

NOVEMBER 2022

Transform data into new insights

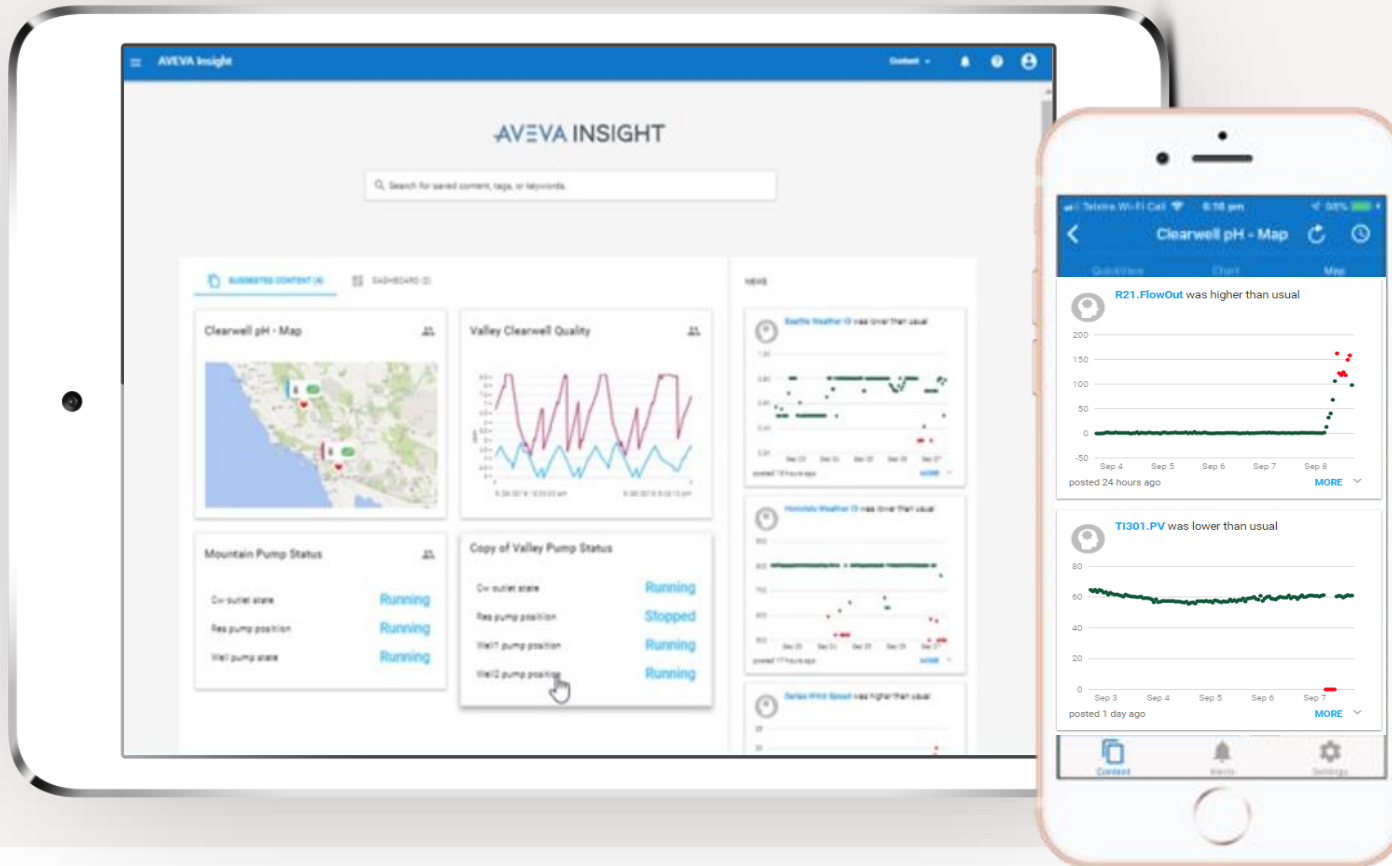
with AVEVA Insight Analytics

Christian-Marc Pouyez, Director APM Advanced Analytics

AVEVA

AVEVA™ Insight

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

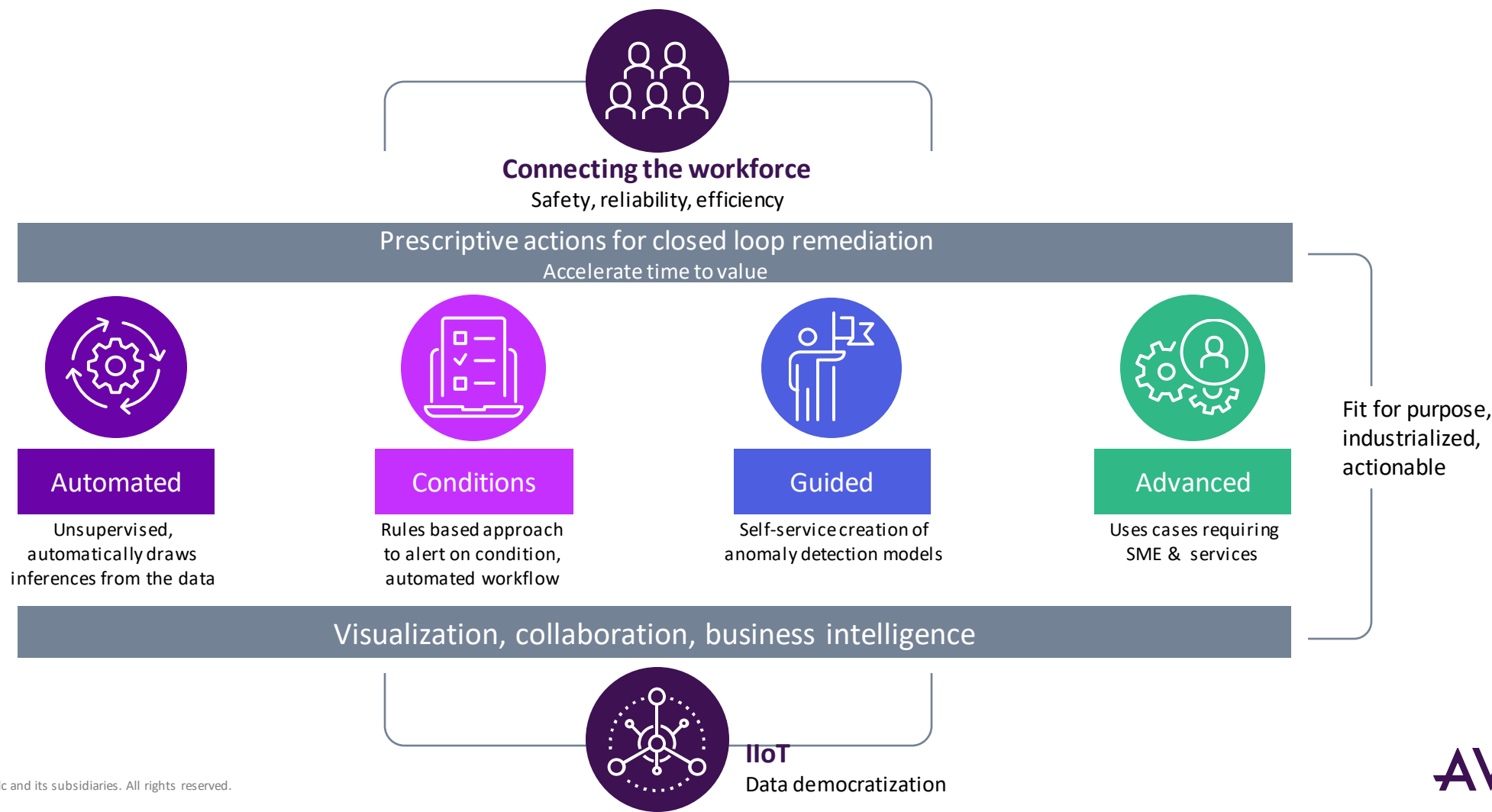


Make operational data accessible and empower your workforce with insights – anywhere, anytime, any device

