AWS re:Invent

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MFG202

Industry 4.0 transformation with AWS for industrial

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Agenda

aws industrial

AWS for industrial

Koch Ag & Energy Solutions (KAES) overview

Amazon Monitron implementation at KAES

Amazon Lookout for Equipment implementation at KAES

aws

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Key manufacturing needs across common workloads



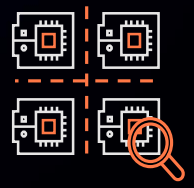
Engineering & design

- Accelerate time to market
- Lower infrastructure costs
- Improve collaboration



Production & asset optimization

- Lower costs (energy, machines, labor)
- Improve machine or asset productivity
- Reduce production downtime



Quality management

- Automate quality inspection
- Improve inspection accuracy
- Reduce product defects



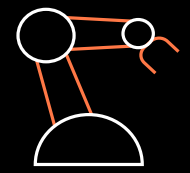
Worker safety & productivity

- Improve employee productivity
- Monitor safety
- Reduce worker injuries



Supply chain management

- Improve forecast accuracy
- Reduce inventory costs
- Improve capacity utilization



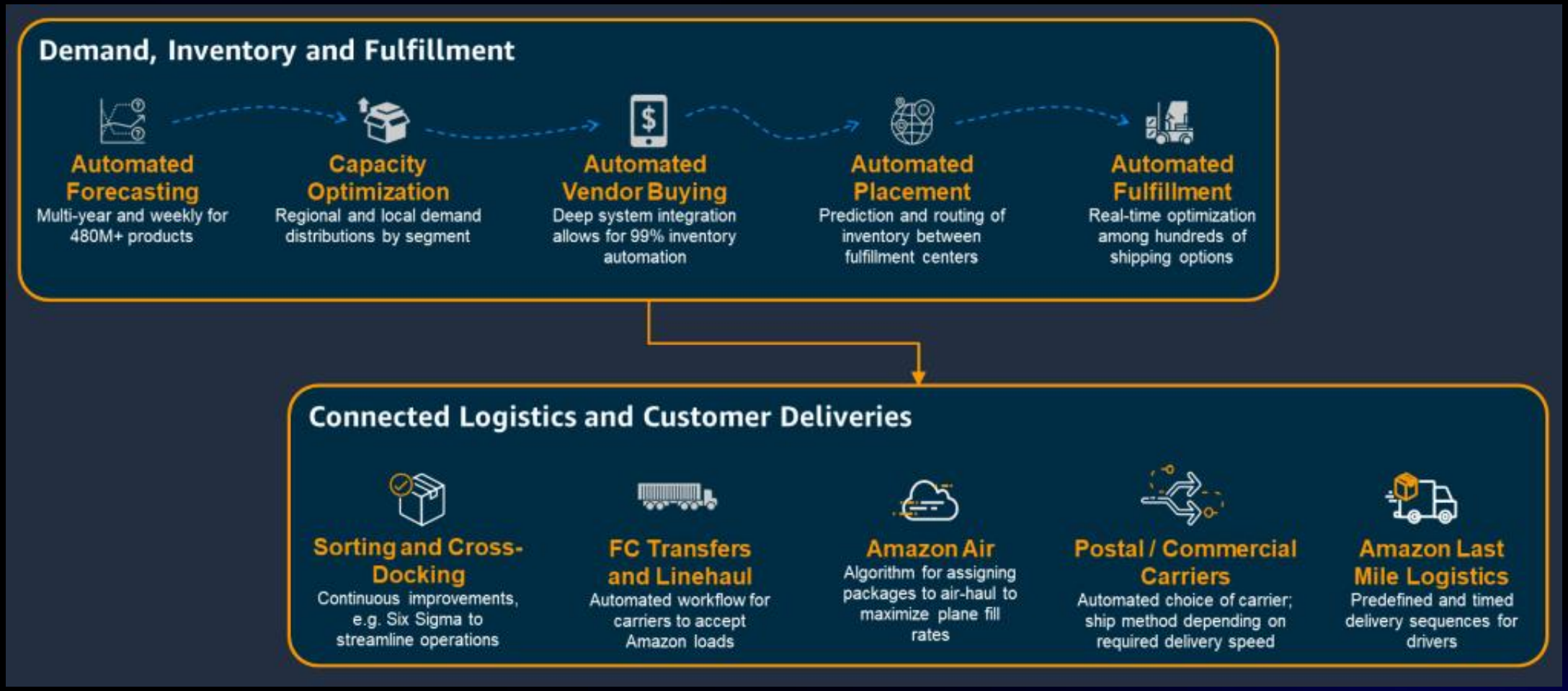
Smart products & machines

- Enhance user experiences
- Create new revenue streams
- Improve product or service quality

