

NOVEMBER 2022

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# Transform data into new insights

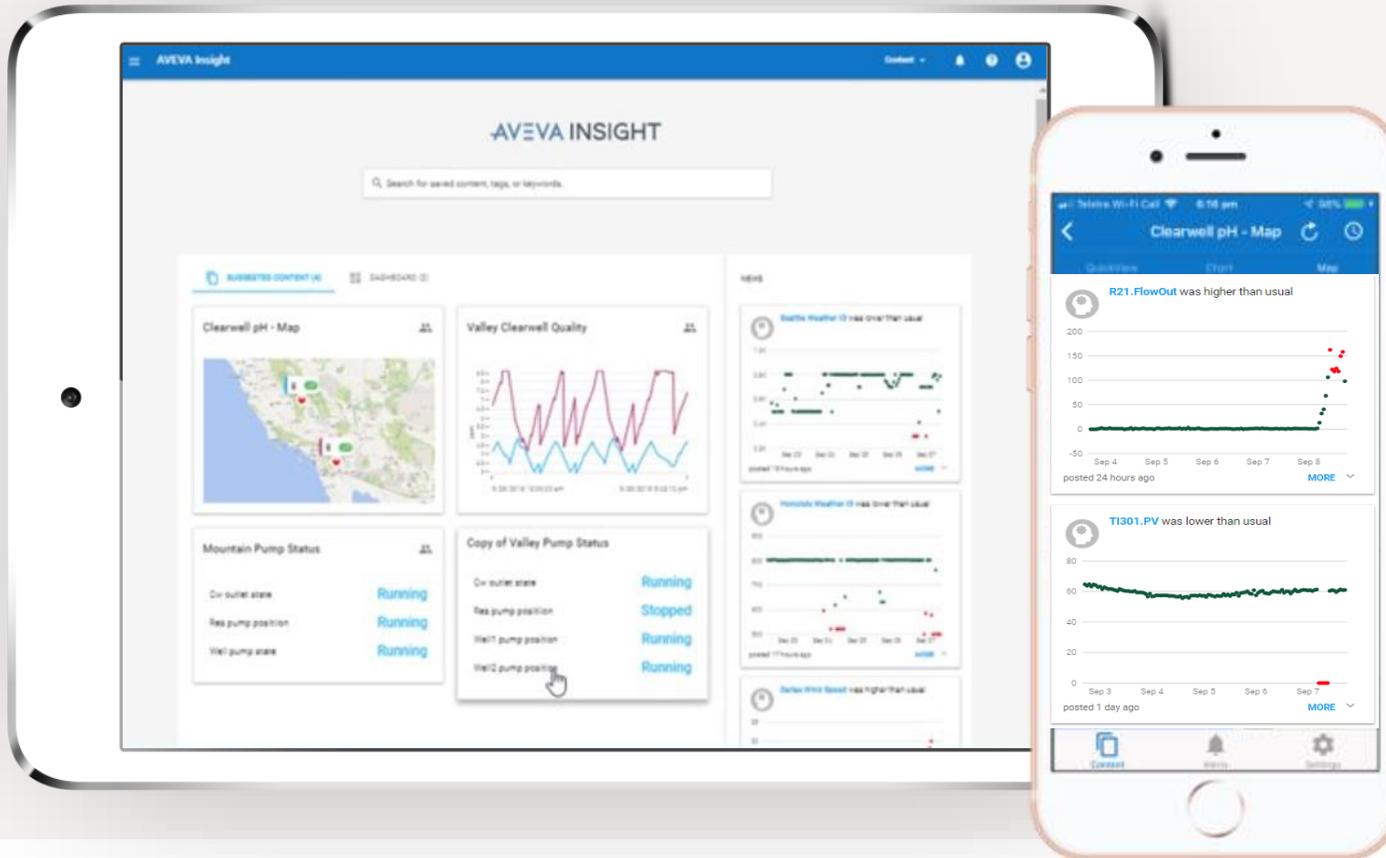
with AVEVA Insight Analytics

Christian-Marc Pouyez, Director APM Advanced Analytics

**AVEVA**

# AVEVA™ Insight

Continuously monitor real-time data to detect anomalies and optimize performance without complexity.

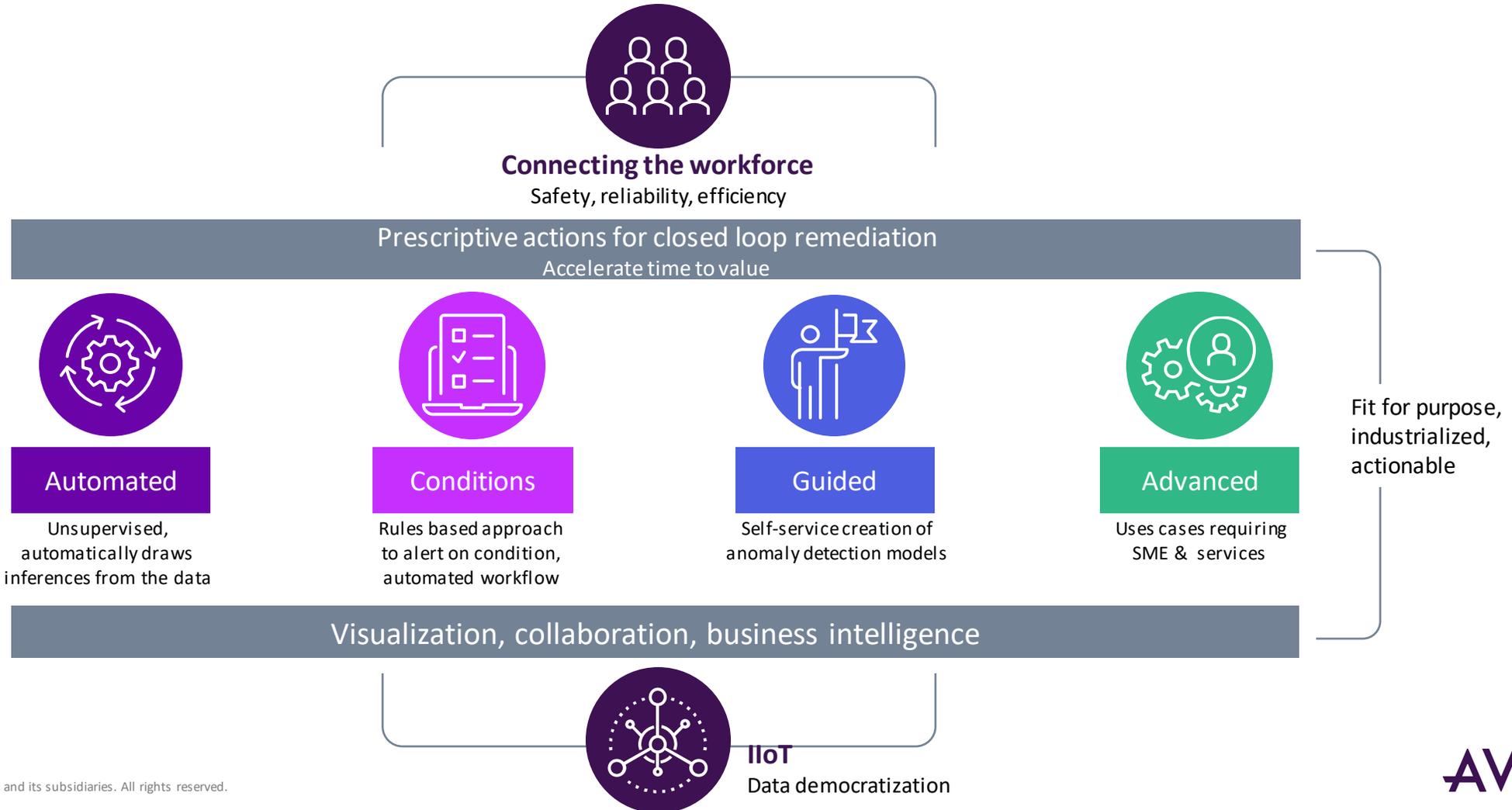


**Make operational data accessible and empower your workforce with insights – anywhere, anytime, any device**

- Search based navigation
- Time series analysis
- Process graphics
- Geolocation / mapping
- Customizable Dashboards
- Condition Management / Alerts & Notifications
- Predictive Analytics
- Asset efficiency & OEE Analysis
- Secure data transport and access

