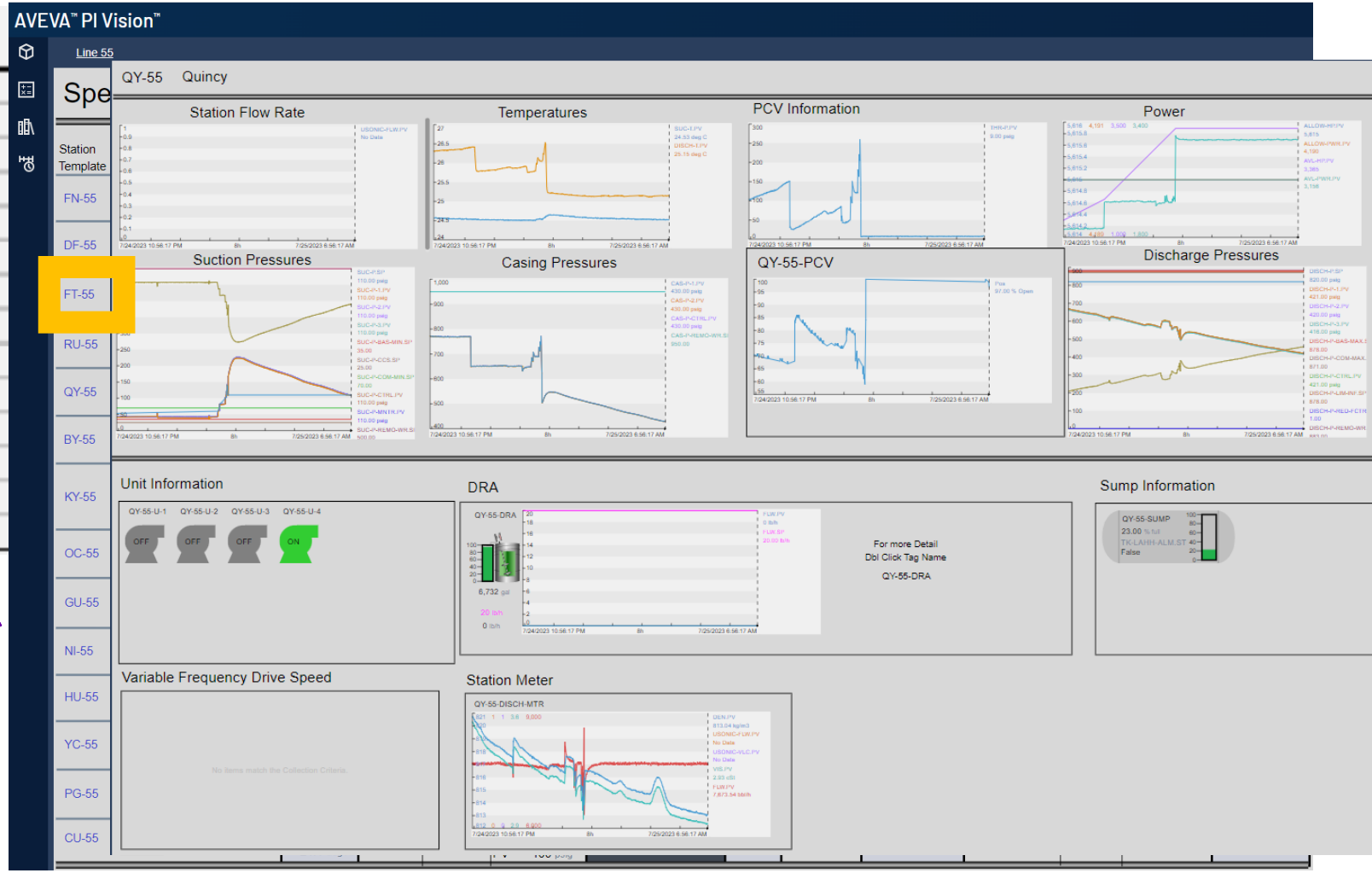
The Basics - Pipelines

Easy access even if you don't know the tag name!

	PCV % Open	Hold Spt.	Hold	Mon.	RMS	Suct. Spt.	Suct.	Thr. / VFD	Disc.	Disc. Spt.	RMD	Cor Flow
FN	100					50	111	9	516	516	Scan Off	7,613
DF	100			64	194	60	60	1	741	795	180	
FT	100			314	186	239	309	3	788	830	72	7,622
RU	100			56	445	50	50	0	710	767	206	7,632
QY	100			112	388	110	112	8	424	820	454	7,613
BY	100			44	405	40	40	2	822	876	108	7,676
KY	75			62	438	50	47	6	630	709	213	7,804
OC	46			141	293	135	136	89	770	844	168	7,328
GU	100			221	279	90	216	7	528	556	291	7,688
NI	100			80	420	74	74	2	770	814	153	7,664
HU	100			283	217	72	278	1	628	677	231	7,670
YC	100			71	429	50	66	7	514	557	236	7,745
PG	59			55	409	50	50	44	711	750	130	7,663
CU	72	160	161	161								7,668

