



# PAVING THE WAY TO AUTONOMY

THE DIGITAL TRANSFORMATION OF NONWOVEN MANUFACTURING

**ANDRITZ**

# ANDRITZ WINS 2024 MICROSOFT INTELLIGENT MANUFACTURING AWARD



Our cutting-edge digital solutions empower autonomous operation of pulp mills



**Winner in the category Disrupt!**

Case: ANDRITZ: Paving the way for autonomous pulp mills

Disrupt category honors

- Digital transformation of the industrial value chain.
- The potential of solutions to fundamentally change the value chains in a company or industry.



MICROSOFT  
**INTELLIGENT  
MANUFACTURING  
AWARD 2024**

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Microsoft





**01**

**WHY THIS MATTERS ?**

# WHAT KEEPS NONWOVEN PRODUCERS AWAKE AT NIGHT?



## Optimize Energy & Fiber Use

Focus on reducing energy consumption and waste.



## Enhance Traceability

Improve data analytics and production traceability for better decision-making



## Implement Effective Maintenance Strategies

Reduce downtime and maintenance cost



## Improve Operator Performance

Enhance training to boost performance and retention. The skills shortage is a major concern for business leaders
















- Environmental Regulations
- Costs/Profits
- Safety
- Reliability
- People/skills Issues
- Competitive pressures

# TURNING OPERATIONAL PAIN POINTS INTO PERFORMANCE GAINS



From digitalizing the operator to digitalizing the entire plant, aiming for full plant autonomy

PILLARS	 <b>PROCESS PERFORMANCE</b>			 <b>ASSET RELIABILITY</b>		 <b>OPERATOR EMPOWERMENT</b>	
	 Production-rate  Quality  Variable costs  Sustainability			 Availability  Maintenance costs  Sustainability		 Productivity  Transparency & predictability  Health & Safety	
MEASURABLE VALUE	1-6%	2-15%	5-25%	10-20%	5-15%	30-95%	5-25%
	Production increase	Cost reduction	Quality losses reduction	Mill availability Increase	Maintenance cost reduction	Operator actions reduction	Productivity increase
	2-8%	1-7%	1-9%				
	Reduction in emissions	Reduction in water usage	Increase energy efficiency				