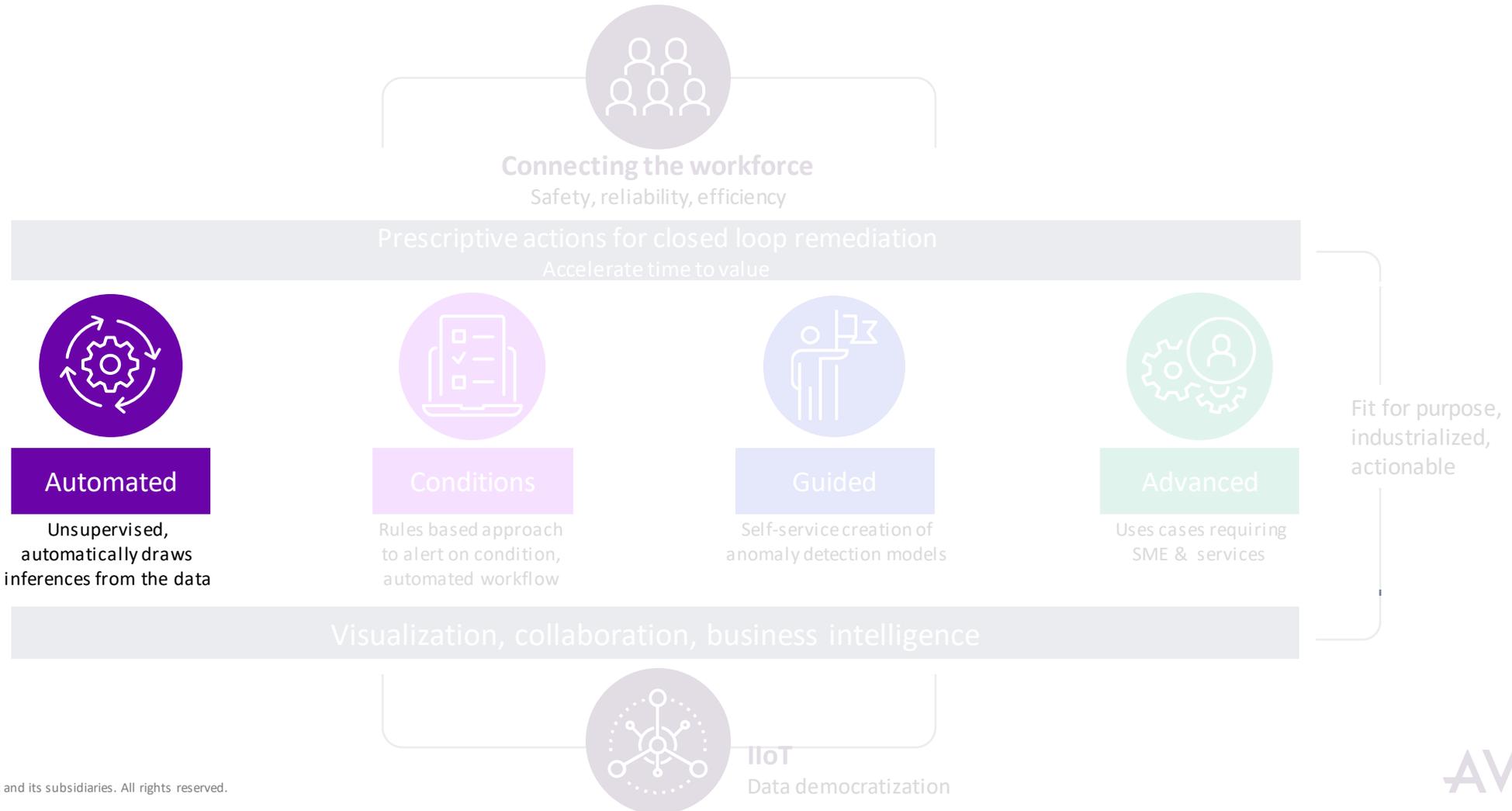
# AVEVA Insight

Empowering the connected worker through predictive analytics



# Unlock data and experience to drive reliable autonomous plant

The human experience meets Artificial Intelligence in the cloud



# Automated Analytics

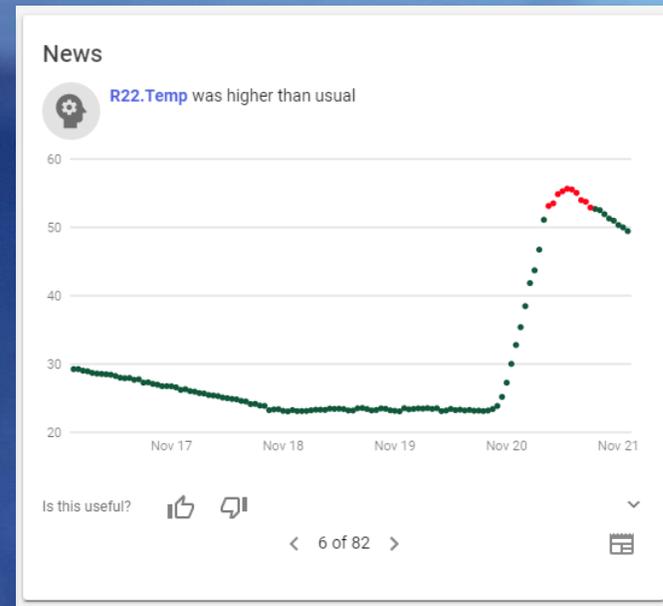
Identify potential issues in day to day processes detecting anomalies through automatic scans.

## Unsupervised Anomaly detection

- Completely automatic,
- Learns from historical data with no configuration needed

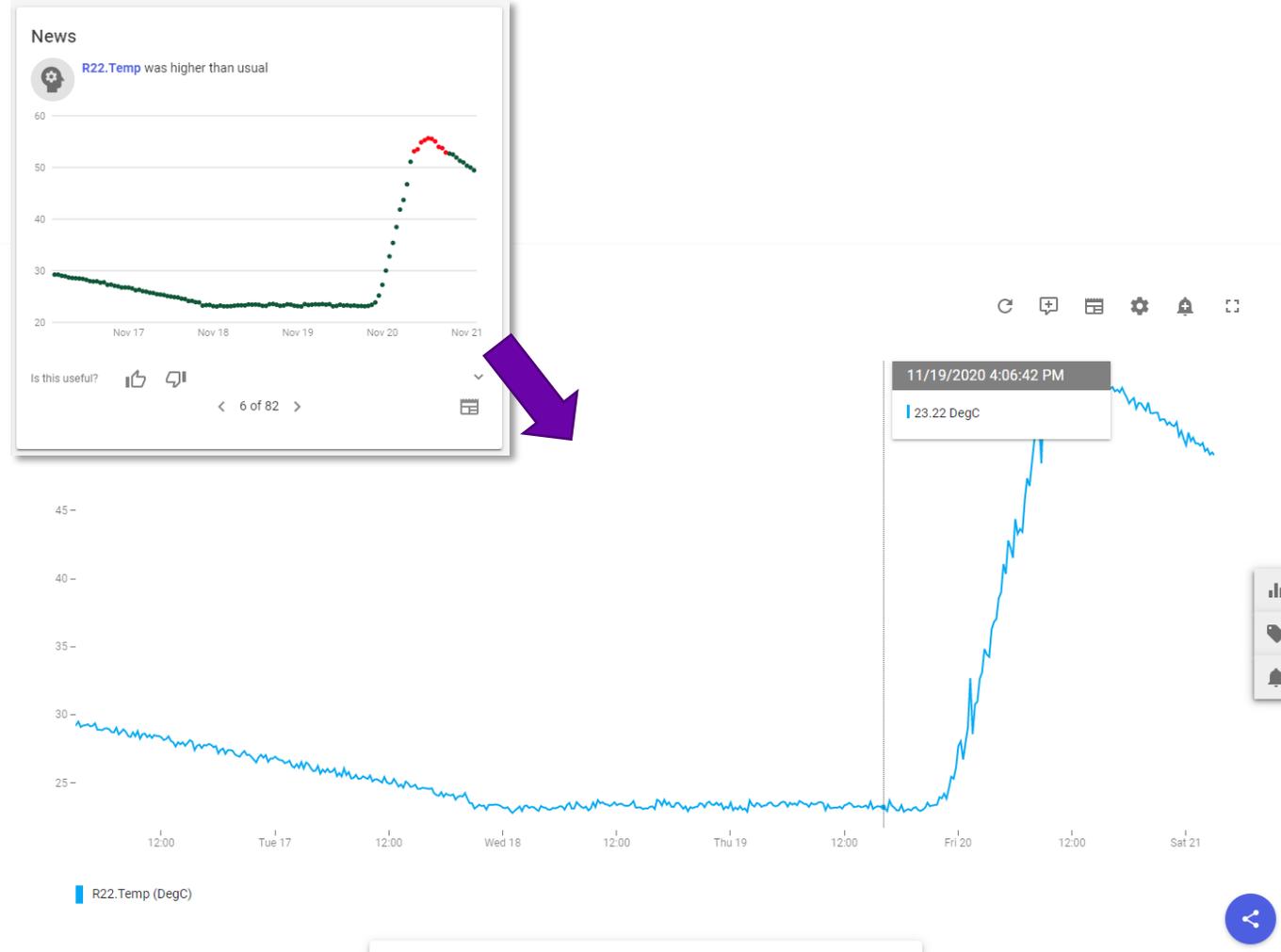
## Anomalies are shown in the News Feed of AVEVA Insight

- Feedback on the usefulness will structure data for future ranking
- Users can drill through to relevant trend for further analysis