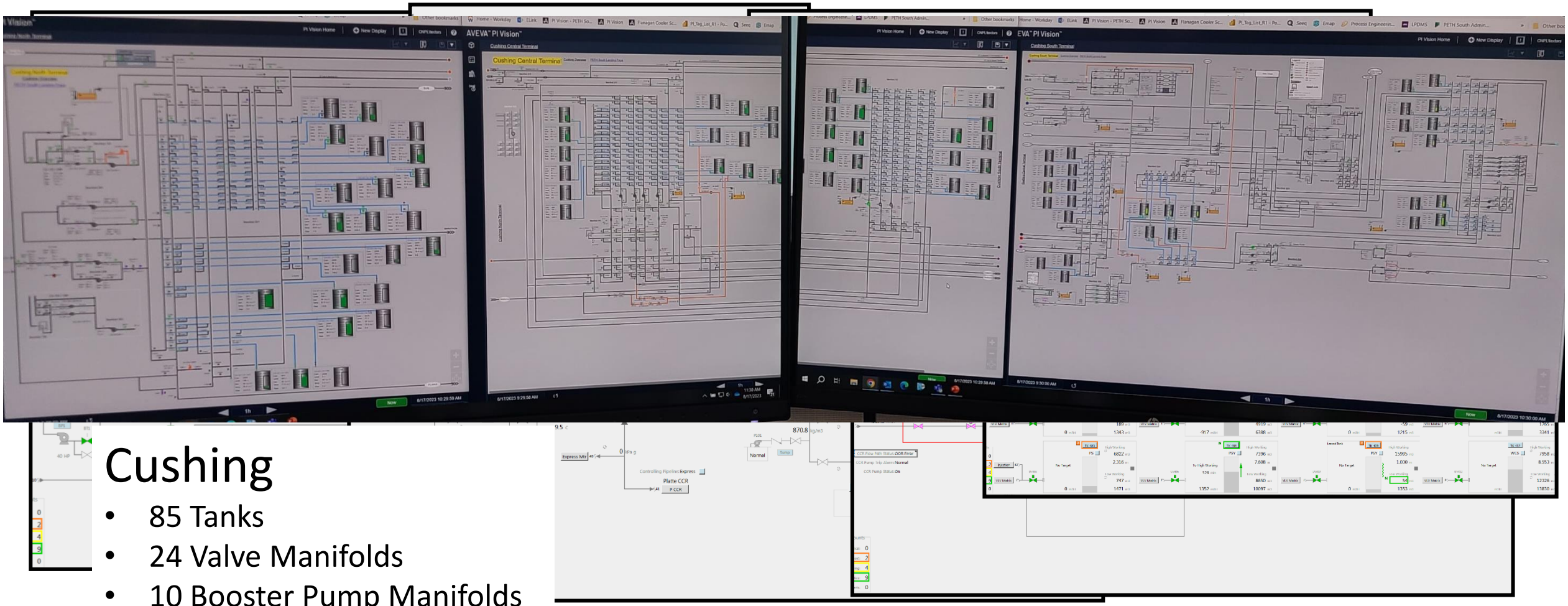
SCADA View

PI Vision



The Base - Terminals

PI Vision allows System Insights

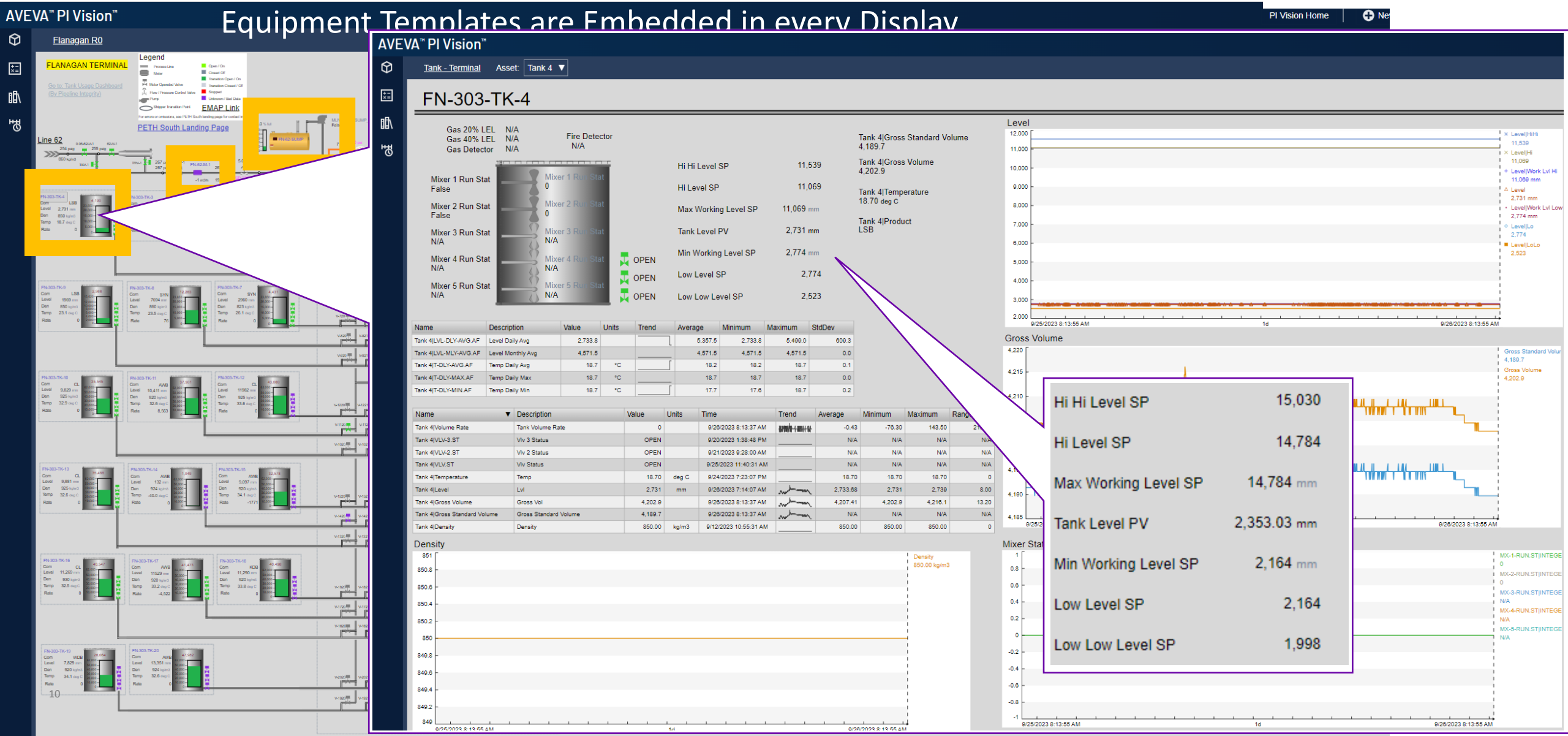


Cushing

- 85 Tanks
- 24 Valve Manifolds
- 10 Booster Pump Manifolds