# WHAT DOES AUTONOMY REALLY MEAN?



Make decisions  
independently



React to  
previously  
unseen events



No previous  
programming

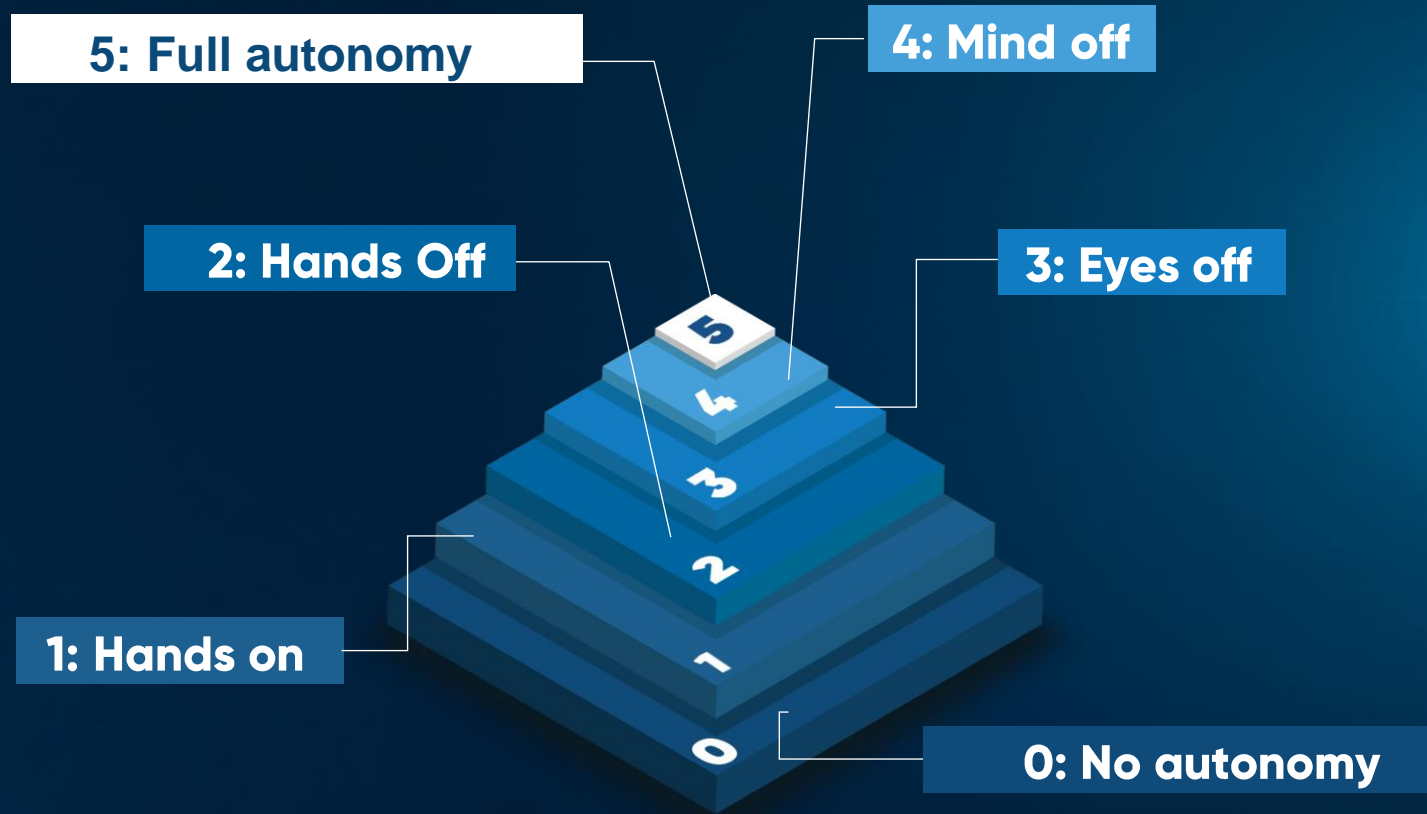
*Autonomy is the ability to **adapt to changing environmental conditions** and **unforeseen situations**, to act **without human intervention***



# BUILDING THE AUTONOMOUS MILL – ONE LEVEL AT A TIME



The ANDRITZ definition of levels of autonomy is based on the ARC Autonomous Operations Maturity Model.