# Introduction to Insight Analytics Capabilities

## Automated Analytics



### Unsupervised Anomaly detection

- Completely automatic; nothing to configure
- Learns from historical data

### Anomalies detected sent as news feed

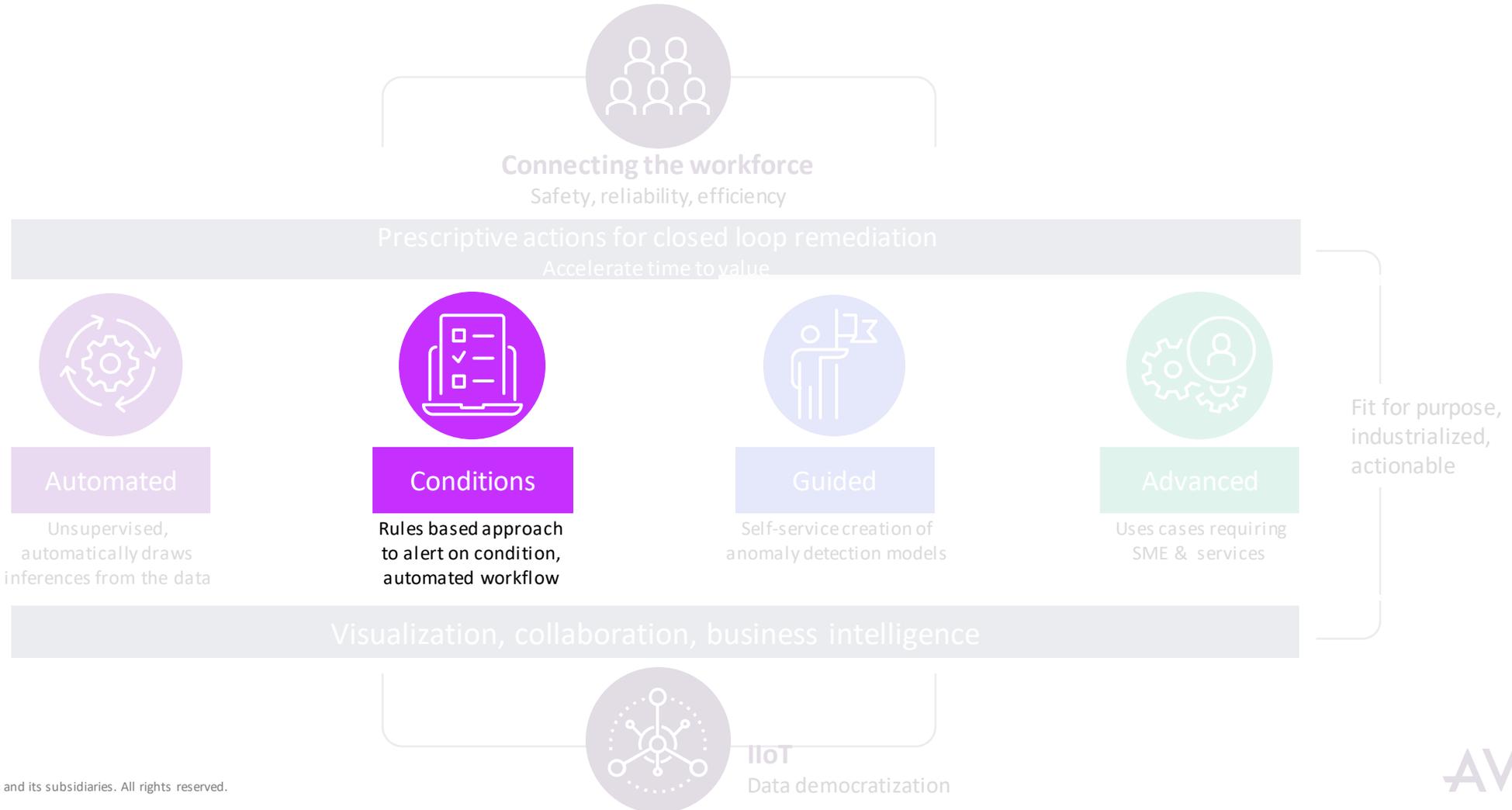
- Users can identify whether news are useful
- Users can drill through to relevant trend

### Example types of anomalies detected:

- Deviation from normal values
- Flatlines
- Different cycle times
- Entropy variations
- Correlations between tags

# Unlock data and experience to drive reliable autonomous plant

The human experience meets Artificial Intelligence in the cloud



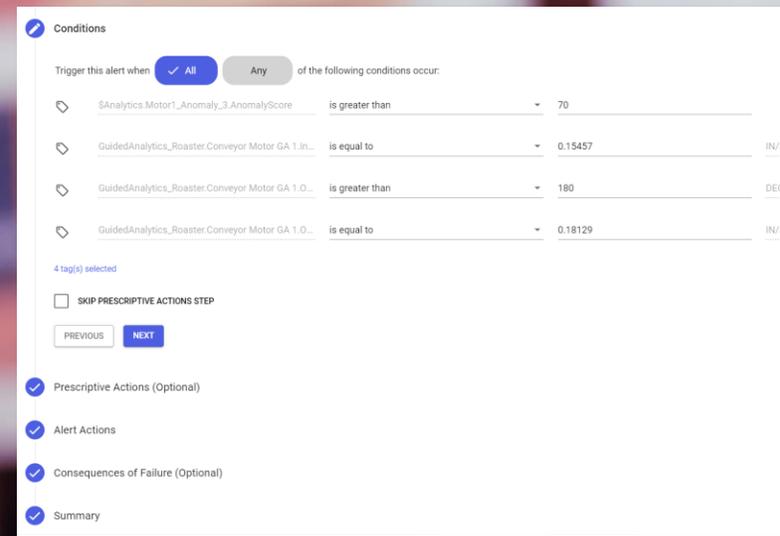
# Condition-Based Rules

## Detect asset conditions that have a need for a maintenance action.

- Condition-Based Multi Tag Rules triggering alerts and configured actions when the conditions are met.
- Integrate consequences of failure: Safety, Environmental and Production.
- Best used to monitor known conditions limits in assets and prevent non-desired operational conditions and downtime.

### Example of configurable actions:

- Prescriptive information from Insight Asset Library
- Send alert notifications via email, Slack
- Create Work Order in EAM system



The screenshot shows a configuration interface for a condition-based rule. At the top, it says "Trigger this alert when" with two radio buttons: "All" (selected) and "Any". Below this, there are four conditions listed in a table:

Condition	Operator	Value	Unit
SAnalytics.Motor1_Anomaly_3.AnomalyScore	is greater than	70	
GuidedAnalytics_Roaster.Conveyor Motor GA 1.In...	is equal to	0.15457	IN/S
GuidedAnalytics_Roaster.Conveyor Motor GA 1.O...	is greater than	180	DEGF
GuidedAnalytics_Roaster.Conveyor Motor GA 1.O...	is equal to	0.18129	IN/S

Below the table, it says "4 tag(s) selected" and there is a checkbox for "SKIP PRESCRIPTIVE ACTIONS STEP". At the bottom, there are "PREVIOUS" and "NEXT" buttons. On the right side of the interface, there are several checked items: "Prescriptive Actions (Optional)", "Alert Actions", "Consequences of Failure (Optional)", and "Summary".



# Introduction to Insight Analytics Capabilities

## Condition-based rules

Define Alert for WonderWater/Quebec/Pointe-Claire

Alert Name: Differential Pressure B100  
Link to Asset: WonderWater/Quebec/Pointe-Claire  
Description: [Empty]

Trigger this alert when  All  Any of the following conditions occur:

- Baytown.B100.Pressure is equal to 149.878
- Frankfurt.B100.Pressure is equal to 150.0091094970703

2 tag(s) selected

SKIP PRESCRIPTIVE ACTIONS STEP

PREVIOUS NEXT

3 Prescriptive Actions (Optional)

4 Alert Actions

5 Consequences of Failure (Optional)

Status	Alert Name ↑	Linked to Asset
<input type="checkbox"/>	B100.Pressure > 146.5	WonderWater/Quebec/Pointe-Claire/
<input type="checkbox"/>	B100.Pressure [] > 146.5	WonderWater/Quebec/Pointe-Claire/
<input type="checkbox"/>	B100.Temperature > 105	WonderWater
<input type="checkbox"/>	Boiler Event	WonderWater/Quebec/Pointe-Claire/