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Amazon scales through automation and simplicity



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Simplicity in complexity







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Simplicity in complexity

Amazon Monitron



AWS Panorama



Amazon Lookout for Vision

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Capabilities to applications

Capabilities

- Edge stack
- Self-service/ OT persona
- Digital twin
- Machine connectivity
- Data lake
- Analytics/ dashboarding
- Edge analytics
- Rules engine
- AI/ML
- Robotics fleet management
- Workflow
- Partner solutions /extensions

Single pane of glass for developers

Industrial applications

- Andon
- OEE/Analytics
- Track and trace
- MES/EAM
- Quality apps
- WMS
- Recall and rejection
- Robotic automation
- Job aid applications
- Predictive maintenance
- Equipment health

Partner solutions /extensions (sample)

SIEMENS

accenture

Deloitte.

Infosys Navigate your next

slalom

SeeQ

Single pane of glass for operators, managers

Edge	Process/store	Insights

Productivity	Quality	Performance

Scalable and secure cloud infrastructure

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KAES overview

KOCH AG & ENERGY SOLUTIONS

Koch Ag & Energy Solutions, LLC and its affiliates are a global provider of value-added solutions for the agriculture, turf and ornamental, energy, and chemical markets. We are a wholly owned subsidiary of Koch Industries, Inc.

Fertilizer

Energy Services

Methanol

Agronomic Services









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Amazon Monitron deployment at KAES

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Opportunity

- Less critical equipment such as fully spared pumps and motors are often neglected and are deemed run to failure
- Adding an additional sensing point with backend analytics can minimize the operational and maintenance impact, shifting the strategy and preventing failures

Monitor vibration on **all** assets to provide insights to health, increasing asset availability

Quickly deploy sensors on a small subset of assets to gain insights that enable action prior to failure

Minimize:
- Procurement time
- Sensor cost
- Data cost
- Installation labor

Think big



Start small



Scale fast



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Key points of view

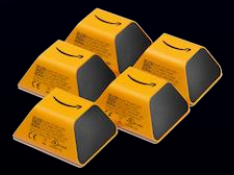
- Minimal to no expertise required (IT or operations)
- Overall vibration is a key indicator
- Continuous data tells the whole story
- Low cost is critical for scale
- Leverage existing infrastructure to maximize value
- Minimize systems for data management and flow
- Rip and replace

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Approach for Amazon Monitron implementation



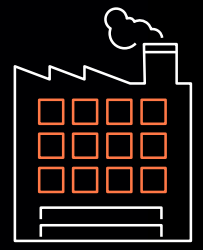
Asset



Amazon Monitron Sensor



Amazon Monitron Gateway



Plant WAP



AWS Cloud



Amazon Monitron app



Operators/SME



AI/ML models



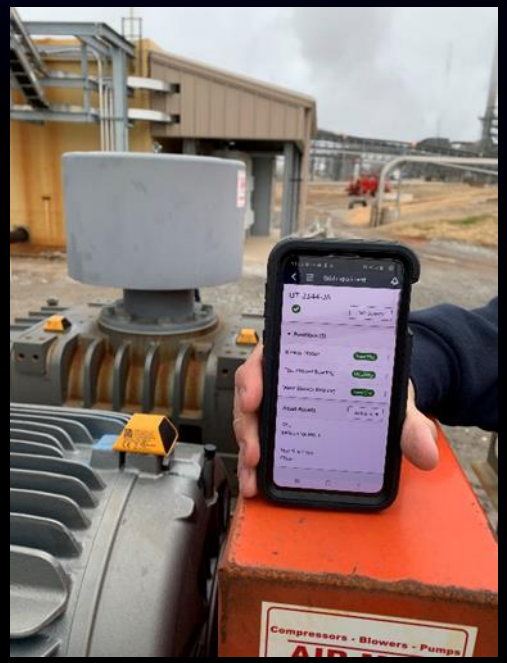
Data historian

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Current deployment at KAES sites