- 100s of Valves

The Base - Terminals

Equipment Templates are Embedded in every Display



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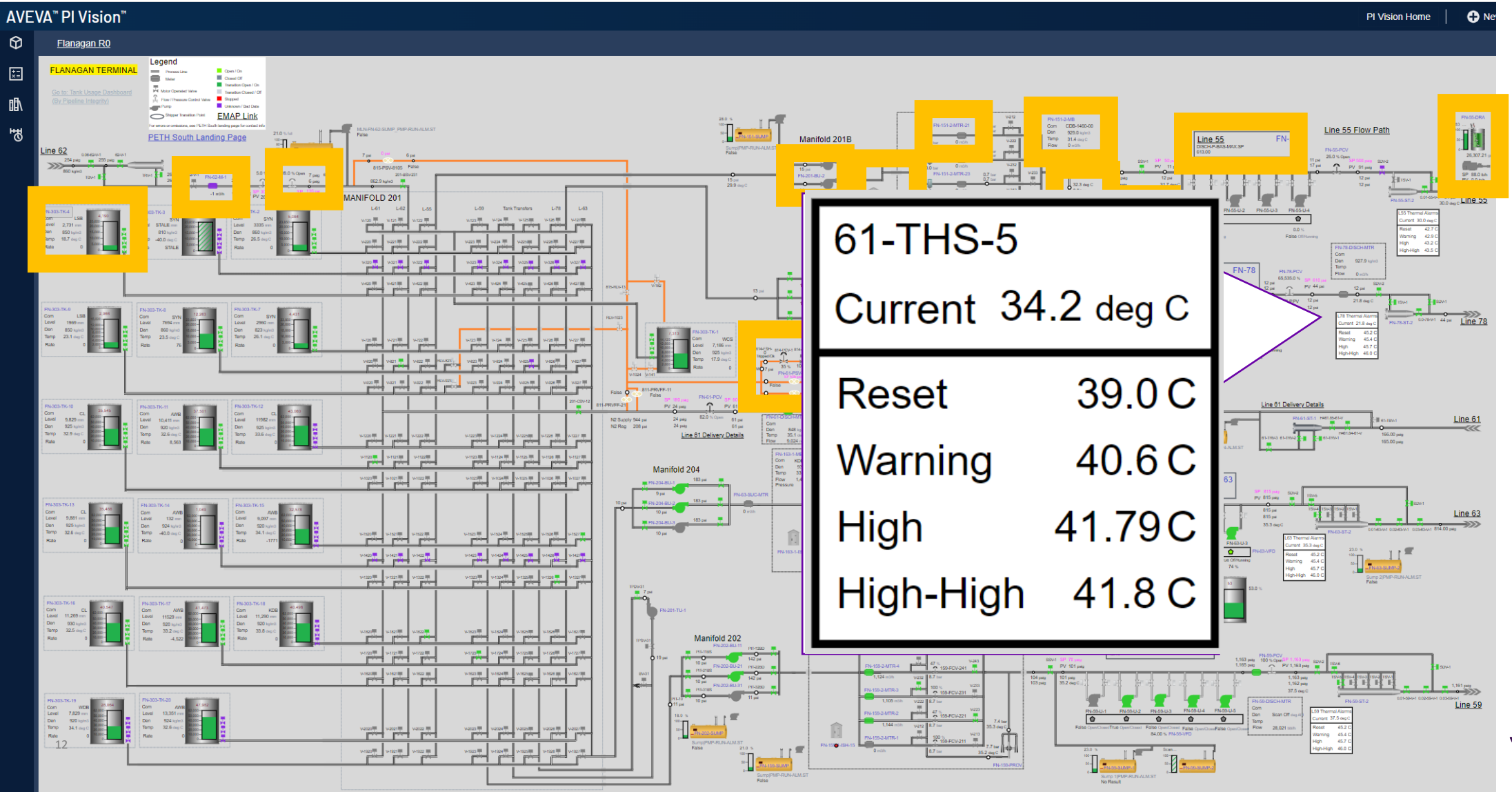
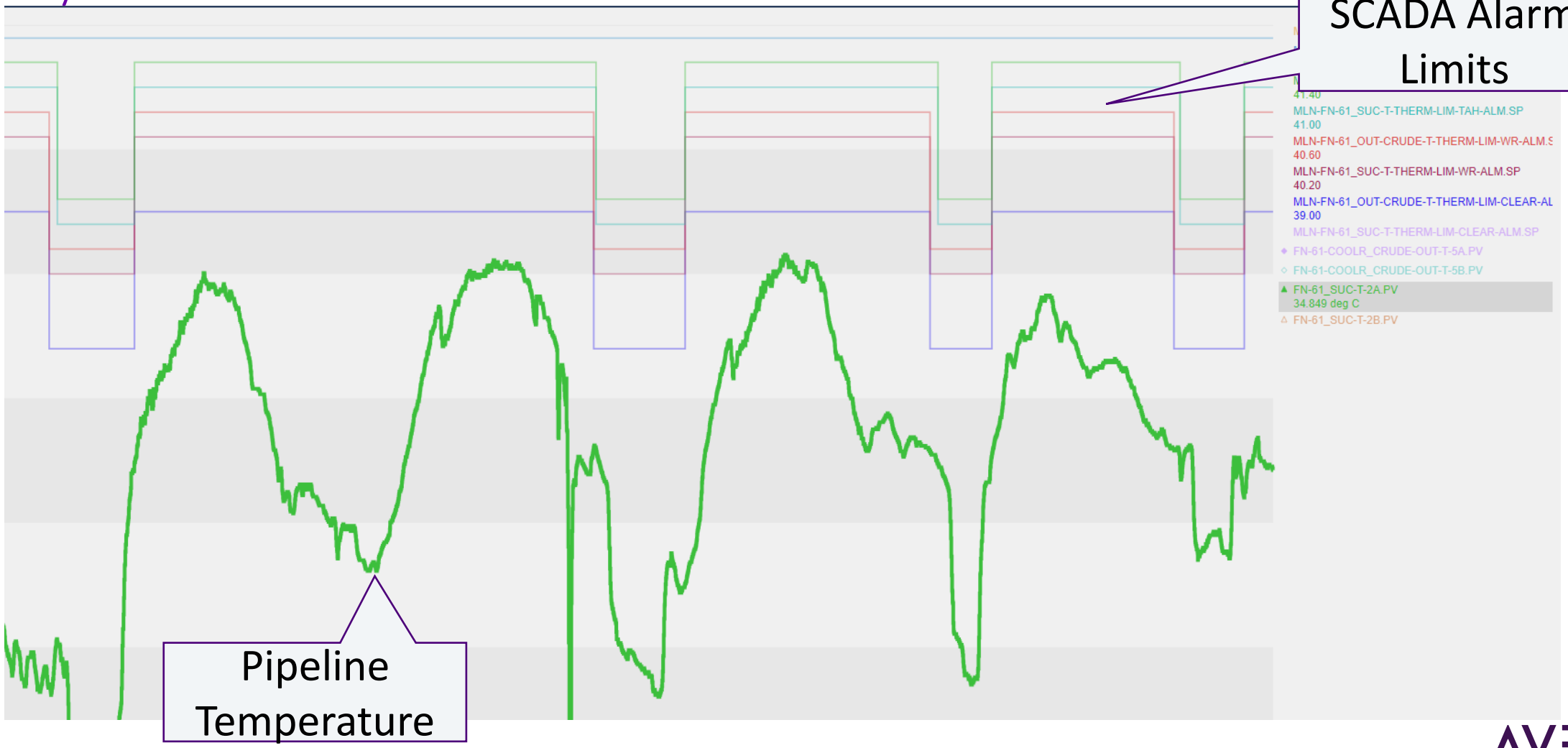