- 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

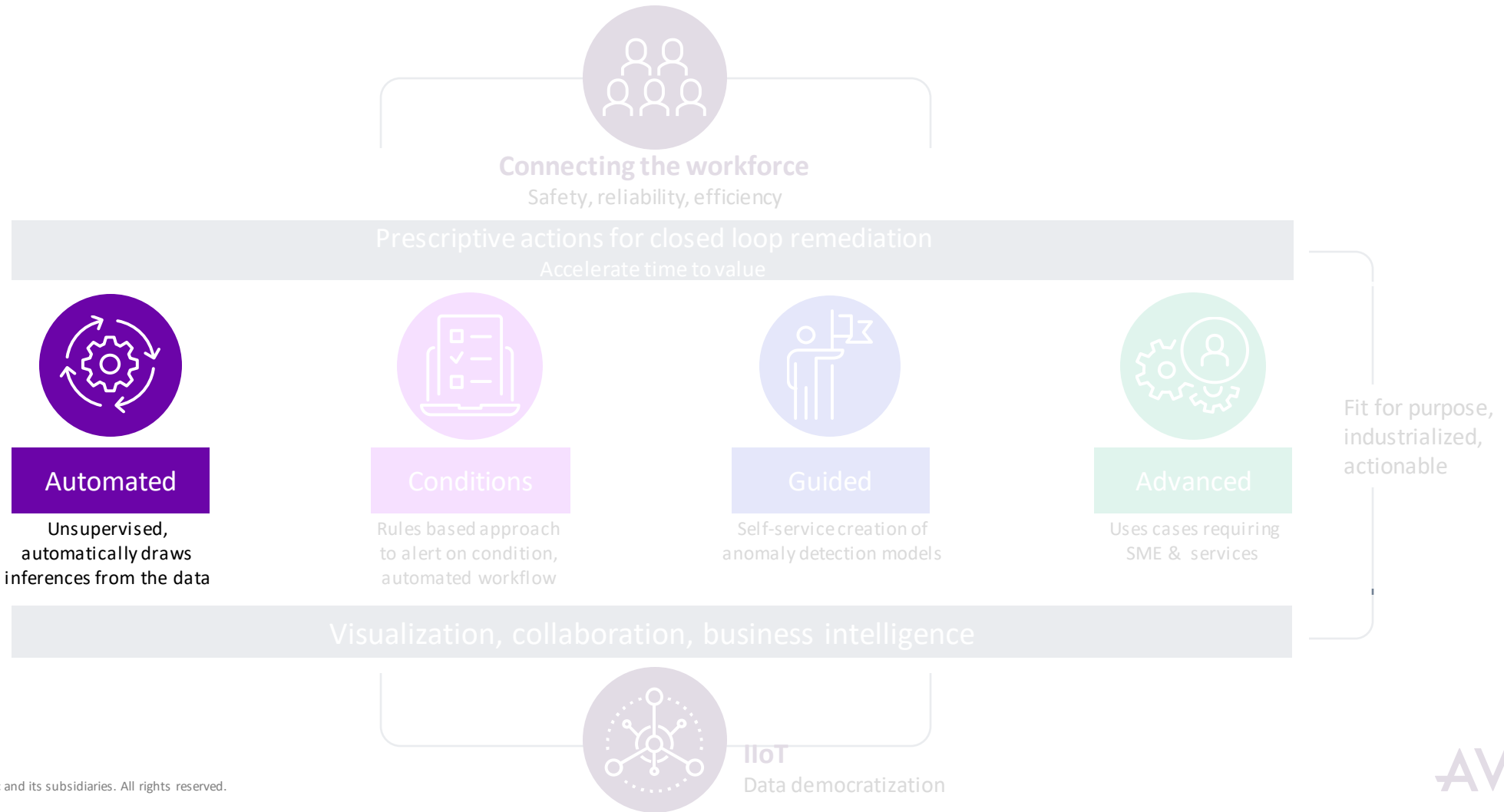
AVEVA Insight

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

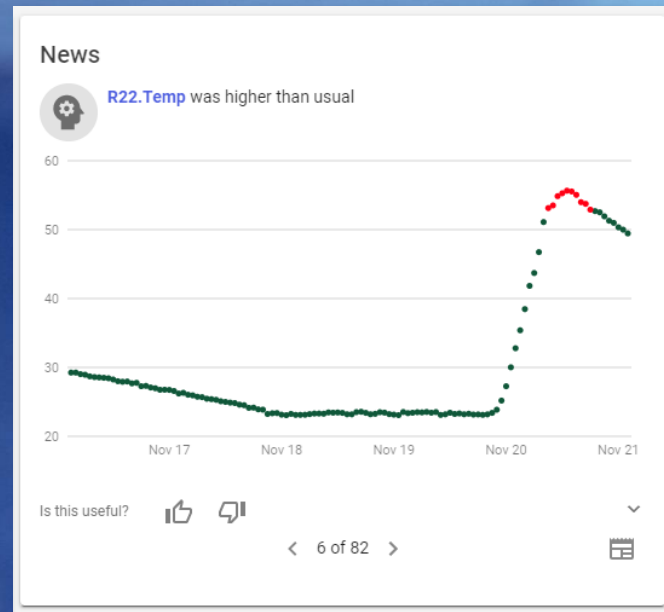
Identify potential issues in day to day processes detecting anomalies through automatic scans.