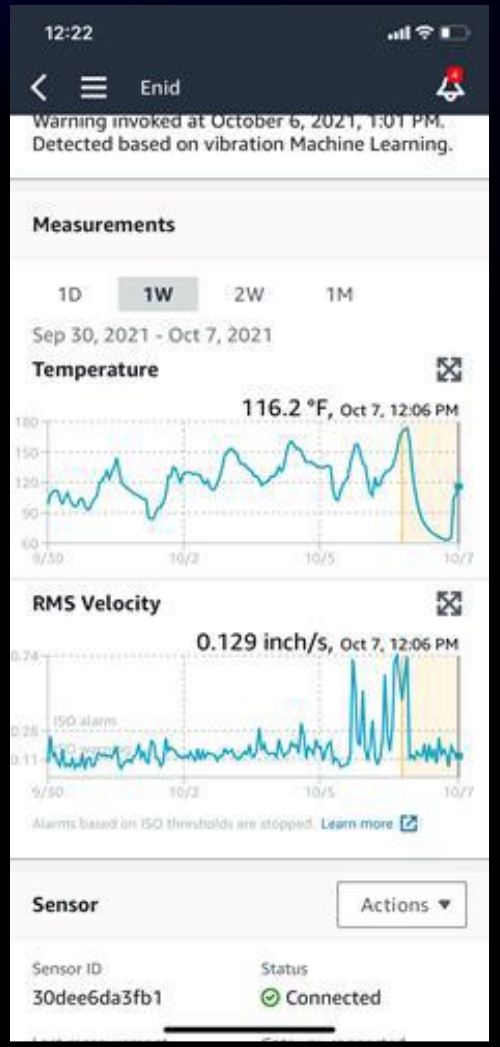


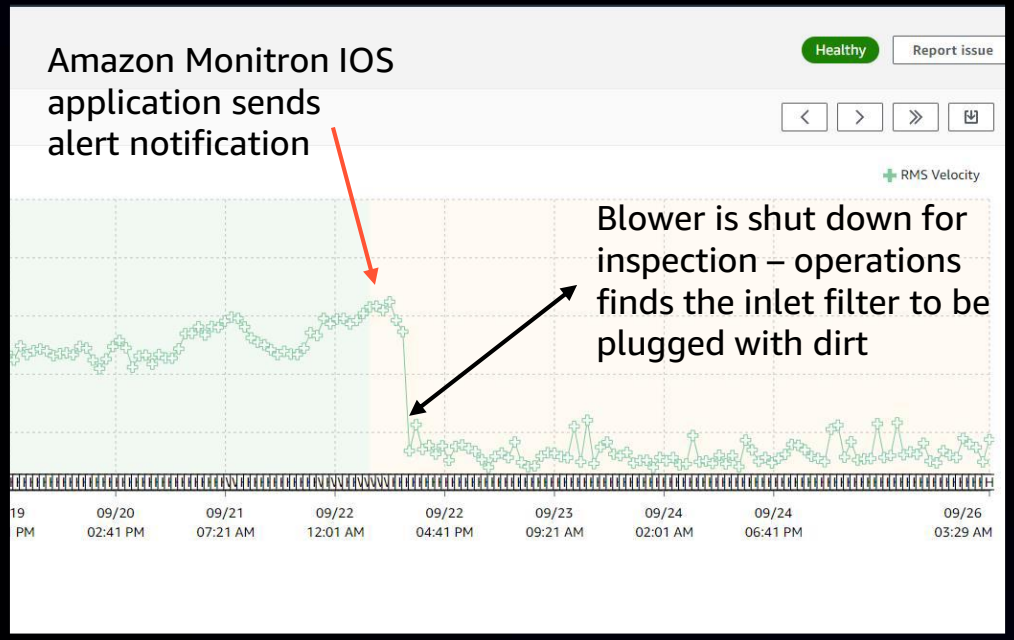


- Deployed 125 sensors across 5 sites
- Scaling to ~2,000 sensors in the next 18–24 months

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Insights to value: Success at KAES



