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CHEMICALS

Seeq







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Enhancing Ammonia Plant Reliability with Seeq

Nutrien Real-time Operations Center (NROC)

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Nutrien







Nutrien Real-time Operations Center (NROC)

- ✓ Loveland, CO for Nitrogen and Phosphate facilities
- ✓ 6 subject matter experts & 3 technology experts
- Operations and reliability improvements through realtime monitoring, collaboration, expertise, and technology





NROC Monitoring Process













Relationship Monitoring (Root Cause Analysis) Trend Analysis (Rate of Change)

Anomaly Detection– PCA (Unsupervised ML) Deep Learning Neural Networks - LSTM (Al Models)







Why Seeq?

Data-driven insights for process optimization

Realtime analytics for reliability monitoring Scalable implementation for large number of assets

Simplified notification and alert management



Enhancing Ammonia Plant Reliability with Seeq

Operationalized Use Cases



Use Case 1: High Pressure Boiler Corrosion Monitoring



Use Case 2: Ammonia Process Threshold Monitoring

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Use Case 1 : High Pressure Boiler Corrosion Monitoring





Coordinated phosphate/pH control is a water treatment program used in steam generators to protect against corrosion



Corrosion in high pressure boilers lead to catastrophic failures and unplanned downtime due to high operation pressures



Phosphate: added to the boiler water in the form of trisodium phosphate and disodium phosphate salts



pH Control: Ratio controlled of these phosphate additions, maintain boiler water pH within between 8.3 and 10.5





Use Case 1 : High Pressure Boiler Corrosion Monitoring



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Use Case 1 : High Pressure Boiler Corrosion Monitoring





Use Case 1 : Steps of Development and Deployment



Ensure the Tags are available and pull the data for PH and PO4

spy.jobs.schedule()
spy.search() spy.pull()

Define the Safe operating limits, Creating the Alarm-Signal Graphs and Percentage Coordination

Pushing Alarm Signal to Workbench

spy.push()

Pushing the results to Organizer Topic.

spy.workbooks.push()

Carseland:

101-F 1500psiSystem

CNO pH/phosphate Coordinate Chart. Time: 2025-04-28 20:35 (UTC)



.NoAlarm.....

Percentage Coordination (for last 30 days) : 96.12 %



Steps of Development and Deployment



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Use Case 2 : Ammonia Process Threshold Monitoring



Durpose:

- Alert SMEs to deviations from the desired operation condition
- ✓ SMEs investigate and identify actions

B How?

- Limits generated for key parameter identified for safety, optimization and reliability
- Threshold limits for process tags imported into Seeq through Seeq Data Lab
- Bulk creation of conditions
 - Capsules with Hi and Lo Threshold limits for and Alerts
 - Bulk management of notifications.
- ✓ Alerts triggered when a process variable deviates from its normal operating range.

[EXT] Seeq notification: 107JCD Pump Running Dry [EXT] Seeq notification: BNO 107JAB Pump Running Dry (1) [EXT] Seeq notification: Borger Plant Trip < 800 (1) [EXT] Seeq notification: DP TPM 1 103C Increased > 14pci (1)	
 [EXT] Seeq notification: BNO 107JAB Pump Running Dry (1) [EXT] Seeq notification: Borger Plant Trip < 800 (1) [EXT] Seeq notification: DR TRM 1 103C Increased > 14pci (1) 	
EXT] Seeq notification: Borger Plant Trip < 800 (1)	
IEVELSeen polification: DP TPM 1 103C Increased >14pci (1)	
/ [Ext] Seed nonication: DF TKM T tose increased / 14psi (1)	
> [EXT] Seeq notification: High arch Burner Press (50)	
> [EXT] Seeq notification: High meth DT (66)	
> [EXT] Seeq notification: High Meth DT R6142 (10)	
> [EXT] Seeq notification: High Mole sieve filter DP - 201FA (1)	
> [EXT] Seeq notification: High Mole sieve filter DP - 201FB (1)	
> [EXT] Seeq notification: JNO Plant Trip < 50 (3)	
> [EXT] Seeq notification: LIM High Meth DT (60)	
> [EXT] Seeq notification: Outlet Temp Exceeded (194)	
> [EXT] Seeq notification: Production Below 1800 (54)	
> [EXT] Seeq notification: Reformer Heat up Rate > 100degF (58)	
> [EXT] Seeq notification: RNO 01 Plant Trip < 300 (2)	
> [EXT] Seeq notification: RNO 09 Plant Trip < 1600 (6)	
> [EXT] Seeq notification: TRM 2 high Meth DT (3)	
> [EXT] Seeq notification: TRM 2 Plant Trip < 200 (2)	
> [EXT] Seeq notification: TRM 4 Meth DT (3)	
[EXT] Seeq notification: TRM 4 Plant Trip < 1700	

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Use Case 2 : Ammonia Process Threshold Monitoring

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- ✓ Statistically generated operating limits (SPC, Percentile Range)
- Operating thresholds for safety systems

Denefits achieved

- Optimized Process Conditions
- Process controllers optimized output
- Early warning of process deviations

Equipment health monitoring

- ✓ Vibrations and Bearing temperature
- Declining catalyst life
- ✓ Bad actors in process reliability

Safety and Emissions monitoring

- Safe operating limit deviation
- Environmental limit exceedance





Use Case 2 : Steps of Development and Deployment



1 csv_tree.visualize()

-- 1500# Boiler Conductivity -- Augusta WT Alarm Condition -- 1500# Boiler pH -- Augusta WT Alarm Condition -- BFW Dissolved 02 -- Augusta WT Alarm Condition — Augusta WT Alarm Condition Mixed bed outlet combined Conduct. — Augusta WT Alarm Condition -- Mixed bed outlet conductivity 1 -- Augusta WT Alarm Condition I-- Mixed bed outlet conductivity 3 I-- Augusta WT Alarm Condition I-- Mixed bed outlet conductivity 4 -- Augusta WT Alarm Condition I-- Mixed bed outlet conductivity 5 |-- Augusta WT Alarm Condition |-- 1500# Boiler Conductivity (Lab) -- Borger WT Alarm Condition -- 1500# Boiler PO4 (Lab) -- Borger WT Alarm Condition -- 1500# Boiler pH -- Borger WT Alarm Condition -- 1500# Boiler pH (Lab) -- Borger WT Alarm Condition -- 1500# Boiler silica (Lab) -- Borger WT Alarm Condition -- BFW Dissolved 02 -- Borger WT Alarm Condition -- BFW Silica (Lab) I-- Borger WT Alarm Condition -- BFW conductivity (Lab) 1__ Rorger WT Alarm Condition



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Steps of Development and Deployment



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Borger	Select All BNO Alarm Primary Reformer Outlet Compo sition Seeq Data Lab BNO Alarm LTS Inlet Temp Seea Data Lab		Notifications (1) ③ BNO Alarm Syn Gas Compressor Suction Pressure + Add Notification		Include capsule properties Start Notify the following people through email Adeyinka Opadeyi Look ahead 0 dav(s)		
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Joffre	BNO Alarm Production	 𝔄 𝔄 𝔄 𝔄 	Image: Second system of the	<u>Controller - OP</u>	6 Starts off-screen 44 14 Page: 1		neqt

Future Plans





Fault Detection – Principal component analysis



Long term trends detection

Predictive Analytics

Enterprise Monitoring Suite







Acknowledgements...! Questions?





