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Advanced condition monitoring of critical assets with the AVEVA™ PI System™

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AVEVA



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Advanced condition monitoring of critical assets with the AVEVA™

PI System™

Enhancing Reliability and Efficiency

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What does MONDI do?



Mondi is a global leader in packaging and paper



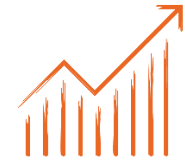
22,000
employees



More than 100,000
solutions for our
customers



Group offices in
London and Vienna



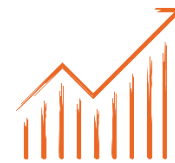
Premium listing on the
London Stock Exchange
for Mondi plc



Over 100 operations
across more than
30 countries



2.4M hectares of
forest managed



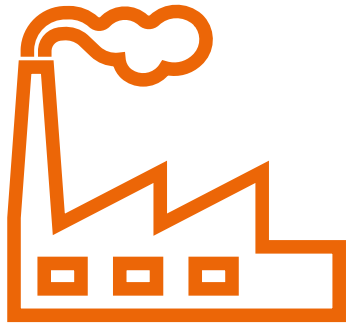
Secondary listing
on the JSE Limited for
Mondi plc



FTSE4Good
Index Series,
JSE's Socially Responsible
Investment Index

Mondi 2030 sustainability commitments

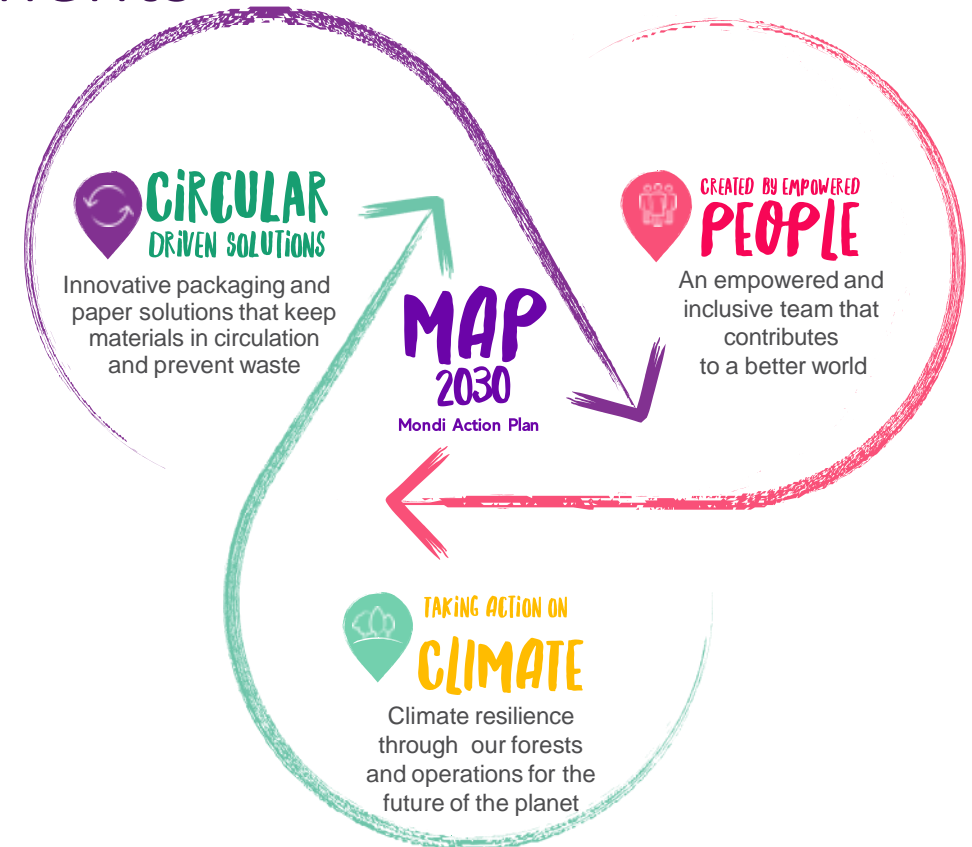
Integration along the value chain



Efficient Production

- Use resources wisely
- Prevent environmental degradation
- Support a circular economy

We are **committed to reducing water use** and increase water recycling, as well as to finding alternative **solutions for waste by recycling** or reuse.