Dynamic Temperature Limits

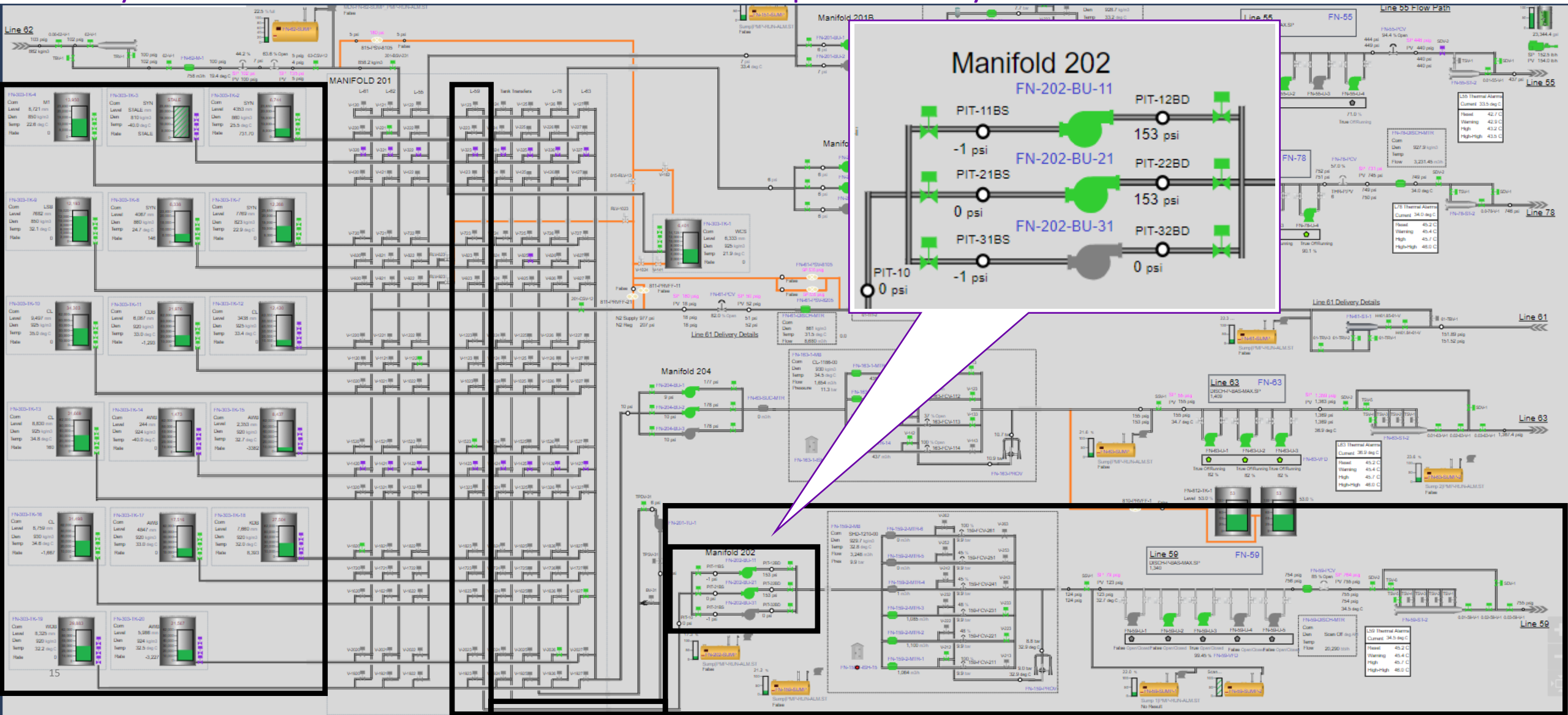
Integration with the AVEVA Enterprise SCADA provides access to more advance control parameters in the PI System