### User-friendly configuration

- Wizard-based configuration
- Define conditions to trigger alert

### Example configurable actions:

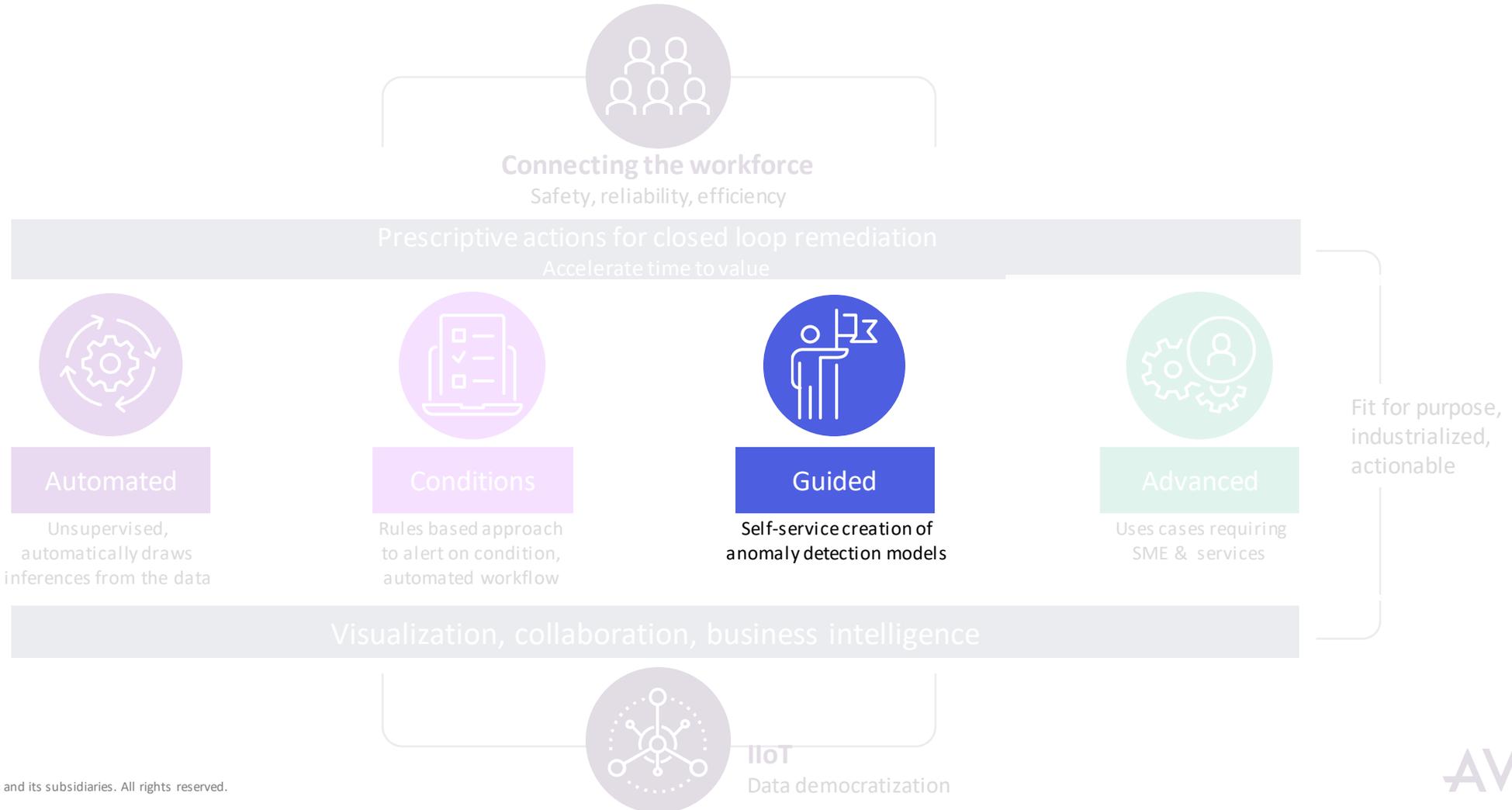
- Prescriptive information from Insight Asset Library
- Send alert notifications via email, Slack
- Create Work Order in EAM system

### Identify consequences of failure

- Safety
- Environmental
- Production

# Unlock data and experience to drive reliable autonomous plant

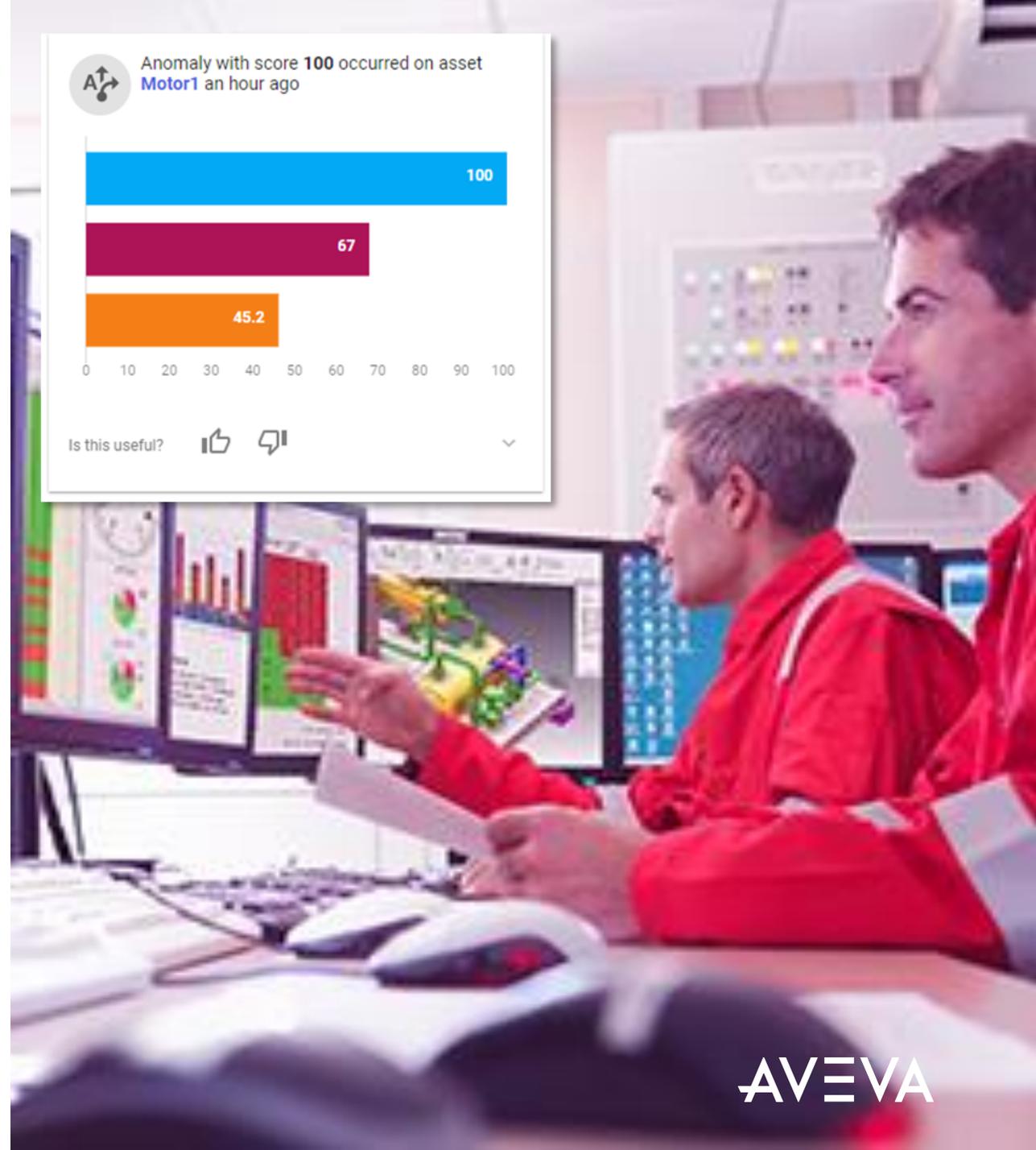
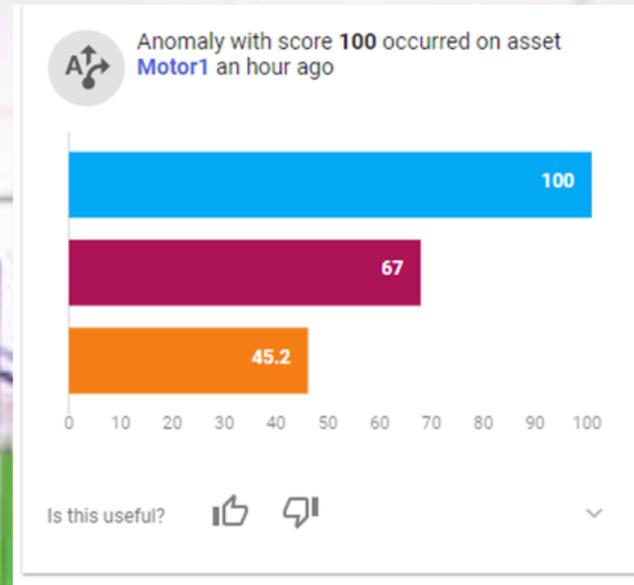
The human experience meets Artificial Intelligence in the cloud



# Guided Analytics

Anomaly detection on selected assets, easy to implement and interpret for Insight users.

- Simple configuration: user selects which tags to include in model and a period representing normal operating conditions.
- No data science knowledge required.
- Simple results: Anomaly score with top 3 variables contributing to the anomaly.
- Overall anomaly score generated as new tag, that can be leveraged to build rules-based alerts with prescriptive actions



# Introduction to Insight Analytics Capabilities

## Guided Analytics

1 Select Tags

Search All Tags

Search for tags in this asset

- Baytown.MF01P5.Power
- Baytown.MF01P5.Pressure
- Baytown.MF01P5.PV
- Baytown.MF01P5.SP
- Baytown.MF01P5.Speed
- Baytown.MF01P5.State

6 tag(s) added out of 30

NEXT

Configure Parameters

Add Advanced Model

Add Asset Anomaly Detection Guided Model

Add Process Anomaly Detection Guided Model

Anomaly with score 100 occurred on asset **Motor1** an hour ago

Contributor	Score
Contributor 1	100
Contributor 2	67
Contributor 3	45.2

Is this useful?