Built on Responsible Business Practices

Human Rights | Communities | Procurement | Environmental Performance

For more details refer to <https://www.mondigroup.com/sustainability/map2030-framework/>

AVEVA Products in use

Unleashing Potential with AVEVA PI System's Asset Framework and AVEVA PI Vision™

Monitoring

Asset Framework

- Templates according Mondi standards
- Notifications

AVEVA PI Vision

- Custom symbols
- Manual inputs and comments



Challenge – Asset Monitoring

Beyond Static Limits and Manufacturer Norms

What has been tried?

- Online calculation of operating points in relation to the **characteristic curve** provided by supplier
- Monitoring and alarming based on **static limits**



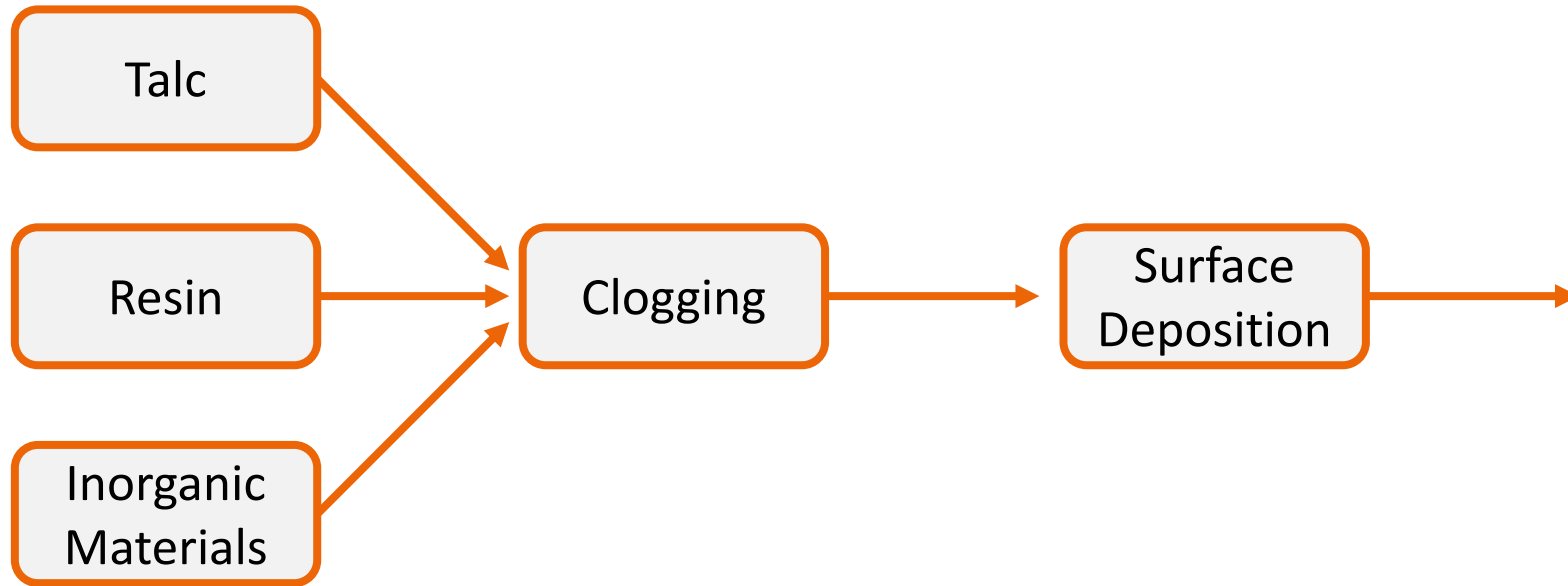
Why didn't it work!

- Characteristic curve **are outdated** after years of operation (i.e. replacement of mechanical components)
- Static limits are **not sufficient** for the diversity of operating states



Challenge – Heat Exchangers

Recognize plugging based on asset analytics



Project Overview

Identifying issues through vigilant monitoring

Challenge

Traditional monitoring strategies have proven **insufficient**, leaving critical gaps in our ability to understand and respond to highly dynamic operating conditions.