Flow Path Analytics

Flowpath Analytics

A System View in PI Vision makes initial evaluation quick and easy



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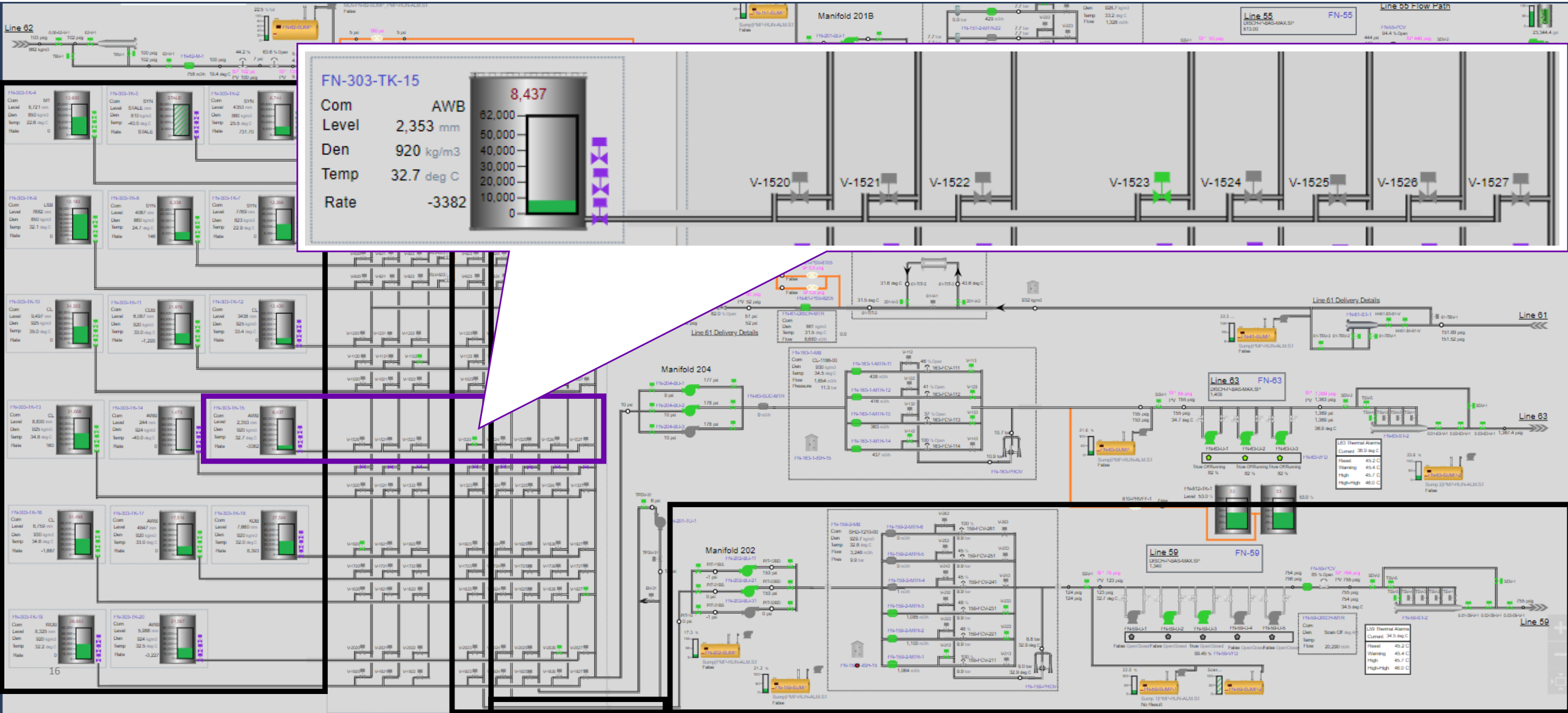

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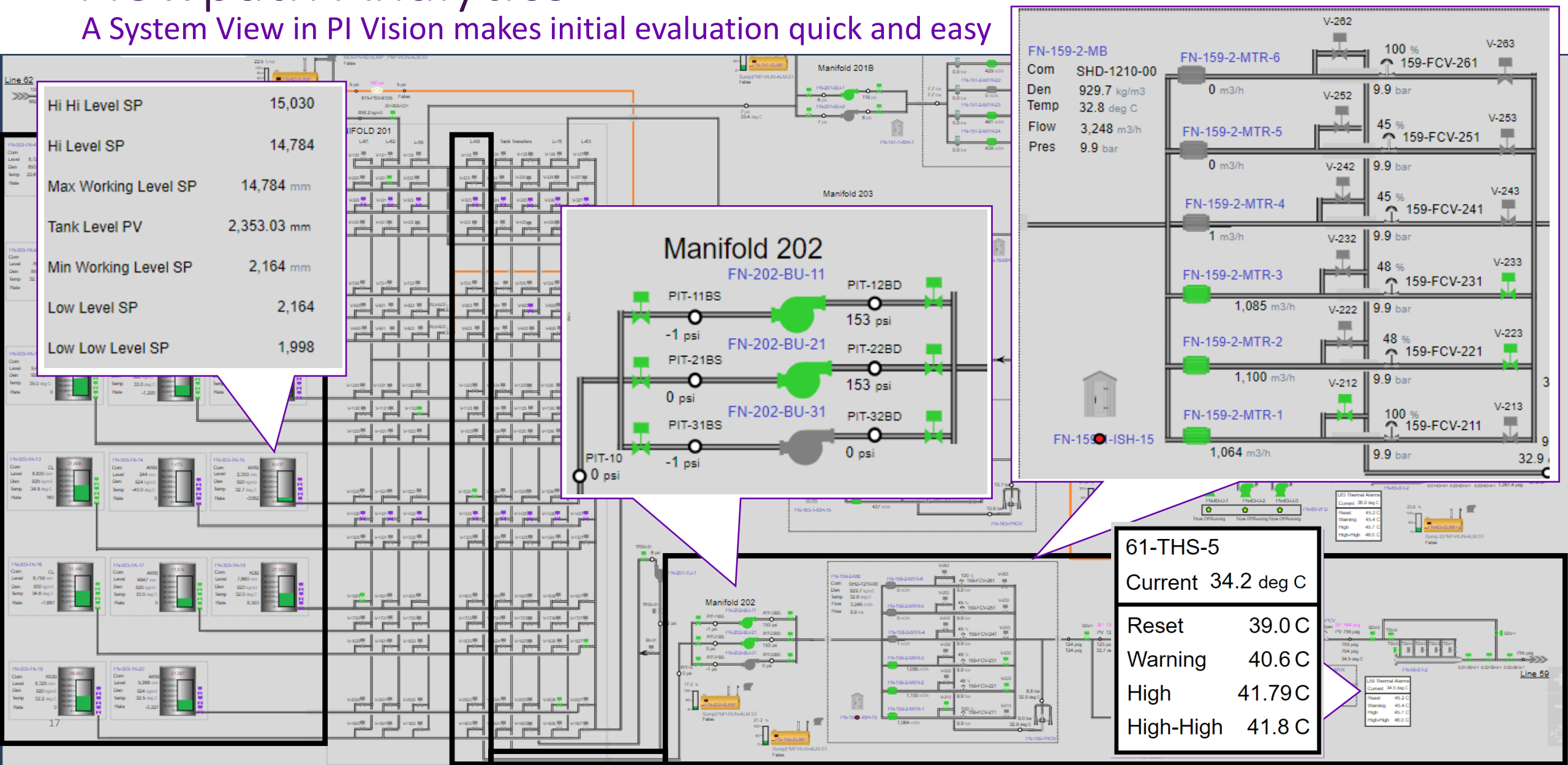
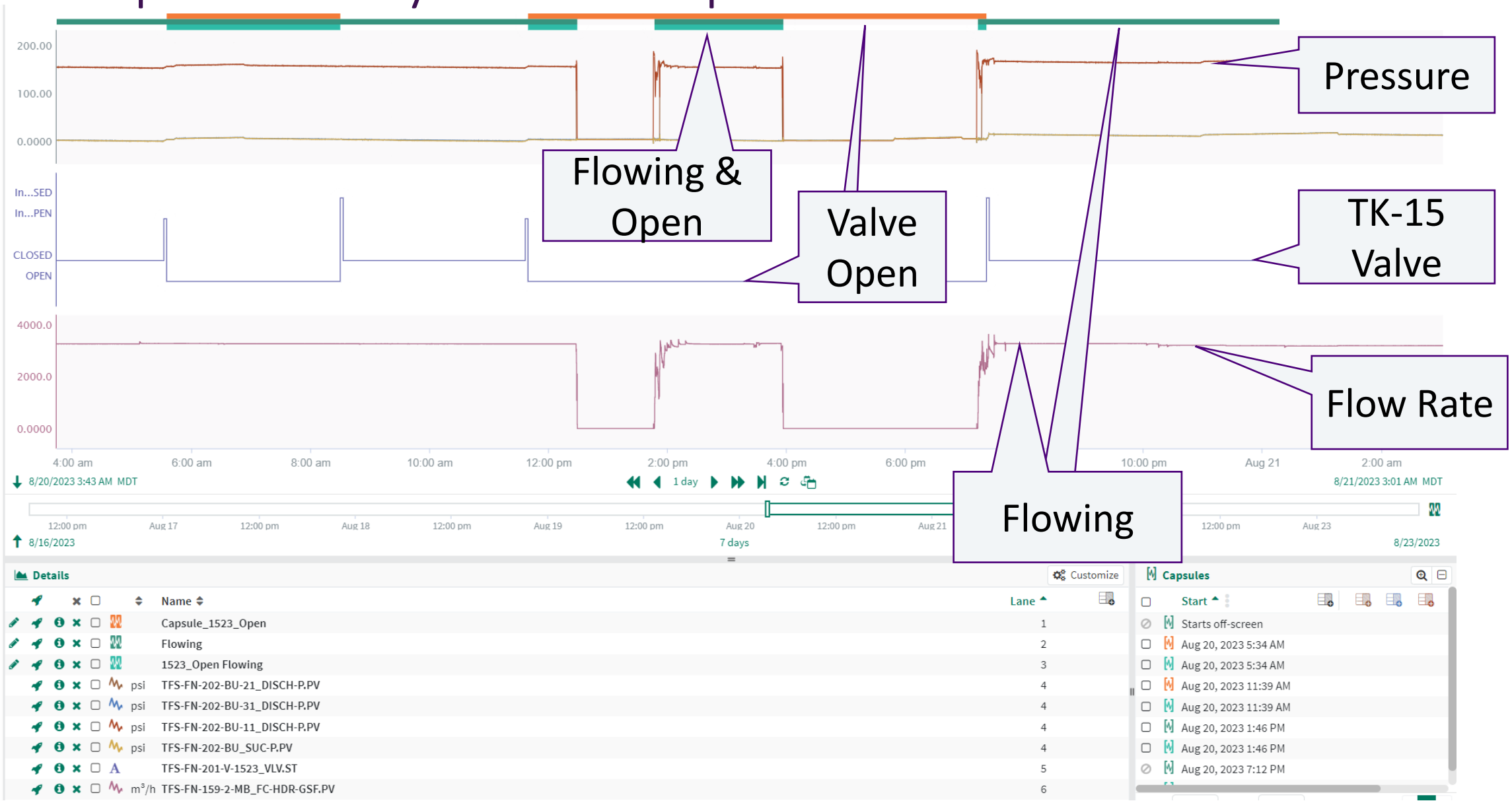