# HOW TO MEET THE AUTONOMY TARGET?



PILLARS



**Process Performance**



**Asset Reliability**



**Operator Empowerment**

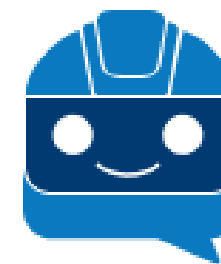
SOLUTIONS



**Advance Control Expert ACE™**



**Risk-Based Management (RBM)**



**Metris Copilot**



**03**

**ENABLING  
TECHNOLOGIES FOR  
PROCESS PERFORMANCE  
AUTONOMY**

# PROCESS PERFORMANCE

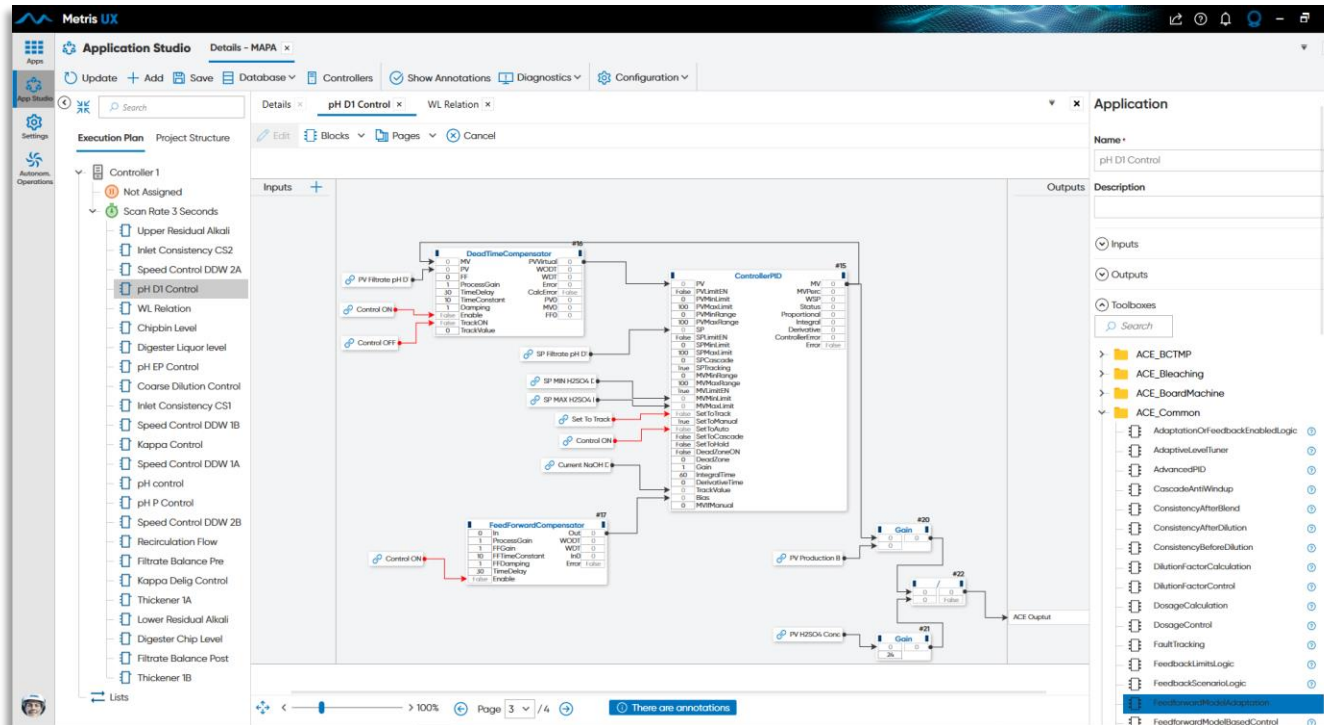


A solution that merges process expert knowledge with control command

- Precise, reliable and optimized process control
- Automatically adapts to changing process dynamics, production demands, and equipment behaviour