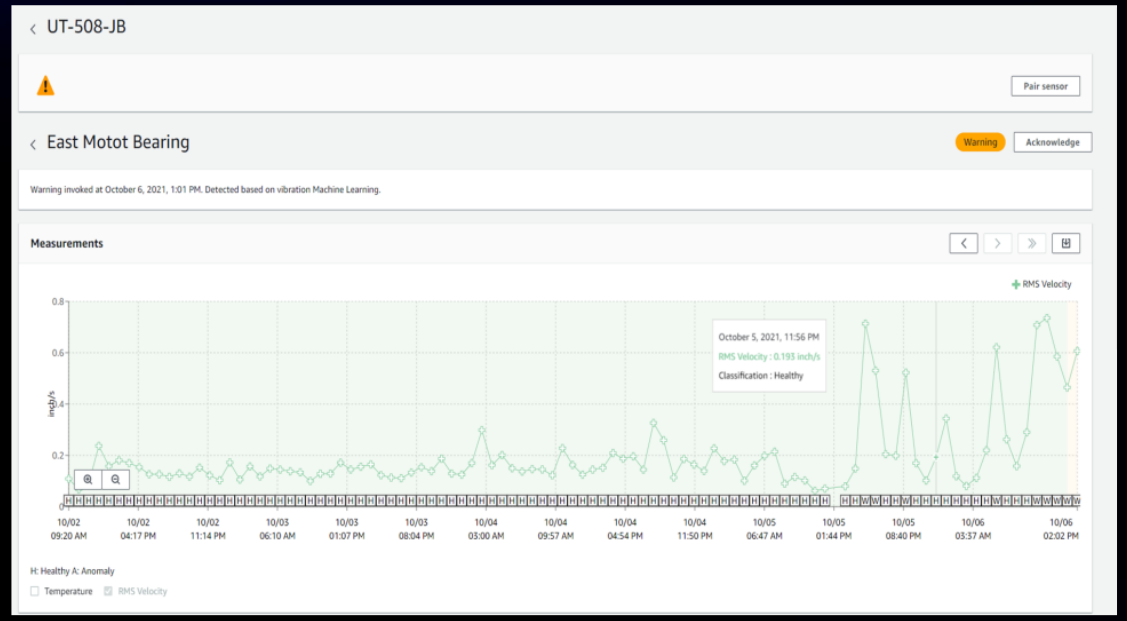




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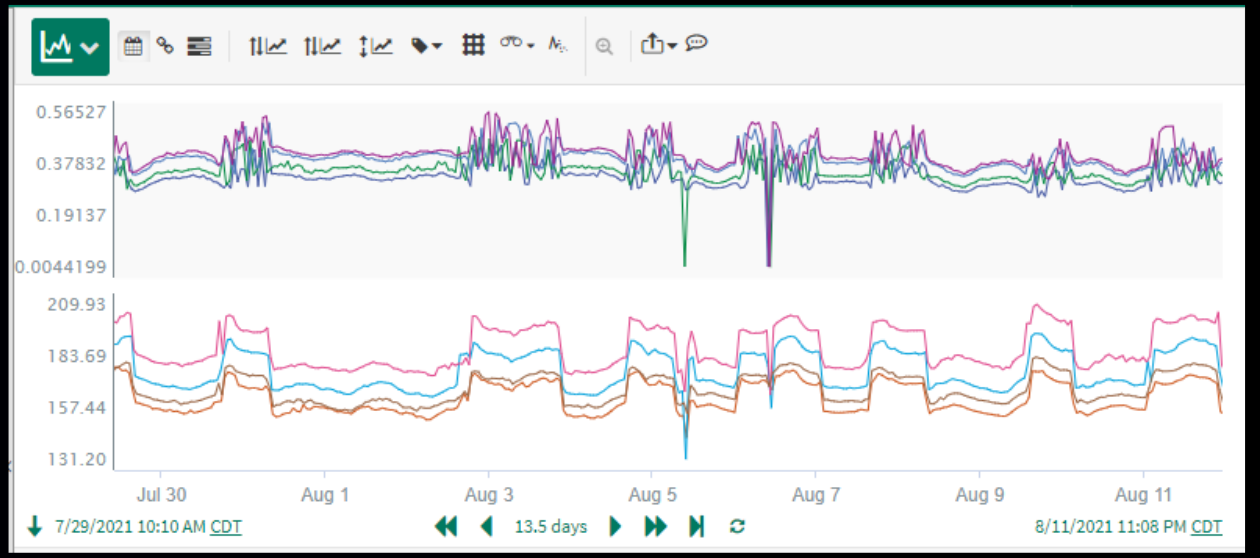
Insights to value: Success at KAES