## Guided Configuration

- Two types of algorithms:
  - Asset Anomaly Detection
  - Process Anomaly Detection
- Select tags to include in model
- Choose model training period
- Optionally identify filters, operational modes

## Anomalies detected sent as news feed

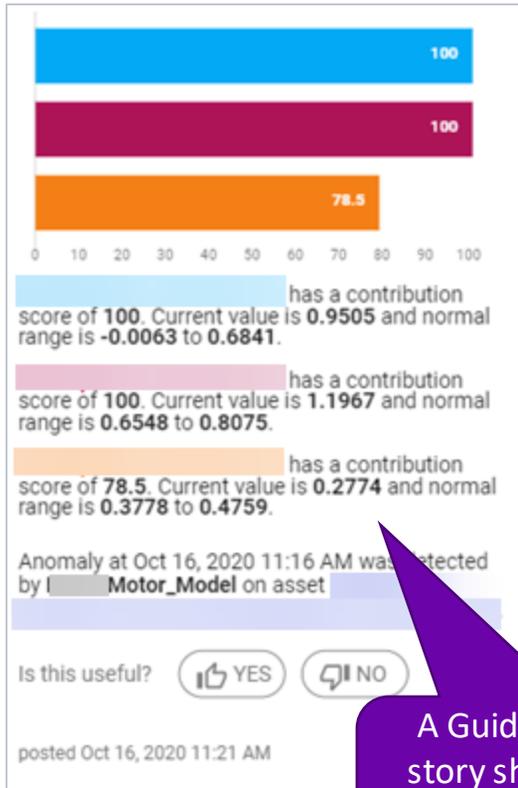
- Identifies top 3 variables contributing to anomaly
- Users can identify whether news are useful
- Users can drill through to relevant trend

## Anomaly score

- Overall anomaly score available in a tag
- Type of anomaly identified for each contributor

# Motor Driven Pump

## Guided Analytics Case



A Guided Analytics news story showing higher than normal vibrations have been detected.



Vibrations start trending up, while Guided Analytics stories start highlighting these changes

Vibrations continue to increase 2-3x above baseline levels

# Industries and Asset candidates for Guided Analytics



## Oil and Gas Chemicals

- Pumps
- Expanders



## Food, Beverage, CPG

- Agitators
- Blender
- Mixer
- Fans
- Blowers
- Boiler
- Oven
- Pumps
- Air heaters



## Mining

- Emission systems
- Pulveriser
- Crusher
- Gearbox
- Kiln



## Infrastructure

- Pumps
- Variable Frequency Drives (VFD)
- Heat exchanger
- Chillers

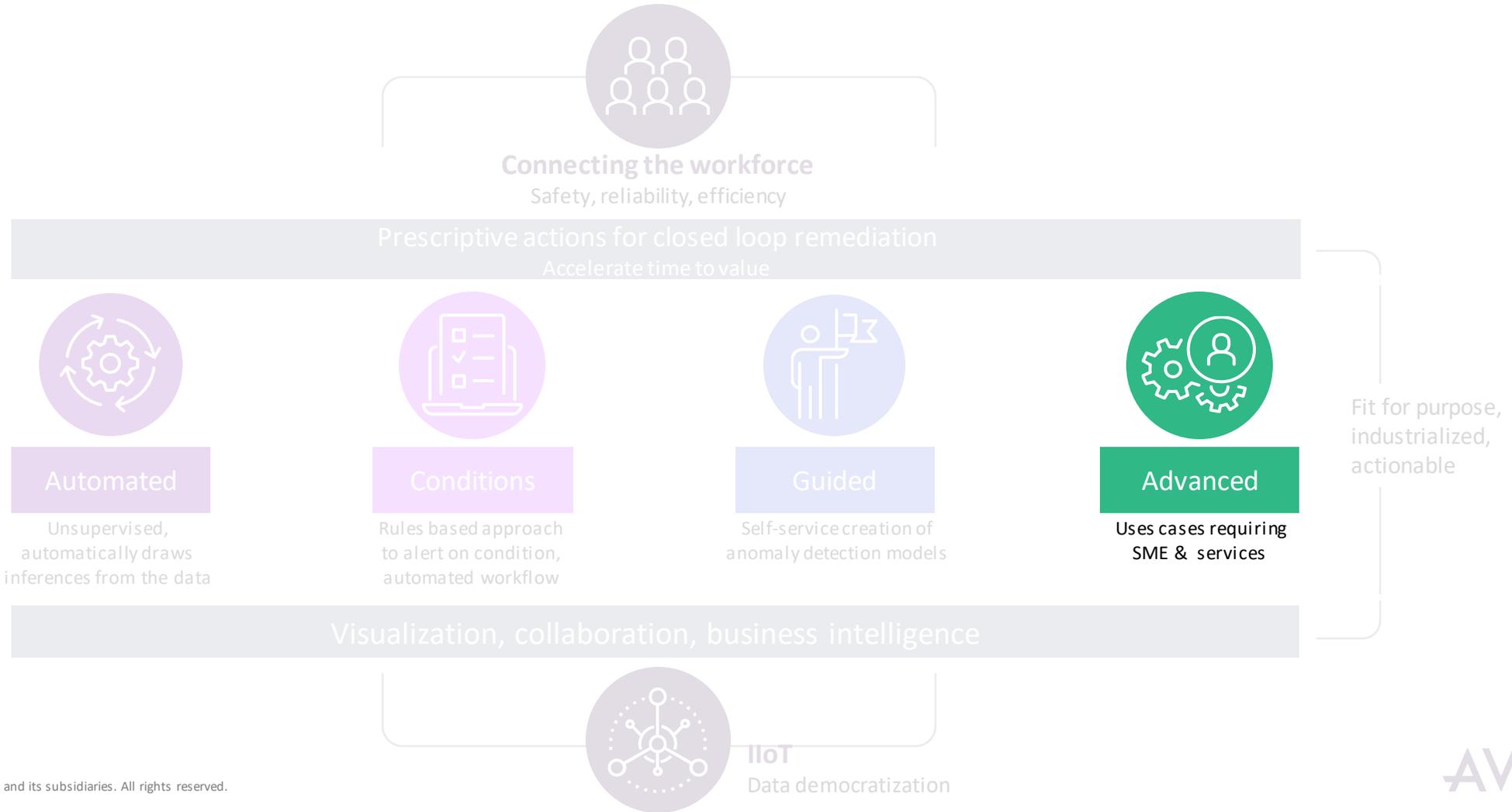


## Water & Waste Water

- Pumps
- Motors
- Blowers

# AVEVA Insight

The human experience meets Artificial Intelligence in the cloud

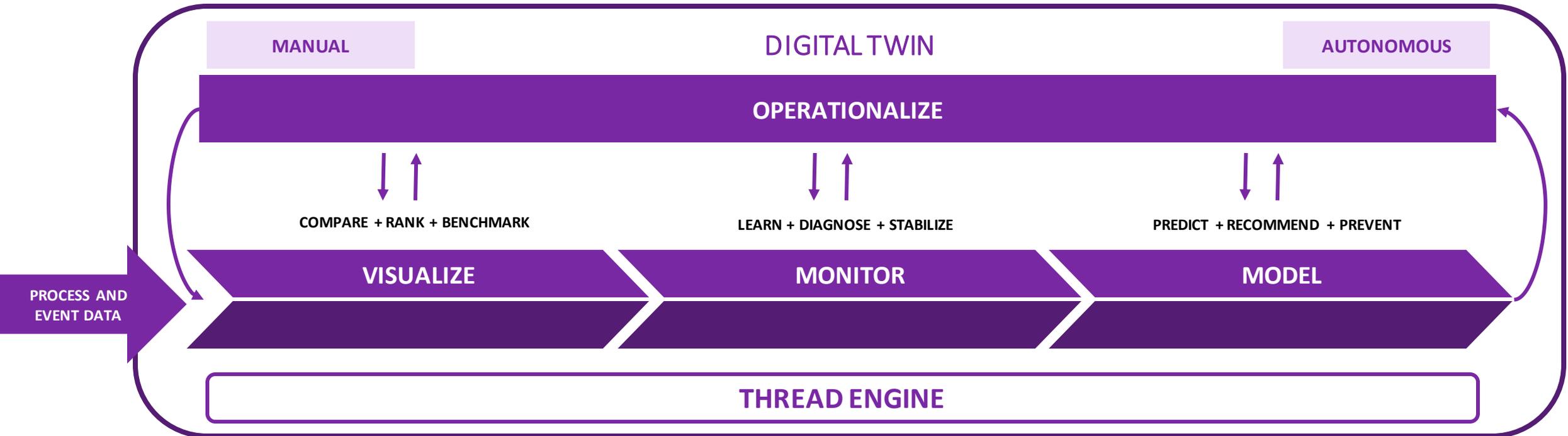


# AVEVA Insight Advanced Analytics



# Providing an accelerated journey to autonomous operations

Proven, continuous innovation process that drives rapid value at each point in the journey



# Case Study: Predictive Quality

## Problem

Premium Pet Food Manufacturer wanted to reduce scrap from frequent line startups / formulation changes and reduce reliance on in-process testing. Due to 30-60min process lag times between key unit operations and finished product quality tests, the potential for scrap from off-quality product was very high.