Unsupervised Anomaly detection

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

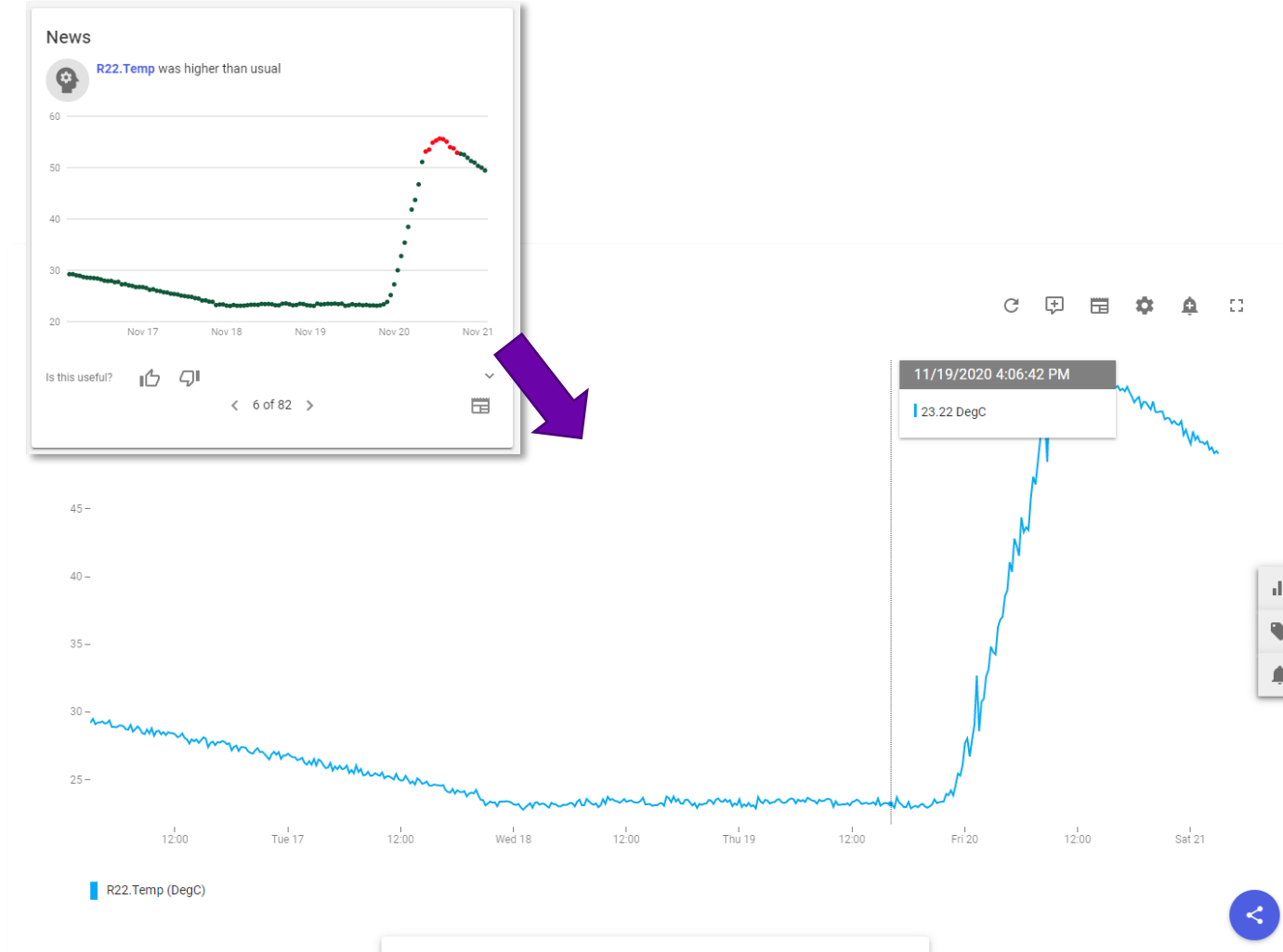
Anomalies are shown in the News Feed of AVEVA Insight

- 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

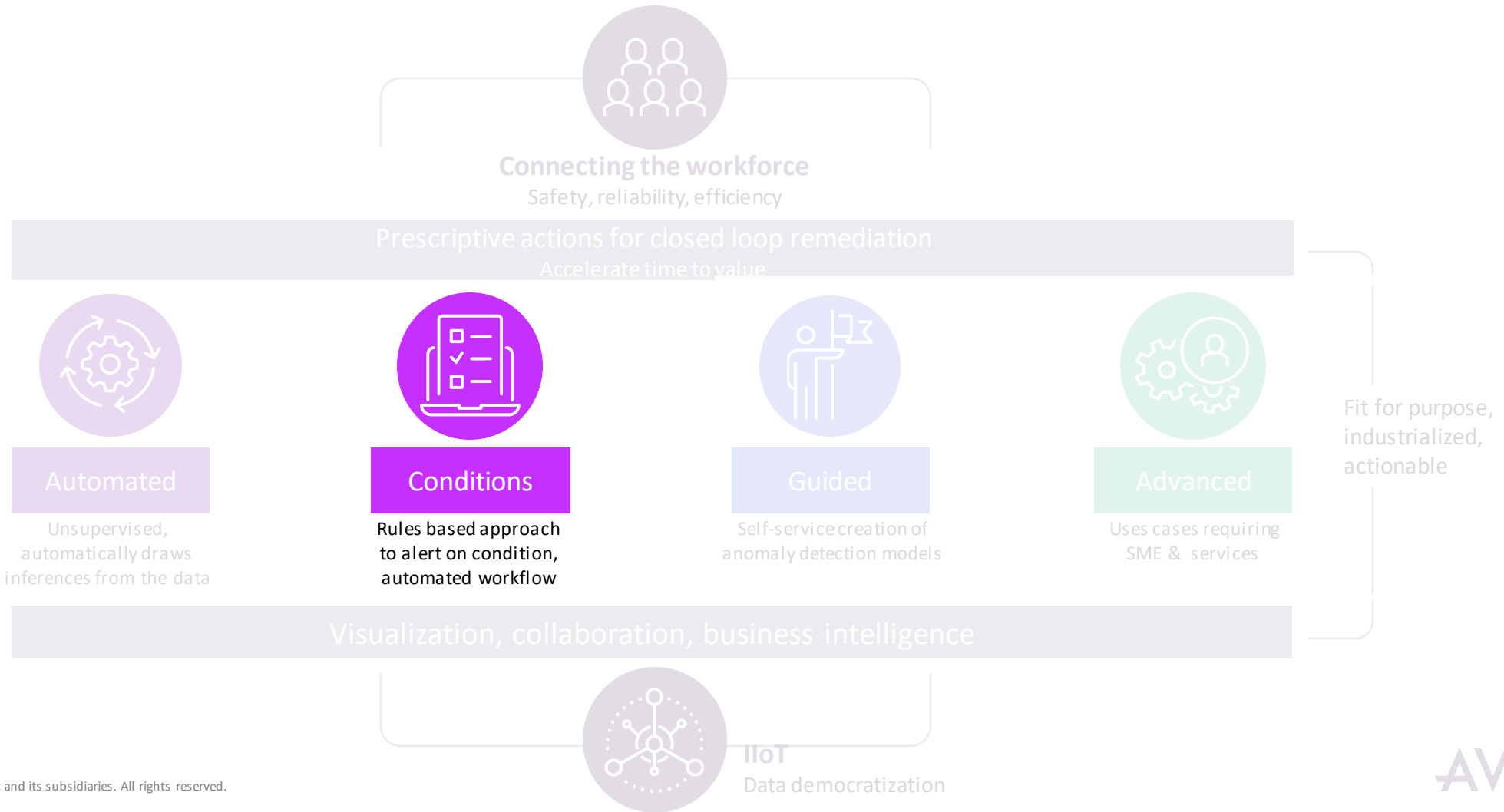
- Users can identify whether news are useful
- Users can drill through to relevant trend