Flowpath Analytics– Seeq



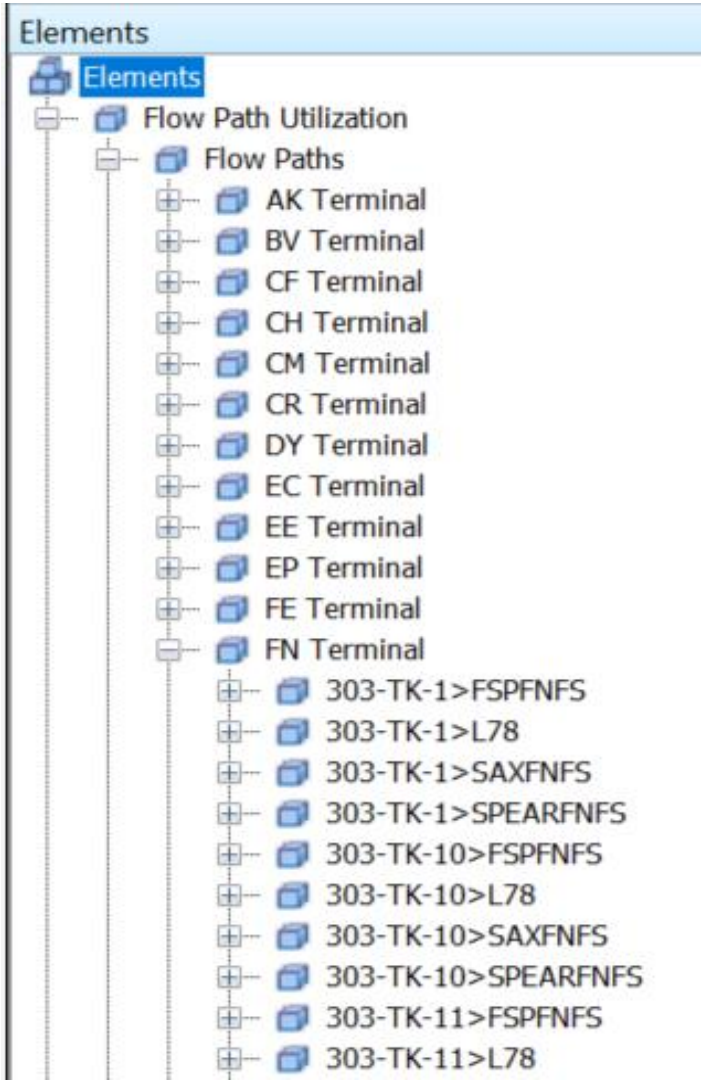
Flowpath Analytics– Seeq Extended

View as if the only path!