## Solution

Implement predictive models for “middle of line” quality for finished product Density, Moisture, Fat, and Protein content. Monitor more than 75 process variables from across the production process to make accurate predictions for all four quality parameters in real-time, plus provide recommendations to operators to keep quality on-target.

## Payback

Payback periods between 15-60 days (implementation + 1yr subscription).

### Innovation and Value Streams

CONTINUOUS LEARNING



Connect Digital Twins



Train Models



Analyze Models

- Top quality drivers
- Best recipe / centerlines
- Automation opportunities
- Recipe simulation



Deploy Models



Monitor Twins



Analyze & Act

- Soft Sensor / Real-time Prediction
- Real-time Anomalies
- Real-time Recommendations

# Advanced Analytics : How is it configured?

- Launch configuration from the Insight Asset page
- Single sign-on to the Advanced Analytics portal
- Authorized users can create/modify models
- Assets and tags are synchronized from Insight
- Upon saving a model, meta-data is sent to Insight, visible in Asset and Admin pages
- At runtime, model results are sent to Insight News Feed, tags, and selected charts

The screenshot displays the 'Add Model' configuration window. At the top, there are input fields for 'Name\*' (containing 'My new model') and 'Description' (containing 'Model description'). Below these fields is an 'Asset Actions' dropdown menu. The menu is open, showing several options: 'Edit', 'Delete', 'Create Alert', 'Create Analytics Model', 'Add Advanced Model', 'Add Asset Anomaly Detection Guided Model', and 'Add Process Anomaly Detection Guided Model'. The 'Add Advanced Model' option is highlighted with a red rectangular box. Below the menu, there is a list of model templates with their descriptions: 'Golden Batch ISA88' (Detect anomalies in ISA88 batch processes), 'Optimize Energy Efficiency' (Predict and optimize energy consumption), 'Optimize Throughput' (Predict and optimize asset production rate), 'Predict Quality' (Predict quality parameter based on process data), 'Predictive Asset Reliability' (Predict and provide advanced warning of asset failure event), and 'Predictive Uptime' (Predict and provide advanced warning of downtime events). At the bottom of the window, there is a dropdown menu for 'or select a non-wizard template' and two buttons: 'Cancel' and 'Confirm'.

# Advanced Analytics : How is it configured?

- Pick one of the models
- Other models are available but those on the right have been validated for the first integration release
- Guided configuration

### Add Model ✕

Name\*

Description

Which Model Template Do You Want To Use?\*

<b>Detect Asset Anomalies</b> Detect anomaly conditions on an asset and determine drivers
<b>Detect Process Anomalies</b> Detect process anomaly conditions and drivers
<b>Optimize Energy Efficiency</b> Predict and optimize energy consumption
<b>Optimize Throughput</b> Predict and optimize asset production rate
<b>Predict Quality</b> Predict quality parameter based on process data
<b>Predictive Uptime</b> Predict and provide advanced warning of downtime events

# Advanced Analytics Configuration

## Guided configuration

Connect Twin to Data Source's Sensors

1  
0101  
11010  
0011011  
011000111  
00110100111  
100100110101  
0110100111011

Connect Sensors

17 properties connected

What products does this Twin produce?

Segment by Product

Configured

What operational states can this Twin be in?

Indicate States

Configured

At what rate does this Twin operate?

Select Rate

Configured

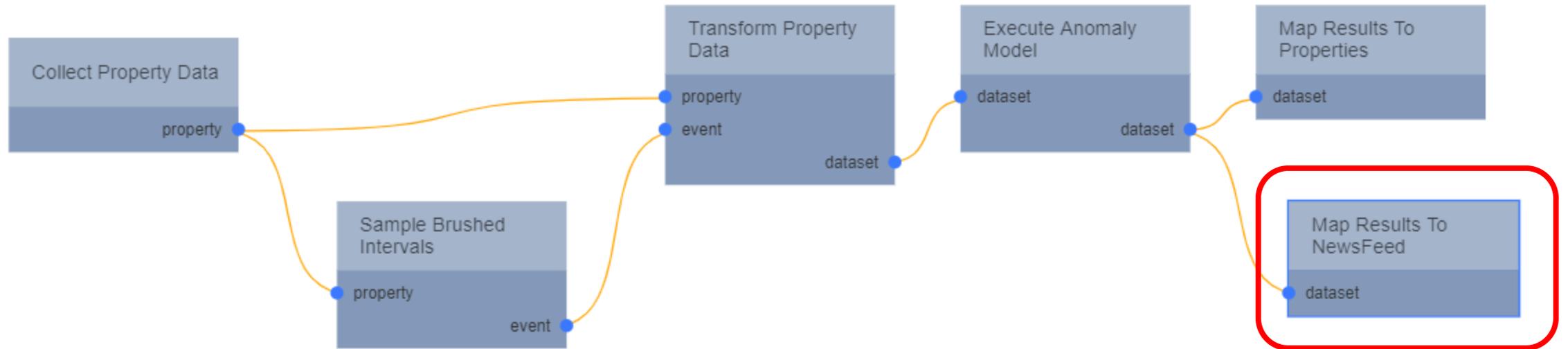
Create a Machine Learning Model for this Twin.

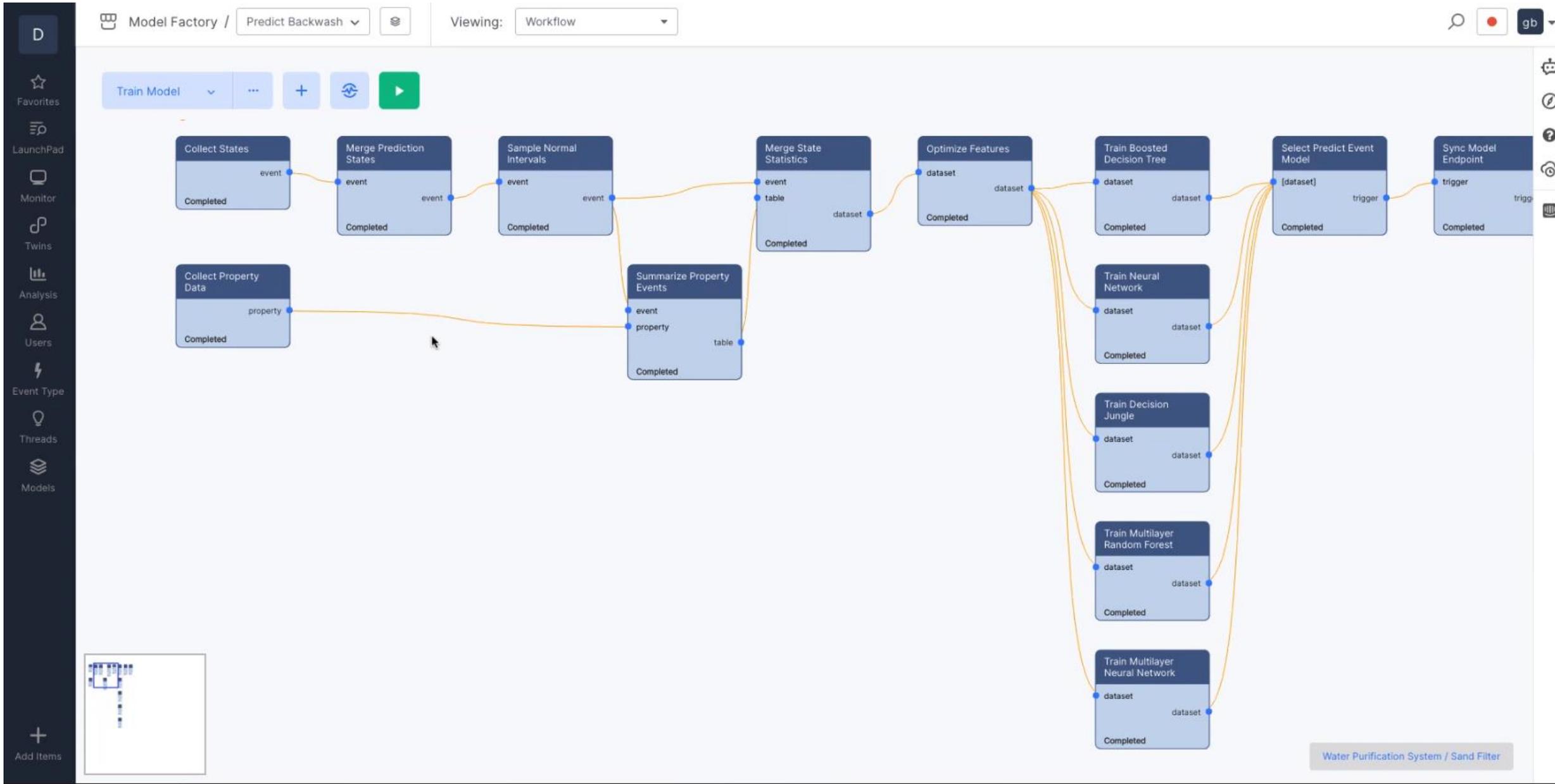
Create Model

Ready

# Advanced Analytics Configuration

## Workflow





# Advanced Analytics: How do you get results?

- Model messages can be sent as News items.
  - News Feed entry shows text entry configured in model.
- Model results can be sent to tags
- Charts can also be viewed in Insight
- The Asset page also provides:
  - News Feed items related to asset
  - List of models associated to asset