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

Conditions

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

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

4 tag(s) selected

☐ SKIP PRESCRIPTIVE ACTIONS STEP

☒ Prescriptive Actions (Optional)

☒ Alert Actions

☒ Consequences of Failure (Optional)

☒ 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:

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:

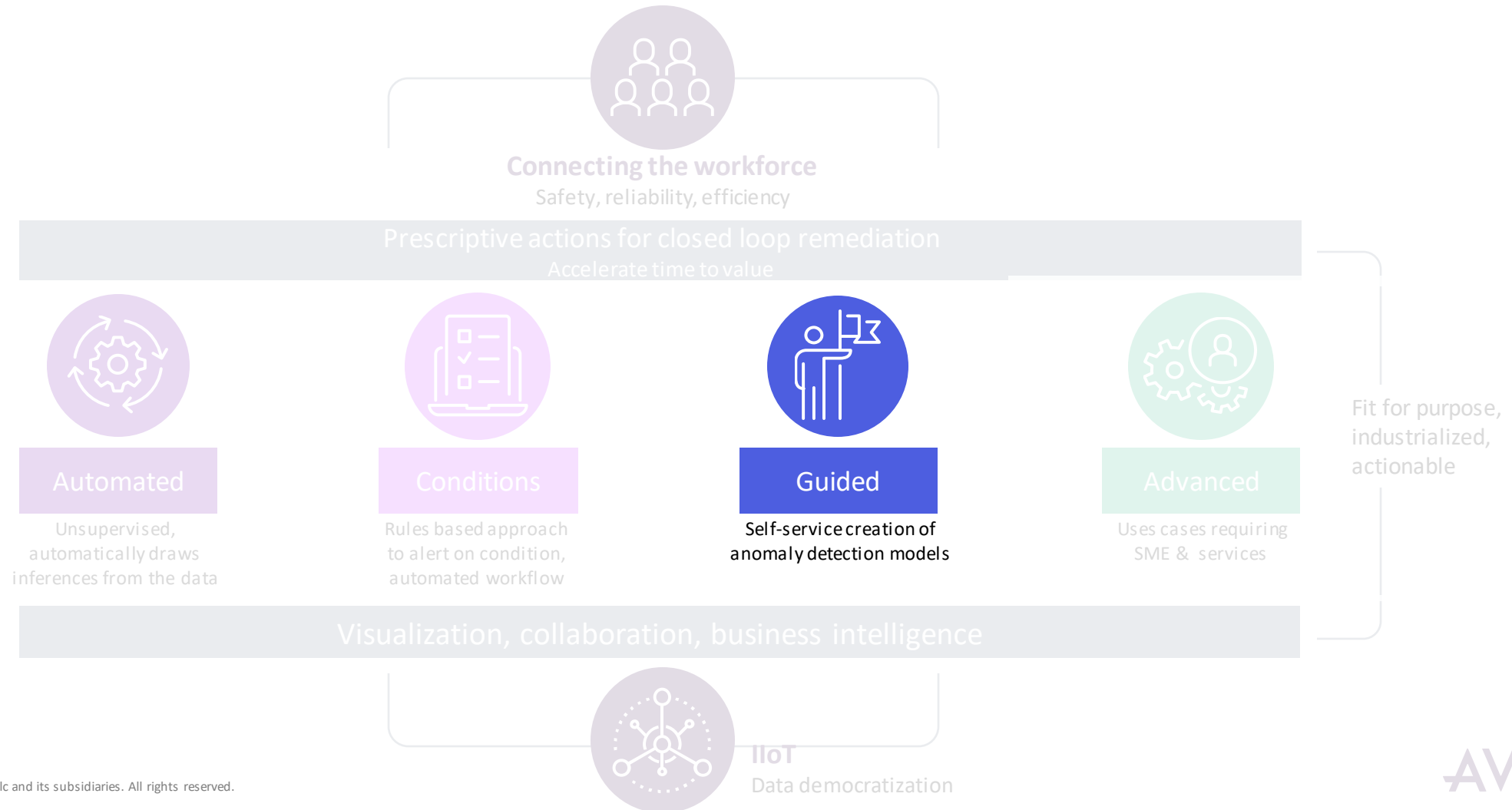
- Prescriptive information from Insight Asset Library
- Send alert notifications via email, Slack
- Create Work Order in EAM system

Identify consequences of failure

- Safety
- Environmental
- Production

Unlock data and experience to drive reliable autonomous plant

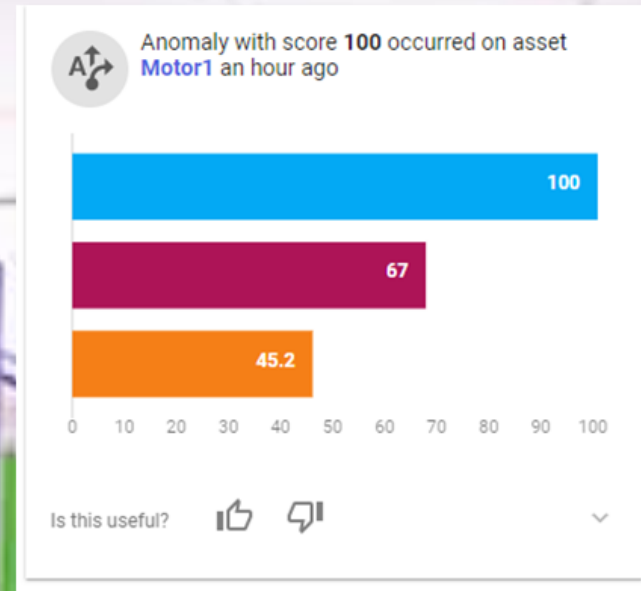
The human experience meets Artificial Intelligence in the cloud



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

The screenshot displays the 'Select Tags' step of the Guided Analytics process. On the left, a list of tags for 'Baytown.MF01P5' is shown, including Power, Pressure, PV, SP, Speed, and State. A search bar is available above the list. A 'NEXT' button is at the bottom of the list. A red box highlights the 'Add Advanced Model' section, which contains three options: 'Add Asset Anomaly Detection Guided Model' (selected), 'Add Process Anomaly Detection Guided Model', and 'Add Advanced Model'. Below this, a bar chart shows an anomaly with a score of 100 on asset 'Motor1' an hour ago. The chart has three bars with scores 100 (blue), 67 (purple), and 45.2 (orange). A 'Is this useful?' feedback prompt is at the bottom.