Continuous monitoring





Temperature sensing





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Next steps

- Further work with the Amazon Monitron team, continuously learning, and adapt to the process industry
  - Continue to increase datasets supporting ML models to detect anomalies
  - Leverage operating states on assets to eliminate false positives
  - Increase diagnostic capability
- Scale, scale, scale
  - Achieve the lowest price per point to gaining valuable insights
  - Enable the operators to act on information, make it simple

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Amazon Lookout for Equipment deployment at KAES

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Opportunity

- Successfully implementing predictive maintenance requires data from thousands of sensors, a clear understanding of unique operating conditions for each asset, and the ability to scale our ML models with highly accurate predictions
- Being able to model equipment behavior and diagnose issues requires significant investment in time and resources, which has been a hurdle for scaling across our assets

Develop asset-centric ML models to leverage **all** data from our critical assets

Quickly deploy ML models on a small subset of critical assets to provide valuable diagnostics prior to failure

Key factors:
- Resource constrained
- Unique assets
- Thousands of sensors
- Architecture

Think big



Start small



Scale fast



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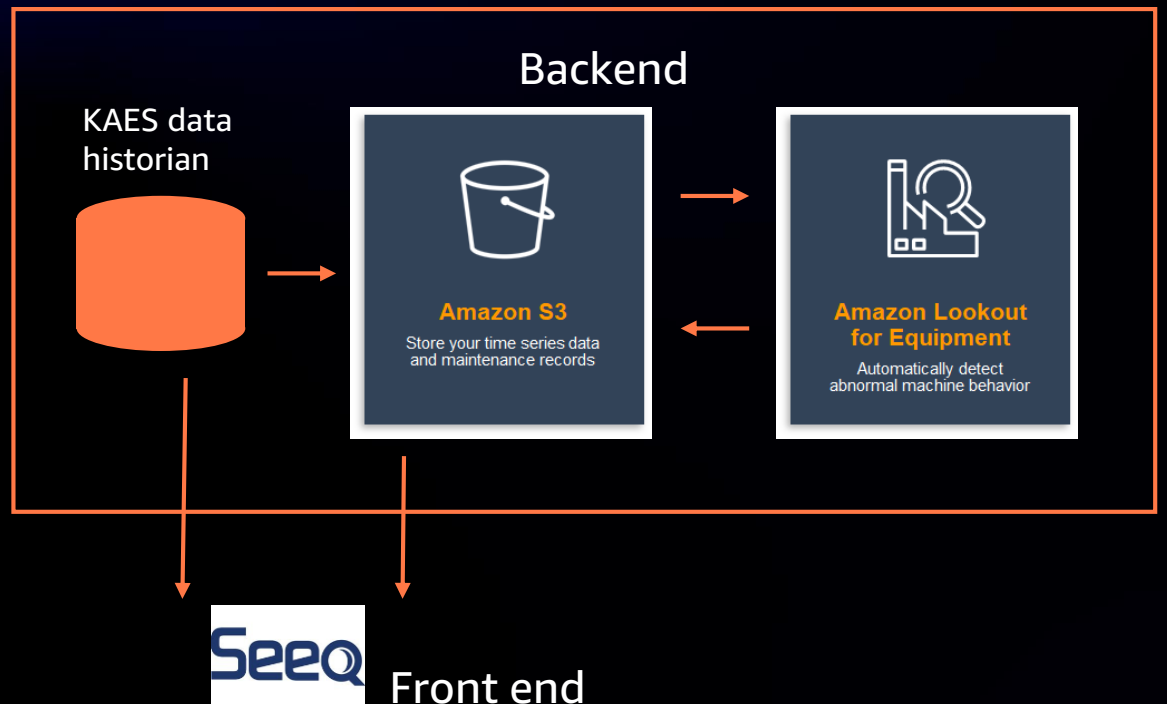
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Key points of view

- Minimal to no ML expertise required
- Holistic approach to leverage **all** data from machine sensors
- ML models are specific to each asset
- Integrates with existing analytics workflow for operations
- Models are developed in hours (speed)
- Ability to scale for automatic monitoring, detection, and diagnostics
- Highly accurate and transparent ML models
- Leverages existing architecture and data flow