### Advanced Analytics Model Details

**Name**  
UF6 Predictive Quality

**Model Type**  
Predict Quality

**9 Associated Tag(s)** ^

**Training Window**  
Start Time  
2/5/2021 9:58:44 PM  
End Time  
3/7/2021 9:58:44 PM

**Model Content**  
Statistical Model ^  
Predictive Model ^  
Dataset ^  
Operational Insights v

[Recommendation Analysis](#) >  
Recommendation Analysis / Execute Predict Property Model for Predict Quality / LAVAL / UF6

[Ideal Conditions Visual](#) >  
Ideal Conditions Visual / Execute Predict Property Model for Predict Quality / LAVAL / UF6

[Anomaly History](#) >  
Anomaly History / Train Multilayer Neural Network for Predict Quality / LAVAL / UF6

### News

UF6 Predictive Quality for UF6  
Target variable **Laval.UF6.PermeateTurbidity** has value 4.55986 with an ideal value of 4.47217 and an operating range from 3.42279 to 5.52155.

[View Model Details](#)

Is this useful? ^

< 5 of 212 >

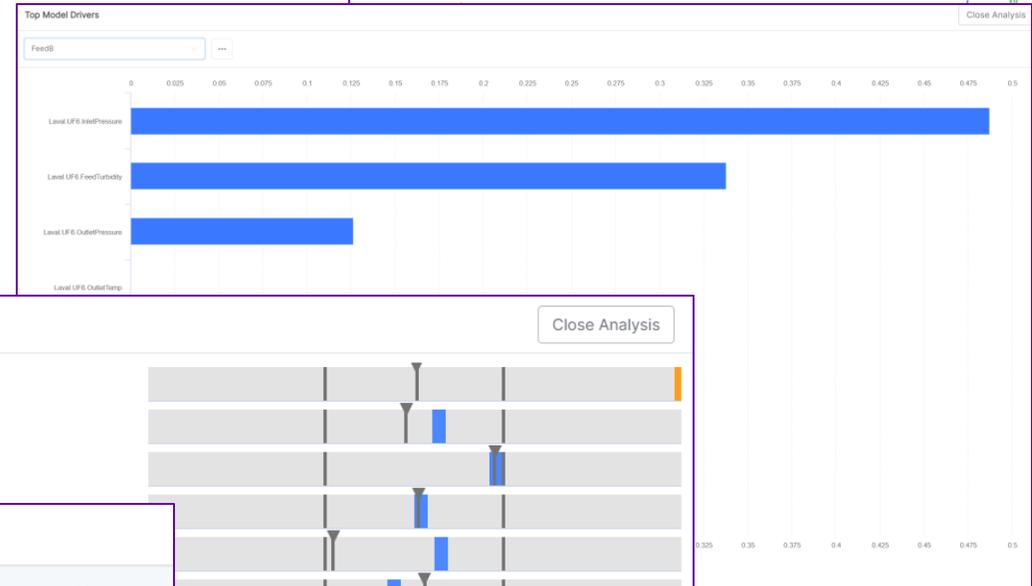
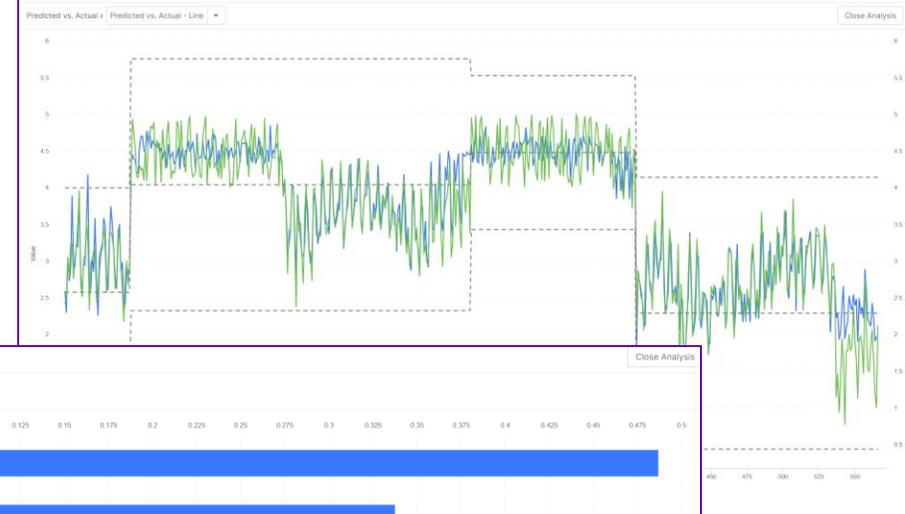
### Advanced Analytics Models

Model Name	Model Type	Status
UF6 Predictive Quality	Predict Quality	Completed
Predictive Quality Example for TSC Tr...	Predict Quality	Completed

# Advanced Analytics

## Model Analysis

- “Predicted Quality Value” & “Model Anomaly Score”
- “Top Model Drivers”
- “Ideal Conditions Visual”
- “Anomaly Status” and “Anomaly Timeline”
- Recommendations



Anomaly Status					
Name	Value	Ideal	Difference	Ideal Range	State
Laval.UF6.FeedTurbidity	420.3	407.5	+12.9	403.9 to 410.9	High
Laval.UF6.PermeateTurbidity	4.5	4.3	+0.1	3.8 to 4.9	Normal
Laval.UF6.FlowRate	105.4	105.1	+0.2	25.1 to 109.0	Normal
Laval.UF6.InletPressure	107.5	107.4	+0.06	103.9 to 110.6	Normal
Laval.UF6.InletTemp	106.3	99.5	+6.9	99.0 to 110.3	Normal
Laval.UF6.OutletPressure	104.8	106	-1.2	102.1 to 109.1	Normal
Laval.UF6.OutletTemp	108.7	102.5	+6.2	102.1 to 113.0	Normal
Laval.UF6.PumpMotorCurrent	321.7	316.9	+4.7	190.8 to 325.2	Normal

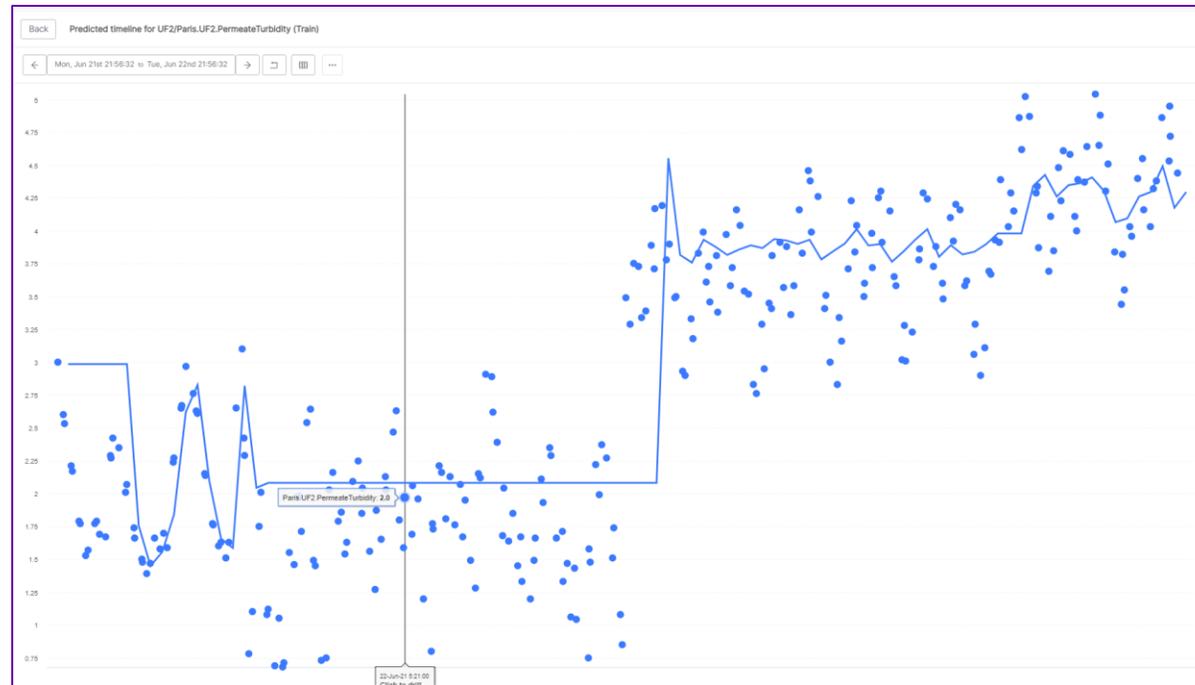
# Advanced Analytics

## Model Analysis

- “Anomaly Breakdown”