Solution

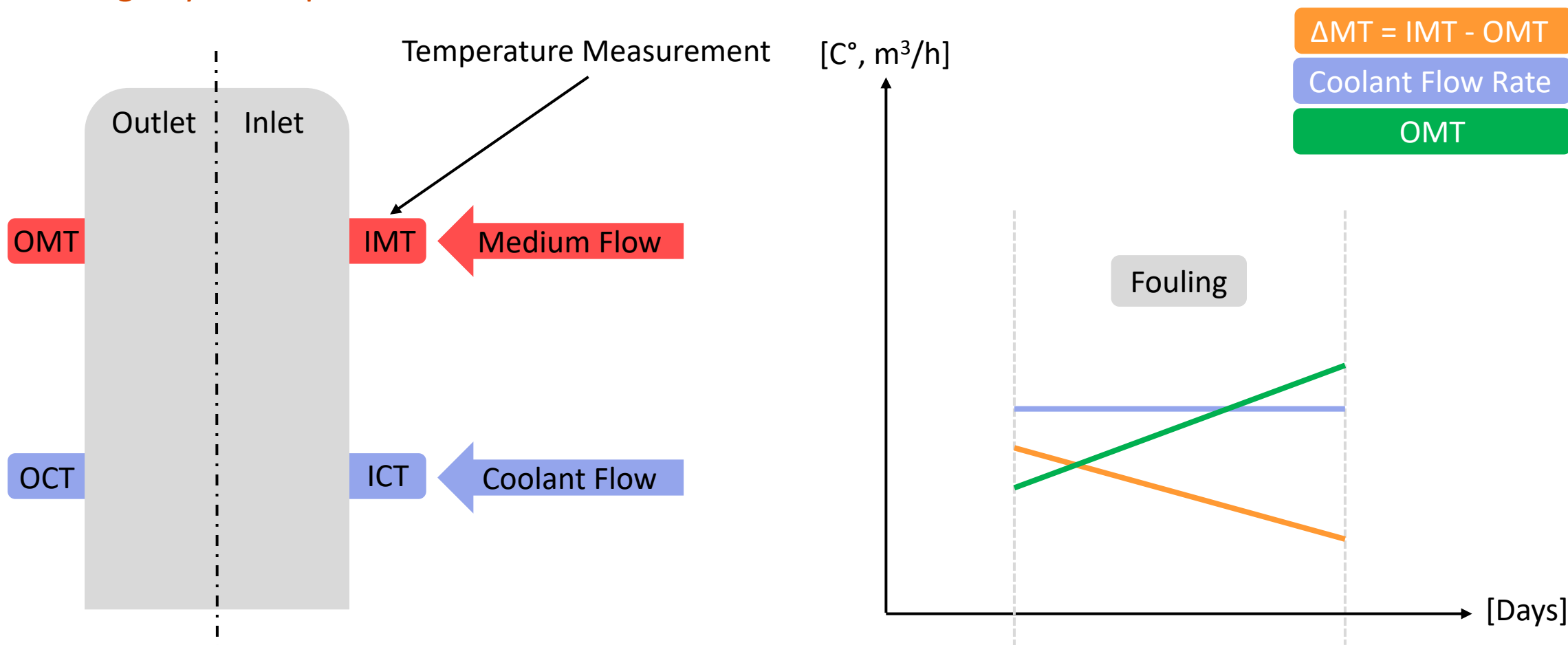
Utilizing **AVEVA PI System** technology, including AVEVA PI Server asset framework and AVEVA PI Vision as well as **Visplore** analytics, to **monitor asset health** and assist engineers in their decision-making.

Benefits

Identifying issues **early** to **prevent unplanned downtimes**, thereby reducing the workload of maintenance and reliability engineers as well as achieving **savings in energy and freshwater** consumption.

Fundamental Concept - Heat Exchanger Monitoring

Unveiling Key Concepts



OMT = Outlet Medium Temperature; OCT = Outlet Coolant Temperature
IMT = Inlet Medium Temperature; ICT = Inlet Coolant Temperature

Anomaly Detection Workflow

Seamless Integration of New Workflow Paradigm

01



Anomaly Definition

Reliability engineer **defines** what an **anomaly** is.

02



Online Analytics

Analytics in Visplore, online using Python API.

03



Anomaly Notification

Automatic Email **notifications** for anomalous conditions.

04



AVEVA PI Vision Monitoring

Check and understand the current **situation**.

05



RCFA Visplore

Use **Visplore** to make a deep-dive data analysis and start **RCFA**.

Anomaly Detection

01



Setting up detection algorithm with subject-matter expertise (SME)

Goal: Early detection of maintenance need

Algorithm: Diverging correlations of coolant flow rate and medium temperature difference

Challenges:

- Filter time periods (e.g. maintenance periods)
- Determine correlation coefficient range
- Distinction of operating conditions
- Validation of detection results

Solution: Algorithm definition using Visplore

- The integrated visual analytics workflow of Visplore yielded an SME-validated solution within very few hours.