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
Motor1	100
...	67
...	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

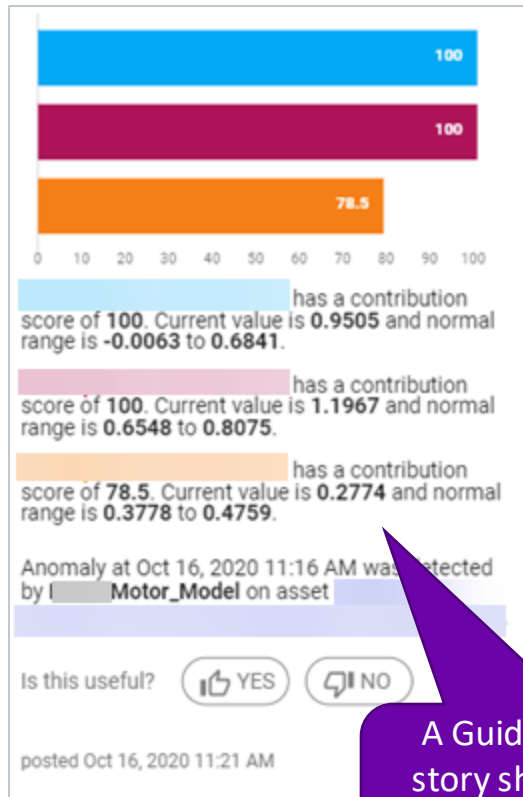
- Identifies top 3 variables contributing to anomaly
- Users can identify whether news are useful
- Users can drill through to relevant trend

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.