- “Predictive Timeline”



# Industry, Asset and metric candidates for Advanced Analytics



## Oil and Gas Chemicals

- Reciprocating and centrifugal compressors
- Pumps
- Expanders
- Turbines
- Heat recovery steam generators
- Energy Efficiency
- Reliability
- Uptime
- Asset Life
- Yield management



## Food, Beverage, CPG

- Agitators
- Blender
- Mixer
- Fans
- Blowers
- Boiler
- Oven
- Pumps
- Air heaters
- Quality
- Asset Reliability
- Uptime
- Asset Life
- Throughput



## Mining

- Emission systems
- Pulveriser
- Crusher
- Gearbox
- Kiln
- Asset Reliability
- Uptime
- Asset Life



## Infrastructure

- Pumps
- Variable Frequency Drives (VFD)
- Heat exchanger
- Chillers
- Reliability
- Uptime
- Asset Life
- Energy efficiency



## Water & Waste Water

- Pumps
- Motors
- Blowers
- Reliability
- Uptime
- Asset Life
- Energy efficiency

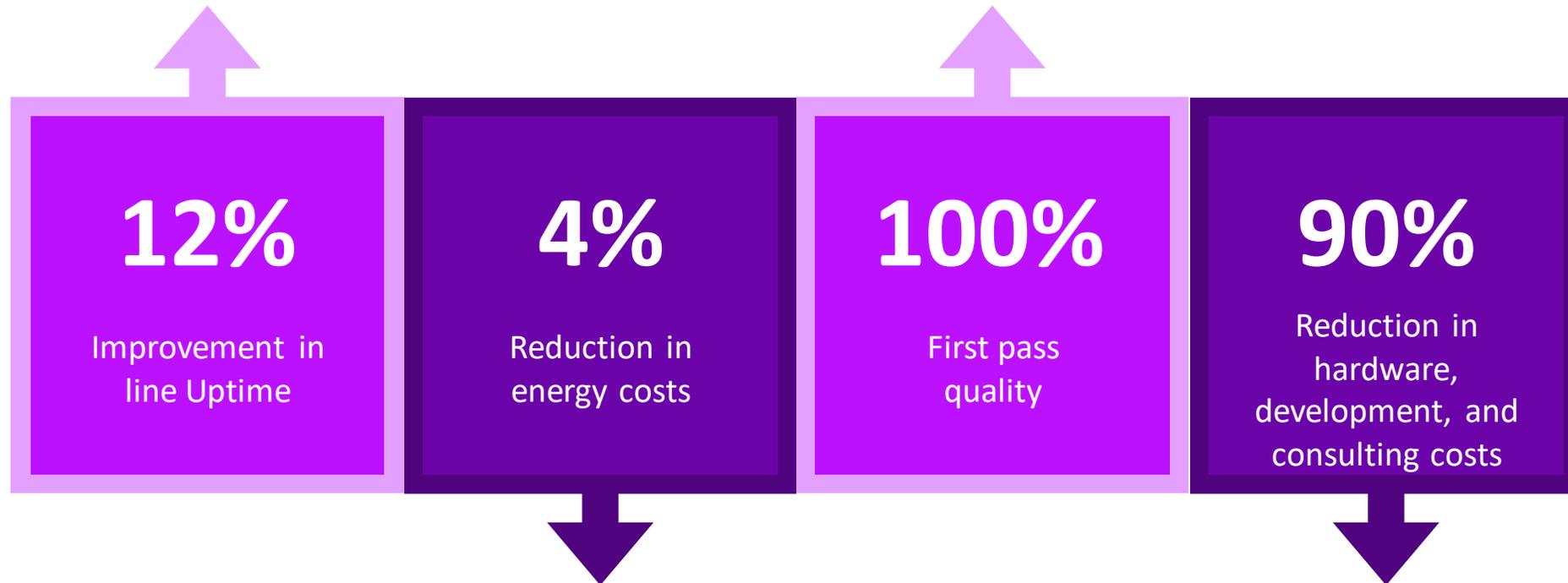


## Power

- Steam and gas turbines
- Generators
- Fans
- Mills
- Boilers
- Feedwater pumps and heaters
- Condensers
- Circulating water pumps
- Emissions systems
- Transformers
- Breakers
- Capacitors
- Asset Reliability
- Uptime
- Asset Life
- Energy efficiency

# Customer Achievements

Typical deployments enjoy 10x ROI on subscription investment



# Case Study: Predictive Energy Efficiency

## Challenge

- Large consumer products manufacturer committed to reducing global manufacturing energy footprint by 5% across all utilities including Water, Air, Gas, Electricity, and Steam.

## Solution

- Implement predictive energy models for each “process type” across making, converting, and packaging. The goal of the predictive models are to find best operating conditions / centerlines that minimize energy while running plus identify procedures to minimize energy while not running.

## Result

- Payback periods between 60 days (implementation + 1 year subscription).

“Committed to reduce energy footprint”



**ROI 60 days**



**Consistent set of measures**



**Scalability**

# Case Study: Predictive Uptime

## Challenge

- Specialty film manufacturer wanted to reduce costly film breaks and improve uptime by using data from existing Historian and MES Systems.

## Solution

- Implement predictive uptime models to continuously monitor line stability across nearly 500 process variables and provide advanced warning of high probability downtime causes to on-shift process engineering resources.

## Result

- Payback periods between 30-60 days (implementation + 1 year subscription).

“  
Goal: advanced warning  
15-30 minutes to reduce  
downtime  
”



**ROI**  
**30-60 days**



**Uptime**  
**increase 12%**



**25% reduction**  
**in breaks**

# Check out these great presentations!

## Underscoring the value and driving into the details

### Tuesday recordings:

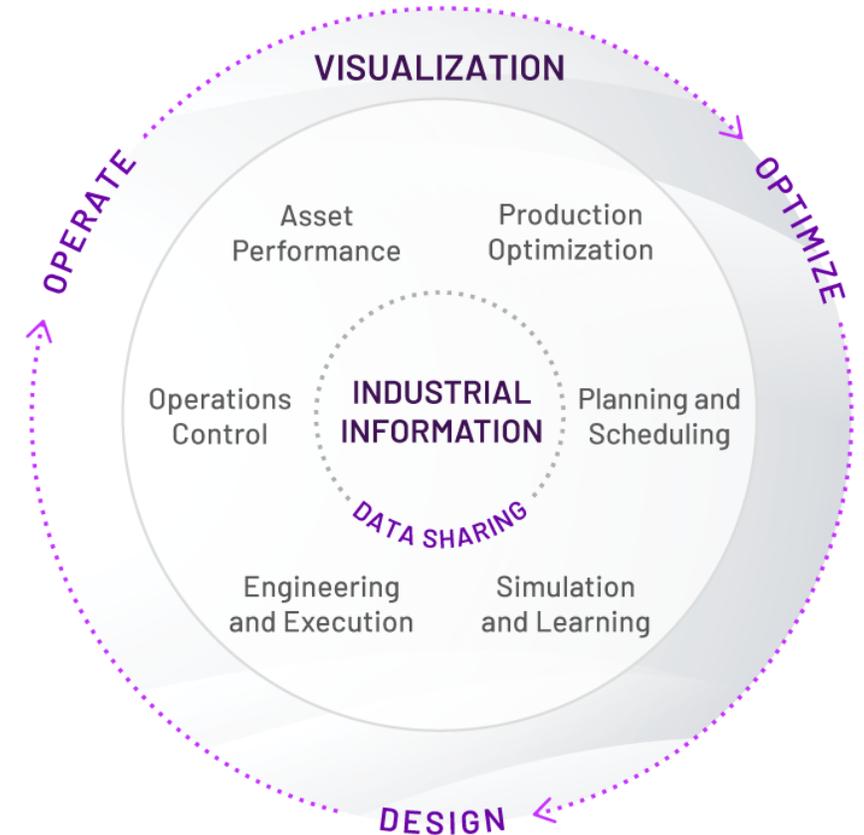
- Optimize Asset Utilization & Efficiency with AVEVA Insight OEE and Guided Analytics

### Wednesday recordings:

- AI to improve efficiency and unplanned downtime at Schneider Electric
- Value Discovery at Nestlé
- Gwinnett County's unified platform to improve performance and optimize water production

### Thursday:

- Enabling your Digital Connected Landscape with AVEVA Insight
- Unlock Your Plant's Data and Enable A Connected Workforce





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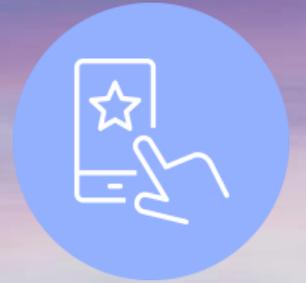
# Questions?

Please wait for the microphone  
State your name and company



# Please remember to...

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



# Thank you

# AVEVA

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The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

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#### ABOUT AVEVA

AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. With operations around the globe, we are headquartered in Cambridge, UK and listed on the London Stock Exchange's FTSE 100.

Learn more at [www.aveva.com](https://www.aveva.com)