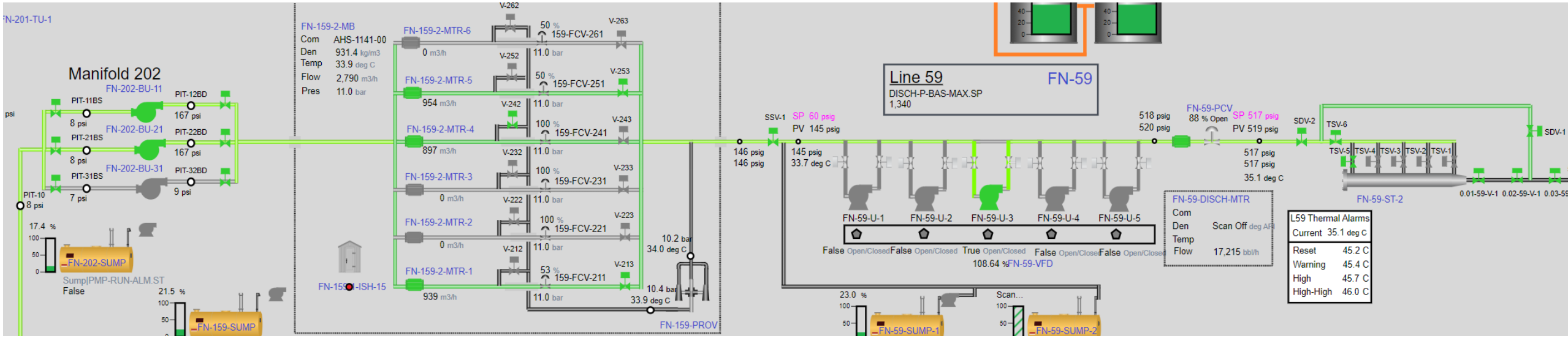
Flowpath Analytics

Asset Hierarchy – Based on Injection and Delivery Flow Paths

- Based on approved flow Paths through a terminal
- Provides a filter for Operating Data
- Works well with Seeq Functionality

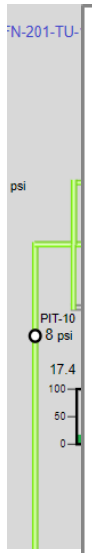


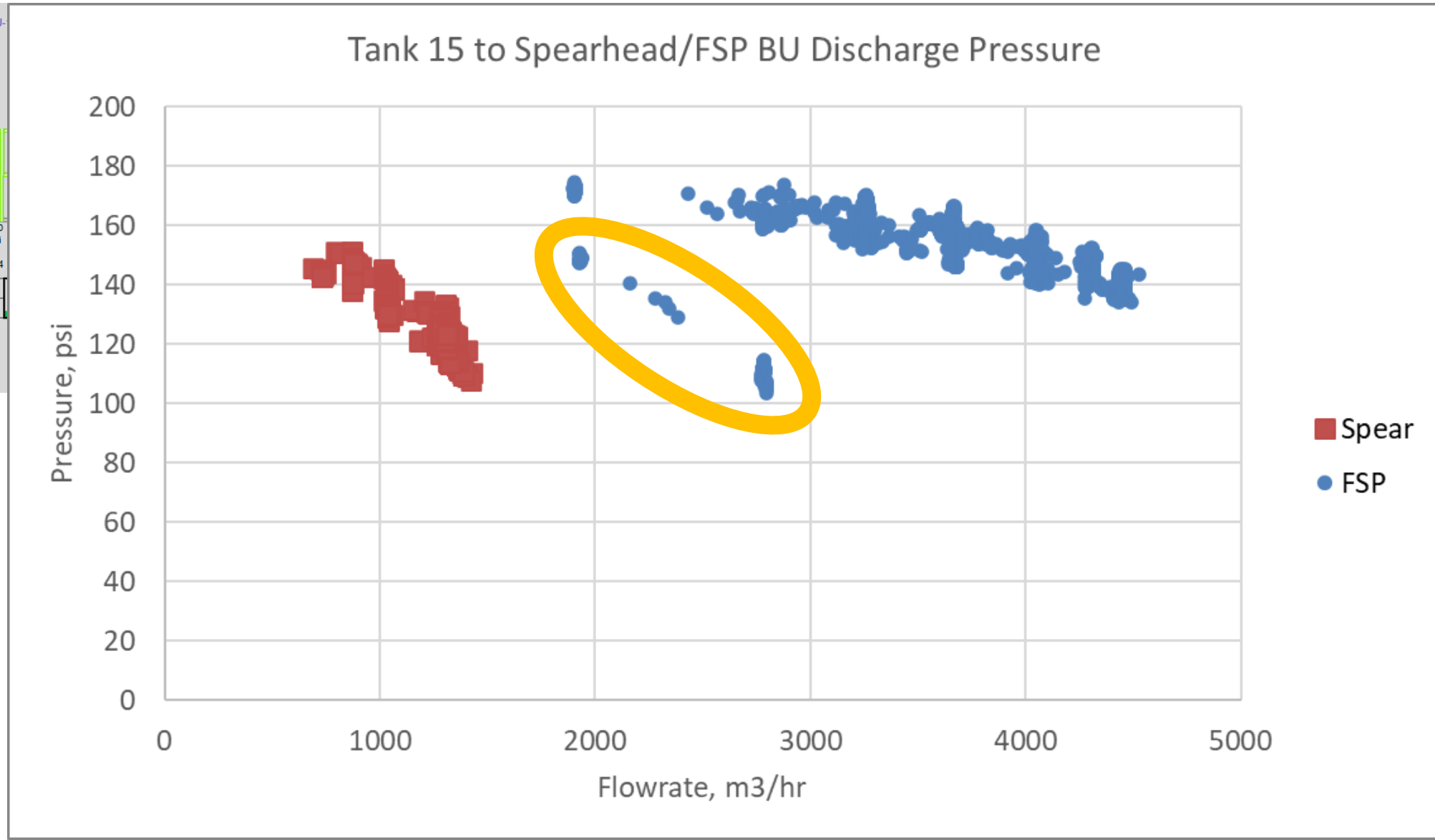
But What If? – Flow Paths!