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

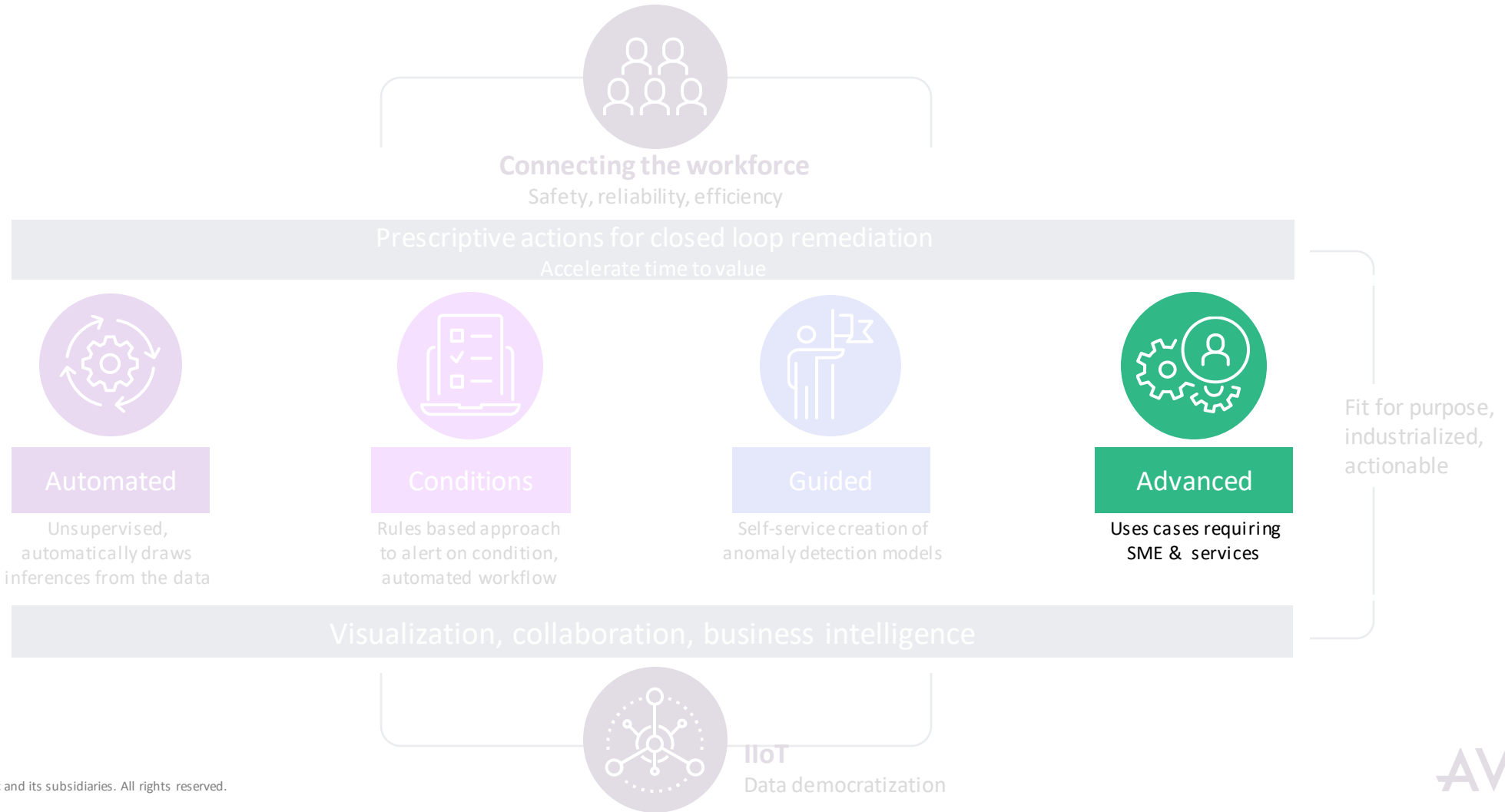


Water & Waste Water

- Pumps
- Motors
- Blowers

AVEVA Insight

The human experience meets Artificial Intelligence in the cloud

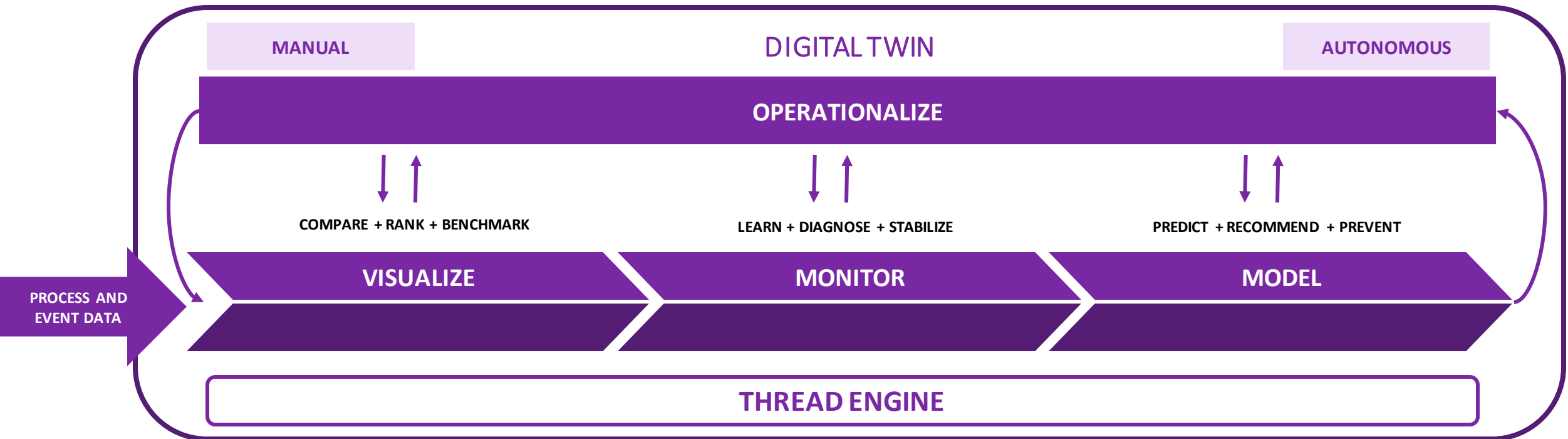


AVEVA Insight Advanced Analytics



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's a blue header with the title 'Add Model' and a close button. Below the header, there are input fields for 'Name*' (containing 'My new model') and 'Description' (containing 'Model description'). To the right of the description field is an 'Asset Actions' dropdown menu. This menu is open, showing options: 'Edit', 'Delete', 'Create Alert', and 'Create Analytics Model'. The 'Create Analytics Model' option is highlighted. Below this menu, there's a list of model templates. The first template, 'Add Advanced Model', is highlighted with a red box. Other templates include 'Add Asset Anomaly Detection Guided Model' and 'Add Process Anomaly Detection Guided Model'. Below the templates, there's a list of specific model types 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, there's a dropdown menu labeled '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?*

Detect Asset Anomalies

Detect anomaly conditions on an asset and determine drivers

Detect Process Anomalies

Detect process anomaly conditions and drivers

Optimize Energy Efficiency

Predict and optimize energy consumption

Optimize Throughput

Predict and optimize asset production rate

Predict Quality

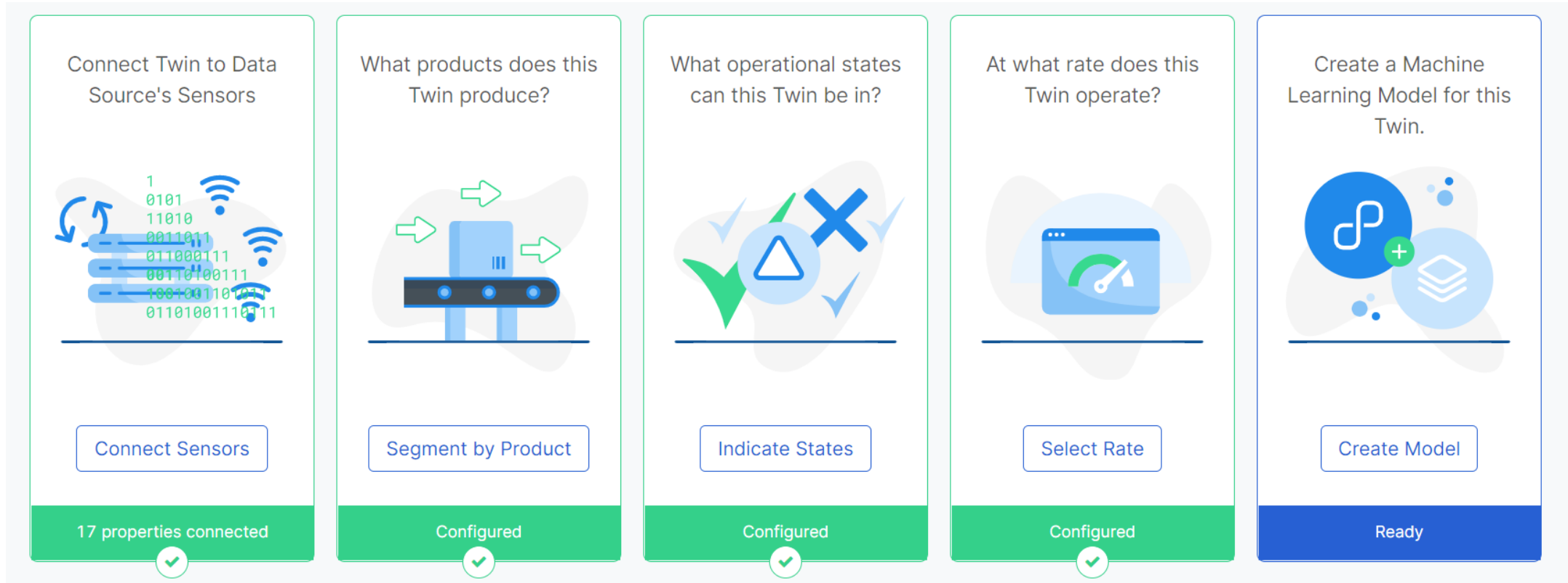
Predict quality parameter based on process data

Predictive Uptime

Predict and provide advanced warning of downtime events

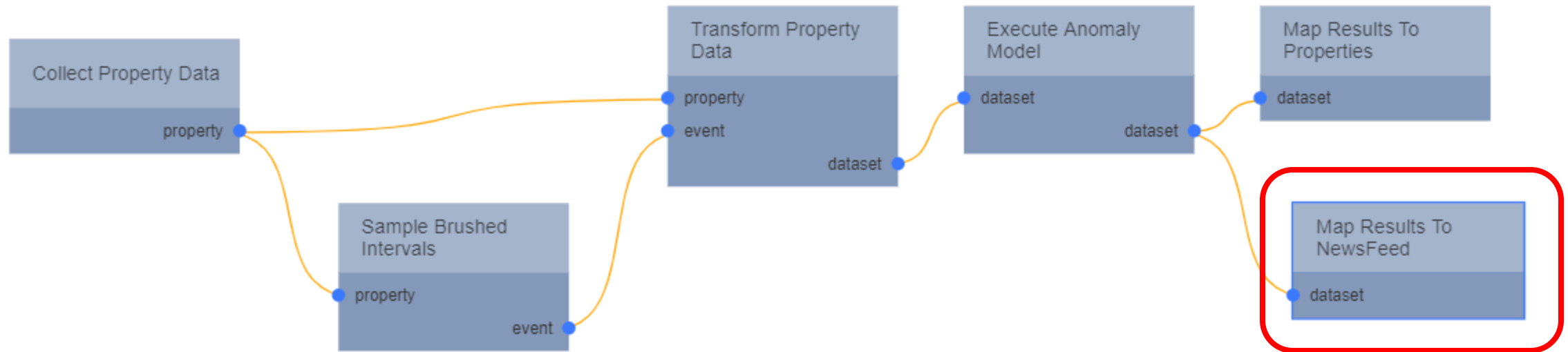
Advanced Analytics Configuration

Guided configuration



Advanced Analytics Configuration

Workflow



The screenshot displays the Model Factory interface, which is used for building and managing machine learning models. The top navigation bar includes the 'Model Factory' label, a 'Predict Backwash' dropdown, and a 'Viewing: Workflow' dropdown. The main workspace shows a complex workflow diagram for a 'Water Purification System / Sand Filter'. The workflow consists of several interconnected steps, each represented by a blue box with a dark blue header and a light blue body. The steps are connected by orange lines, indicating the flow of data and model training. The steps include:


- Collect States**: An event-based step that outputs an 'event' and is marked as 'Completed'.
- Merge Prediction States**: An event-based step that takes an 'event' as input and outputs an 'event', marked as 'Completed'.
- Sample Normal Intervals**: An event-based step that takes an 'event' as input and outputs an 'event', marked as 'Completed'.
- Merge State Statistics**: A step that takes an 'event' and a 'table' as input and outputs a 'dataset', marked as 'Completed'.
- Optimize Features**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Train Boosted Decision Tree**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Train Neural Network**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Train Decision Jungle**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Train Multilayer Random Forest**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Train Multilayer Neural Network**: A dataset-based step that takes a 'dataset' as input and outputs a 'dataset', marked as 'Completed'.
- Select Predict Event Model**: A step that takes a '[dataset]' as input and outputs a 'trigger', marked as 'Completed'.
- Sync Model Endpoint**: A step that takes a 'trigger' as input and outputs a 'trigger', marked as 'Completed'.


The workflow is organized into two main paths. The top path starts with 'Collect States' and flows through 'Merge Prediction States', 'Sample Normal Intervals', 'Merge State Statistics', 'Optimize Features', and then branches into four parallel training steps: 'Train Boosted Decision Tree', 'Train Neural Network', 'Train Decision Jungle', and 'Train Multilayer Random Forest'. The bottom path starts with 'Collect Property Data' and flows through 'Summarize Property Events' and 'Merge State Statistics'. The output of the training steps is then used in the 'Select Predict Event Model' step, which leads to the 'Sync Model Endpoint' step. The interface also includes a sidebar on the left with navigation options like 'LaunchPad', 'Monitor', 'Twins', 'Analysis', 'Users', 'Event Type', 'Threads', and 'Models'. At the bottom left, there is a small thumbnail of the workflow diagram. At the bottom right, the text 'Water Purification System / Sand Filter' is displayed.


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?   v

< 5 of 212 > 

Advanced Analytics Models

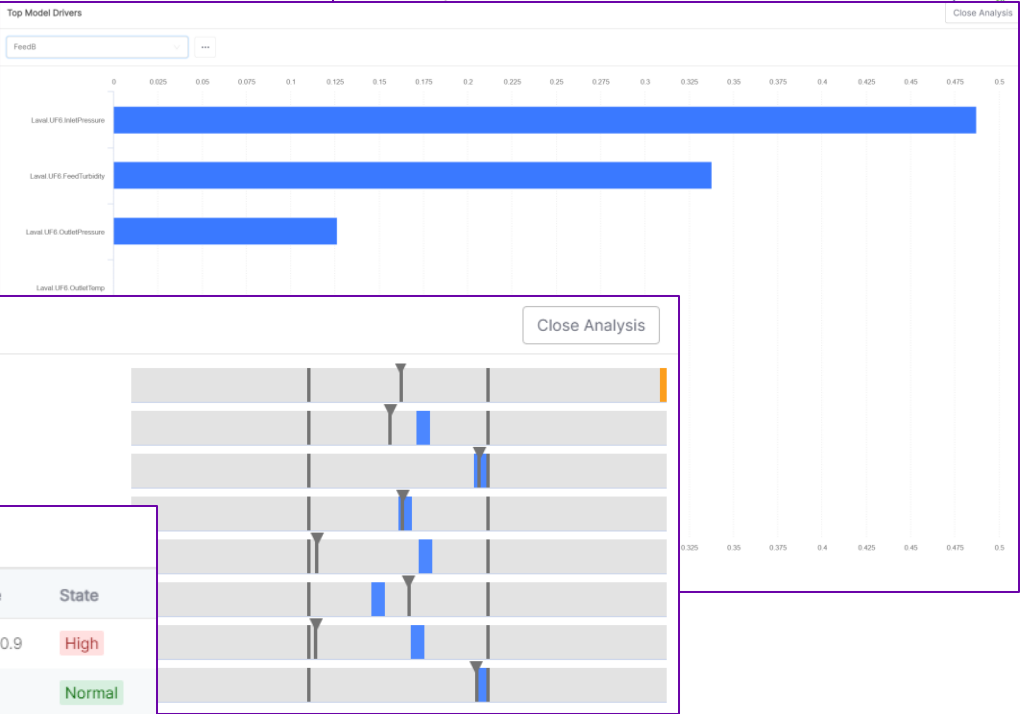
Model Name	Model Type	Status
 UF6 Predictive Quality	Predict Quality	Completed
 Predictive Quality Example for TSC Tr...	Predict Quality	Completed