## Advance Control Expert ACE™



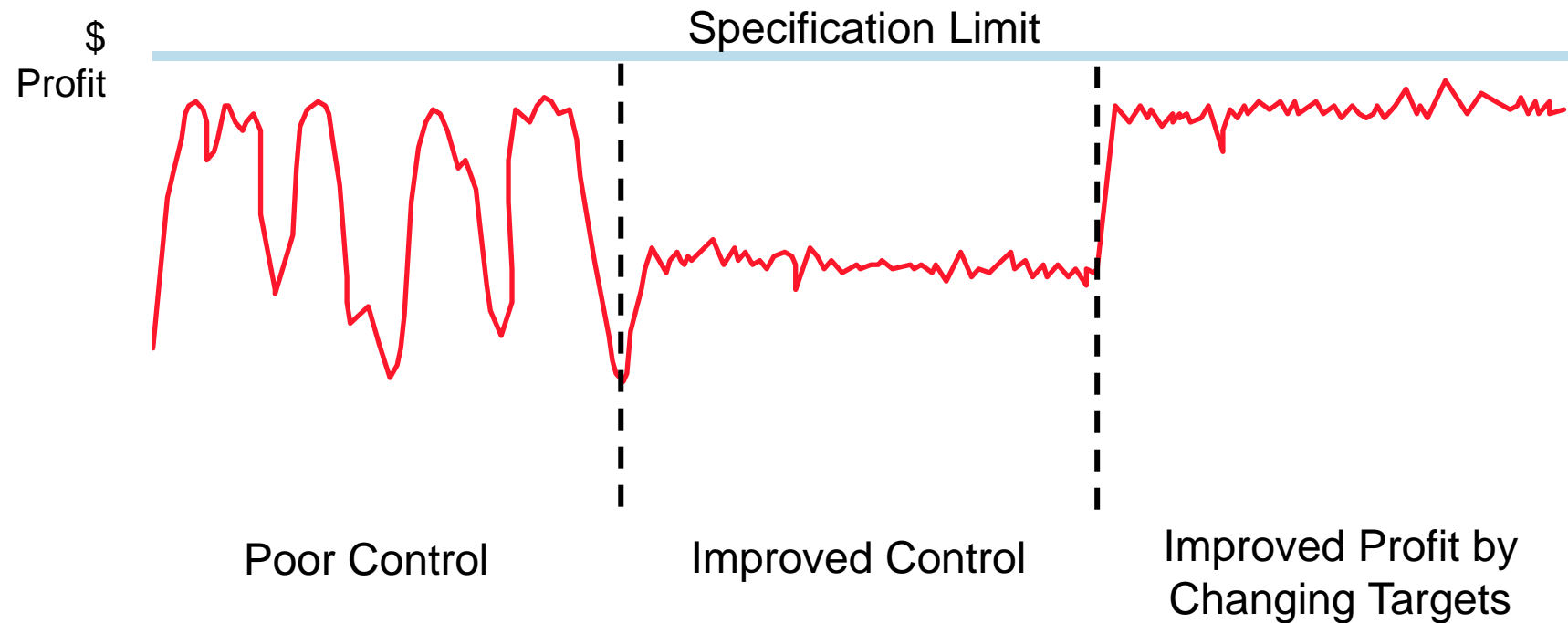
### Benefits

- Personal process expert available 24/7
- Decreases operator mistakes and reduces shift variations
- Improves production efficiency, stability, and resource consumption