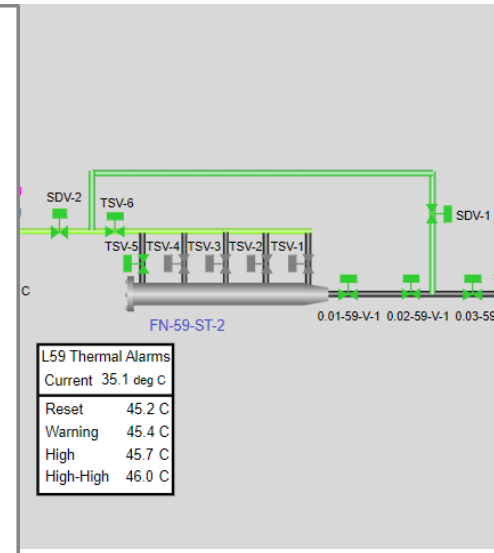


- Instant Flow Path Knowledge
  - Quick Operational Evaluations
  - Longer term efficiency monitoring
- Knowing how much equipment is being used:
  - Facility Integrity
  - Asset Monitoring

But What If? – Flow Paths!







Conclusion

Best Practices and Lessons Learned

Imparting Wisdom

Best Practices

- Get the Base Correct
  - Good PI AF Structure
  - Consistent Tagging & Governance
  - Proper Engineering Units
- Plan out PI AF Templates as early as possible
- Make it easy to find the information
- Integrate AVEVA eSCADA & the PI System – significant synergy value

Lessons learned

- Visualization need to be simple but include all the appropriate info.
- Maintenance of PI Vision Screens is not as onerous as you would think.
- Engineers want different information than a control room.

OIL & GAS MIDSTREAM

Intelligent Liquid Pipeline & Terminal Operations

AVEVA eSCADA and the AVEVA PI System – Better Together by Enabling Synergy Value and Intelligence

Challenge

- Finding information
- Seeing the pipeline and terminal systems as a whole – many SCADA screens to navigate
- Reactive & cumbersome troubleshooting
- Seeing flow paths in real time & retroactively to troubleshooting
- Reactive vs proactive, exception-based operations
- Enabling remote SME support

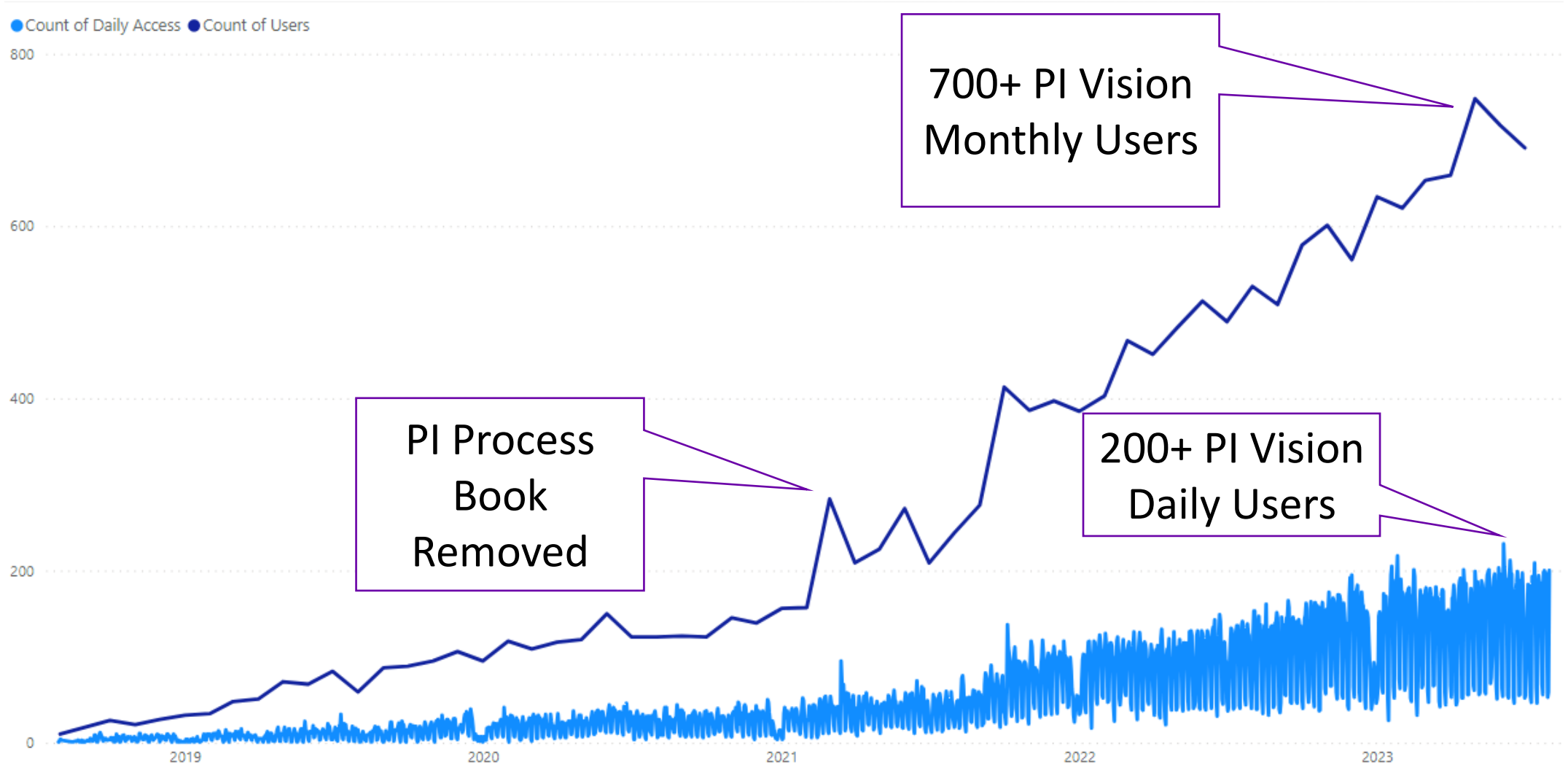
Solution

- Integrated the AVEVA eSCADA and PI System to capture synergy value
- Configured PI AF in both a standards and linear hierarchy using templates
- Configured PI Vision displays to provide system views and to easily find information
- Configured PI Event Frames for proactive identification of issues & enhanced troubleshooting
- Started the journey to developing overlay PI System based applications like pump efficiency, cavitation avoidance, etc.

Benefits

- Significant improvement in SME effectiveness and efficiency
- Improved flow path visibility and associated analytics in support of FBI
- Move to proactive, exception based intelligent liquid pipeline & terminal operations
- Ability to capture and share knowledge and best practices

The Result of Easy to Find Process Information!



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Questions?

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State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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