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How it works under the hood



1. A user selects an asset and sensors inside of Seeq and selects train model
2. The data for that asset is then moved to S3 in Lookout for Equipment format
3. Lookout for Equipment trains a model on the asset data
4. Once the model is complete (<1 hour), Lookout for Equipment is ready to accept real-time data
5. Every 30 minutes (configurable), the real-time data from the selected asset is moved from the data lake to S3
6. Lookout for Equipment then runs the new data through the model and outputs the results back to S3
7. Seeq then displays the results for the end user
8. End user can give model feedback and retrain all through Seeq

From the above, notice that the process engineer only has to choose the sensors from PI AF and tell whether the alerts are relevant or not; there are no direct interactions with Lookout for Equipment

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Current deployment at KAES





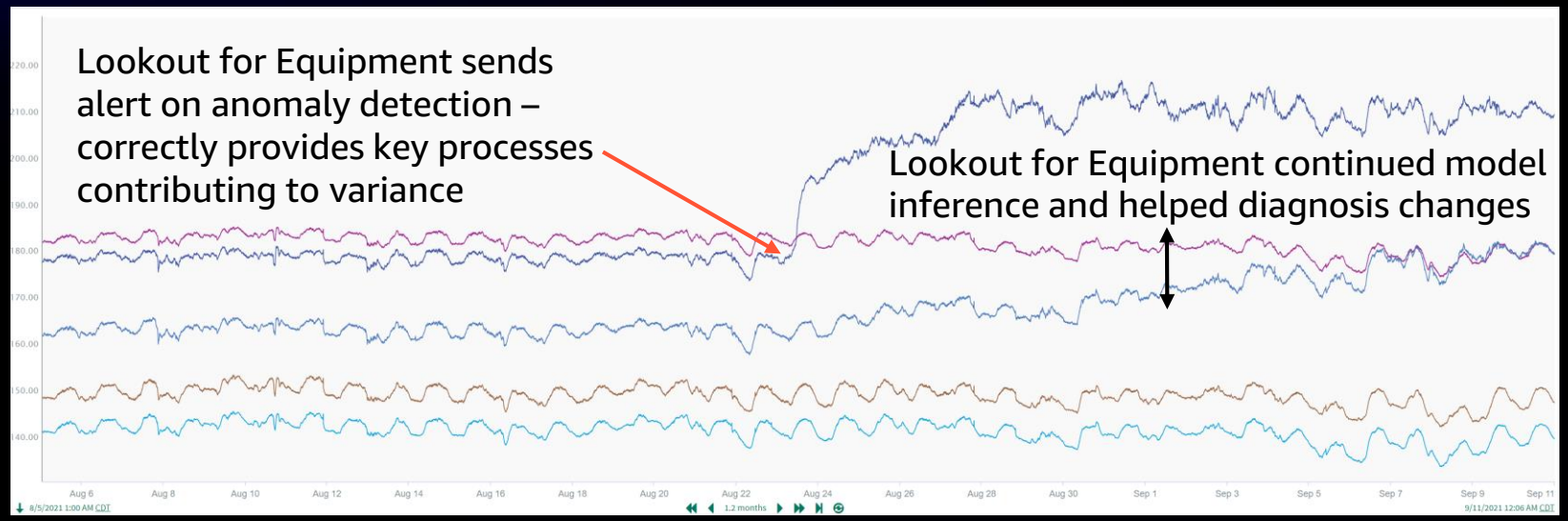


- Deployed across 5 sites and 41 critical assets
- Scaling to 100+ critical assets in the next 12 months
- Additionally, leveraging Lookout for Equipment for **process health anomaly** detection

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Insights to value: Success at KAES





- Lookout for Equipment **correctly alerted** to a **bearing temperature issue** within a compressor at one of our nitrogen processing facilities, **hours before** any other monitoring method
- The compressor temperature and vibration deviations were confirmed by the specialists, allowing them to develop short-term mitigations as well as target a long-term plan for maintenance activities

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Next steps

- Continue partnership with Lookout for Equipment team to learn and optimize our usage
- Capture value and scale our automation from Seeq and Black & Veatch partnership
  - Accelerate ML model development across the fleet of critical assets
  - Strategically apply Lookout for Equipment to other **process conditions** for anomaly detection
  - Increase exposure with our reliability SMEs to capture additional high-value use cases
  - Keep it simple, transparent, and meaningful for operations and diagnostic teams

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Thank you!

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