Online Analytics

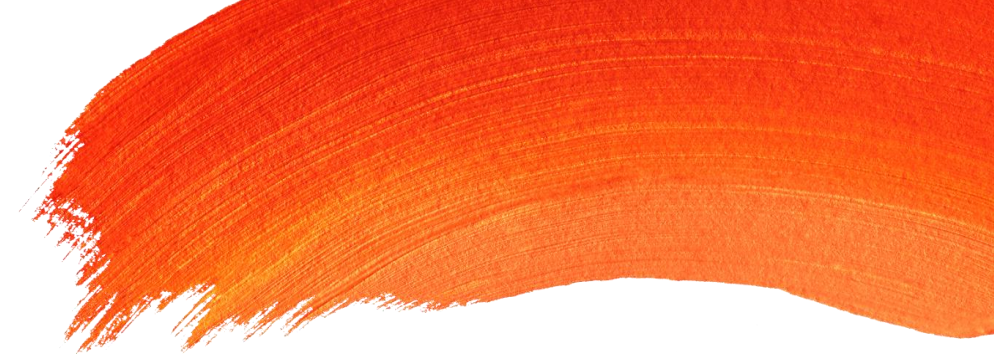
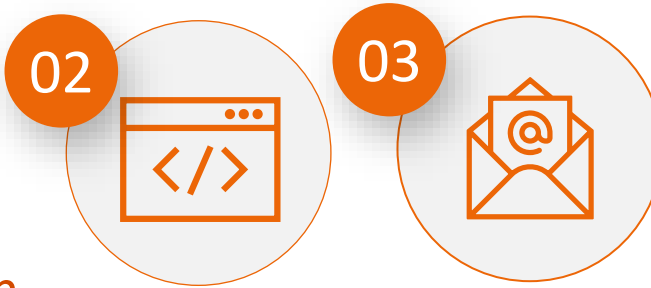
Flexible automatization via Python

Detection

- Negative correlation of smoothed PI tags "*coolant flow rate*" and difference of "*medium temperature at inlet*" and "*medium temperature at outlet*" exceeds threshold
- Automatically excluding periods of shutdowns, maintenance, very high process variability

Online

- Evaluated every 8 hours
- Send notifications to reliability engineers
- Write detection results back to AVEVA PI System
- Implemented based on Python, Visplore API and AVEVA PI Web API





AVEVA PI Vision Monitoring

Real-Time Asset Oversight

- Overview of all assets
- Custom Hit-Rate Symbol
- Actual state of asset

Heat Exchanger Monitoring



FT_Filtratkuehler

[Info](#)



PM6_Klarfiltratkuehler

[Info](#)



PM8_Dichtwasserkuehler

[Info](#)

Name	Beschreibung	Einheiten	Trend
PM8_Dichtwasserkuehler CoolantFlowRate	FW DW-KUEHLER	m3/h	
PM8_Dichtwasserkuehler InletCoolantTemperature	Einl FW DW-Kuehler	deg C	
PM8_Dichtwasserkuehler OutletCoolantTemperature	Ausl FW DW-Kuehler	deg C	
PM8_Dichtwasserkuehler InletMediumTemperature	EINLAUF DW DW KUEHLE	deg C	
PM8_Dichtwasserkuehler MediumFlowRate	DW ZU DW-KUEHLER	L/min	
PM8_Dichtwasserkuehler OutletMediumTemperature	DW KUEHLUNG VAKPPE	deg C	