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



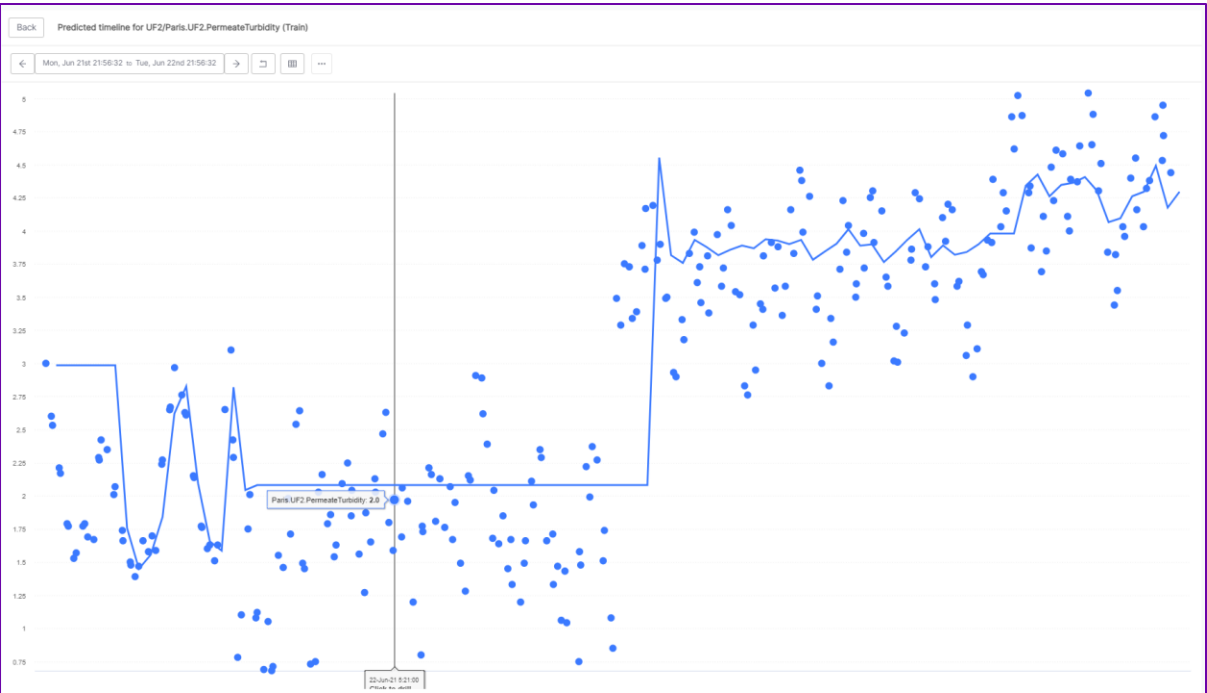
Advanced Analytics

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

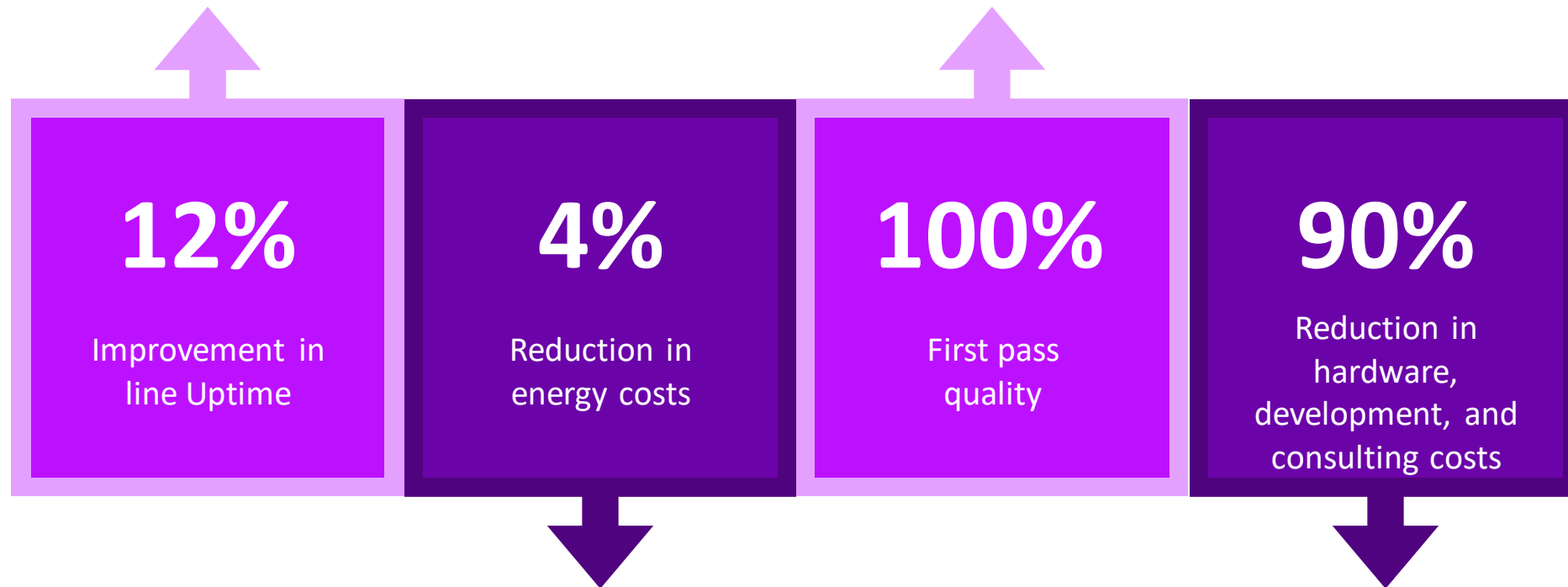


Power

- 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:

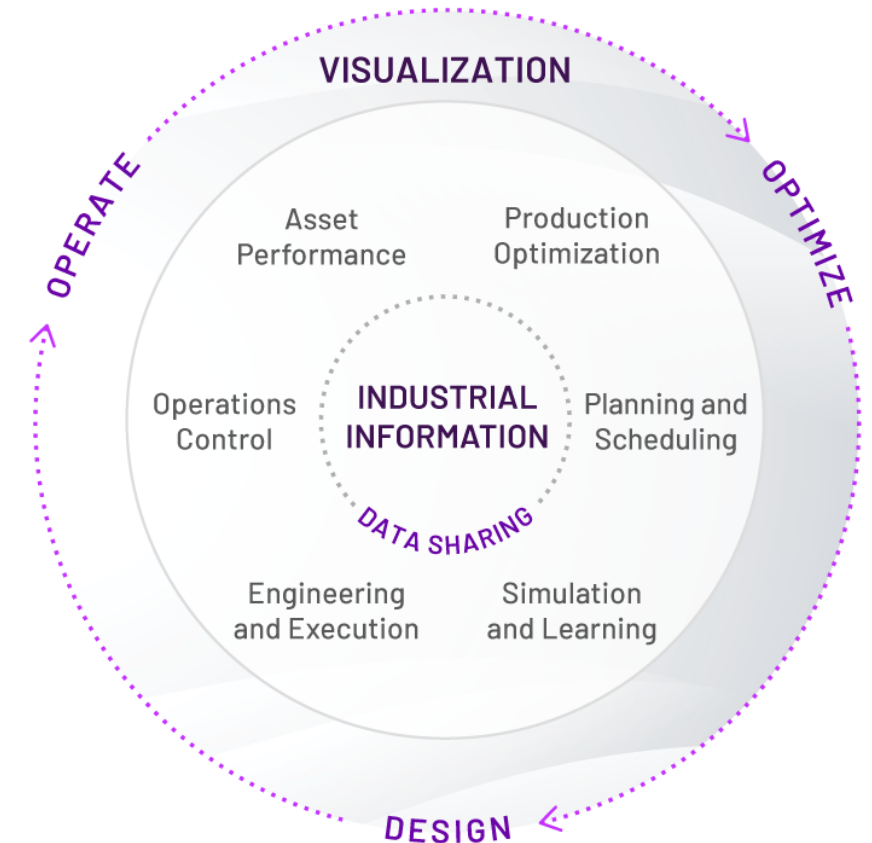
- Optimize Asset Utilization & Efficiency with AVEVA Insight OEE and Guided Analytics

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