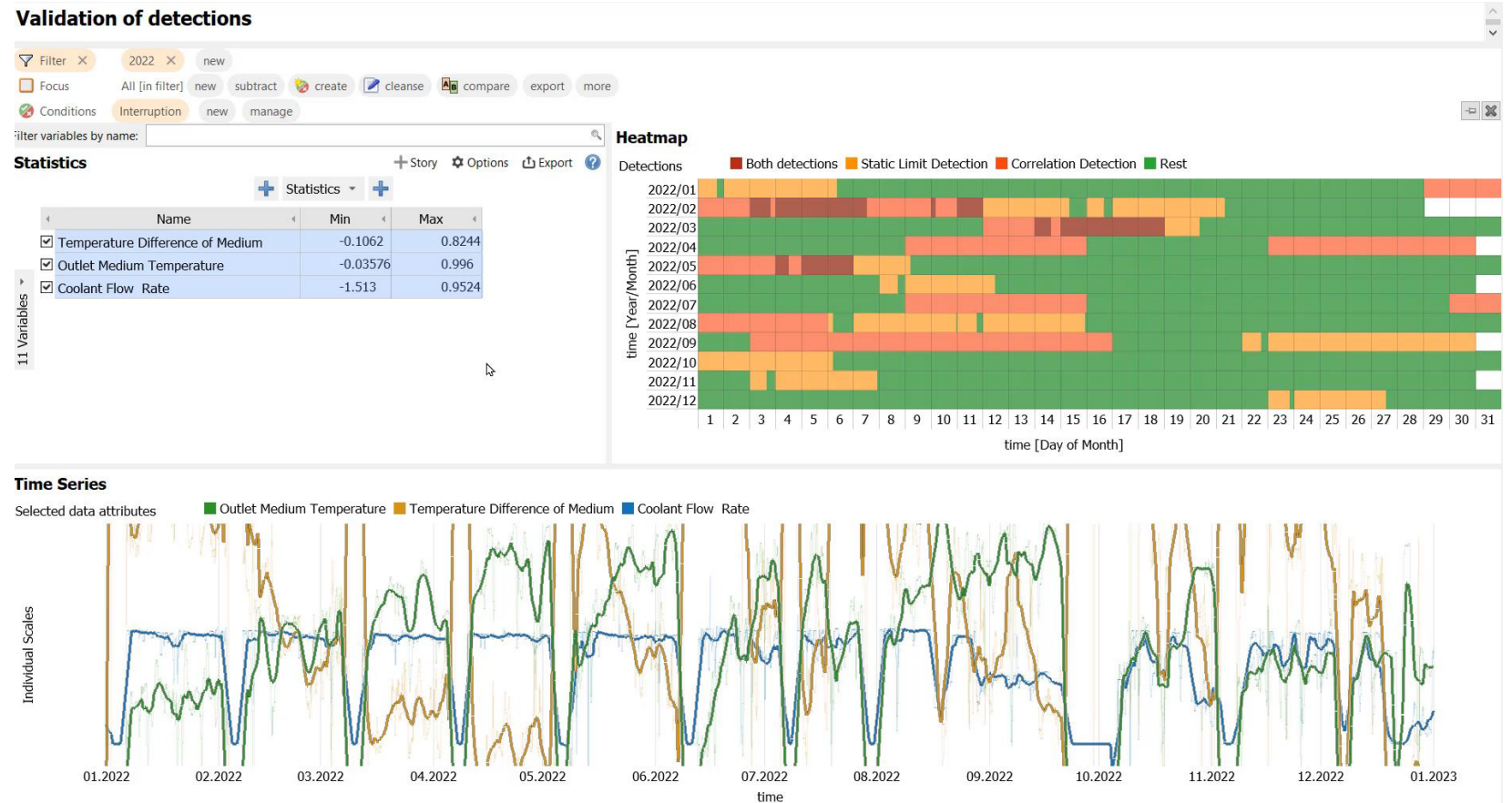
- Detailed view of asset
- Visualization of KPI's
- Information about operating conditions
- Additional asset information



Root-Cause Failure Analysis with Visplore

Standardized workflows for in-depth investigation

- Analytics and statistics
- Comparison of patterns over long time
- Contextualization by process states
- Filtering irrelevant data



Impact Savings

Pioneering Time, Energy, and Water Savings



Time

Time savings in the **maintenance** area. Technicians **do not** have to **check manually**.



Energy

Energy savings achieved by optimizing asset **utilization** within the **optimal operating range**.



Freshwater

Savings in freshwater through the **reduction of soiling's**.

Conclusion

Reduction of downtime, energy, fresh water, and workload by advanced condition monitoring

Success factor: Use each technology for its strengths

- **AVEVA PI and PI AF:** Reliable data source and management
- **AVEVA PI Vision:** Efficient visual monitoring
- **Visplore:** Robust detection, RCFA by SMEs
- **Python:** Flexible automatization

Success Strategy: Bring data and subject-matter expertise together

Outlook: Continued adoption of advanced condition monitoring for other assets and across plants



Predicting the future is difficult, but
shaping it is within reach through
vigilant monitoring.

AVEVA



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AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

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. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com