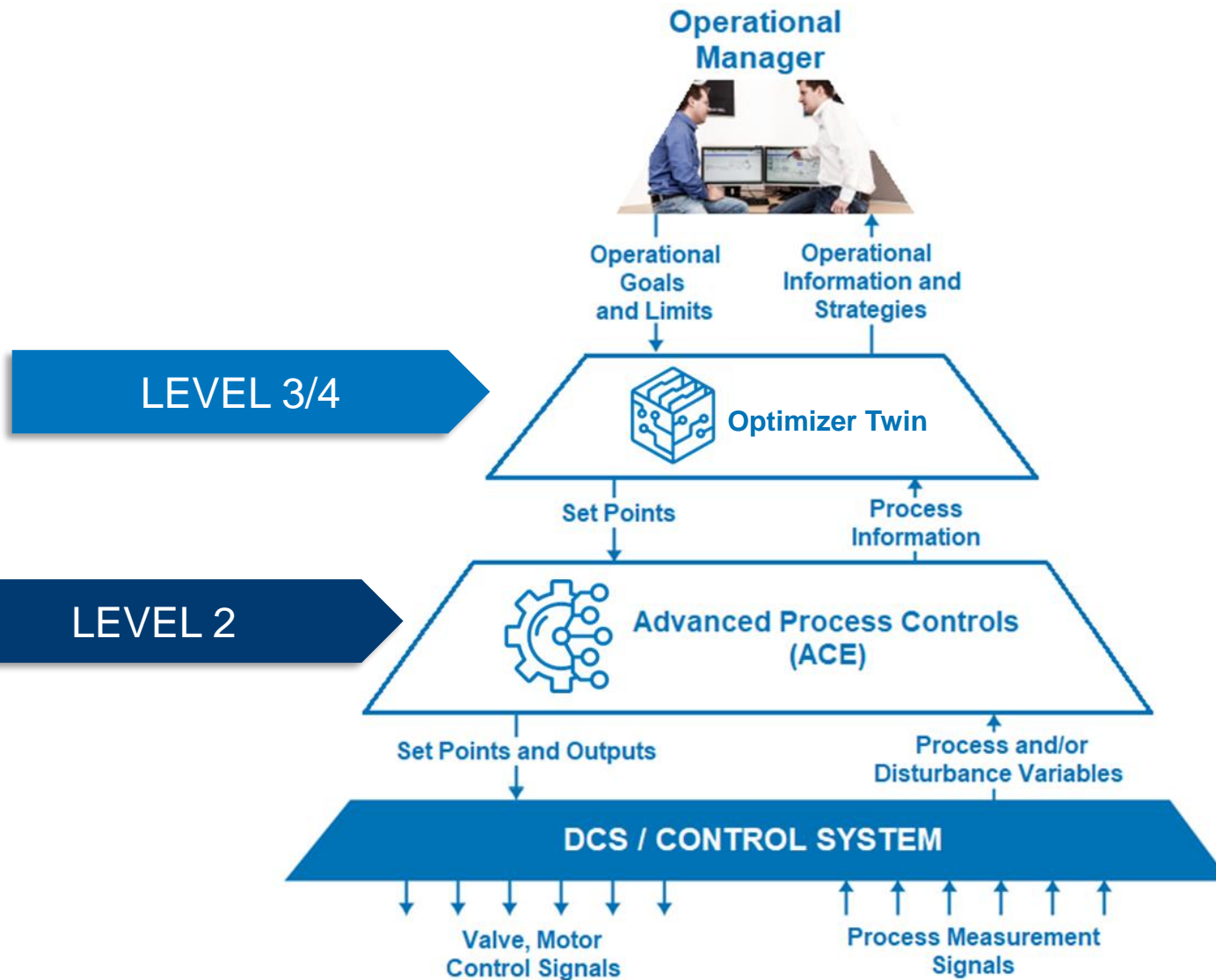
# PROCESS PERFORMANCE



**APC Improves Process Stability and pushes the process to the most profitable operating point**



# PROCESS PERFORMANCE : OPTIMIZER TWIN



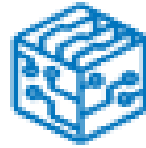
## Benefits

- A digital replica of your plant that illustrates its behaviour.
- Facilitates anomaly detection.
- Allows experimentation with various scenarios to optimize operations.
- It integrates with Advanced Process Controls (ACE)

# PROCESS PERFORMANCE



Autonomous operation  
is a **step-by-step**  
journey



It enables **process**  
**anomaly detection** and  
**best way to react**



Combination of **process experts'**  
**know-how** and **digital tools** to  
continuously maintain production  
at its **most efficient point**

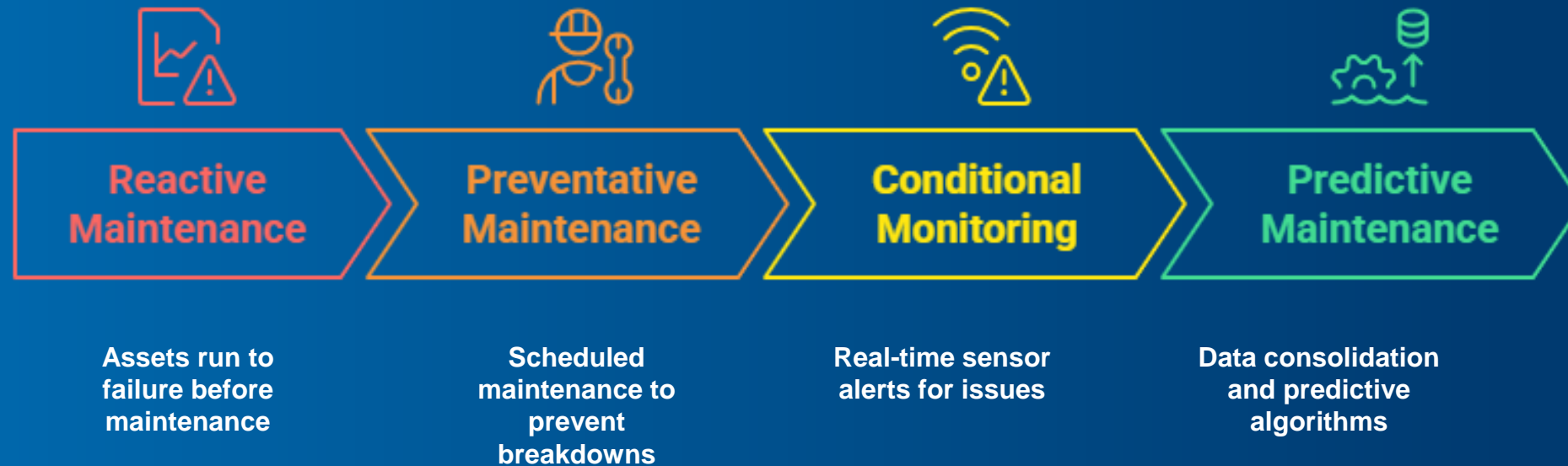


**04**

## **ASSET RELIABILITY / RISK MANAGEMENT**

# ASSET RELIABILITY: PREDICT FAILURES BEFORE THEY HAPPEN

Transition from Lagging to Leading Maintenance Practices



# ASSET RELIABILITY

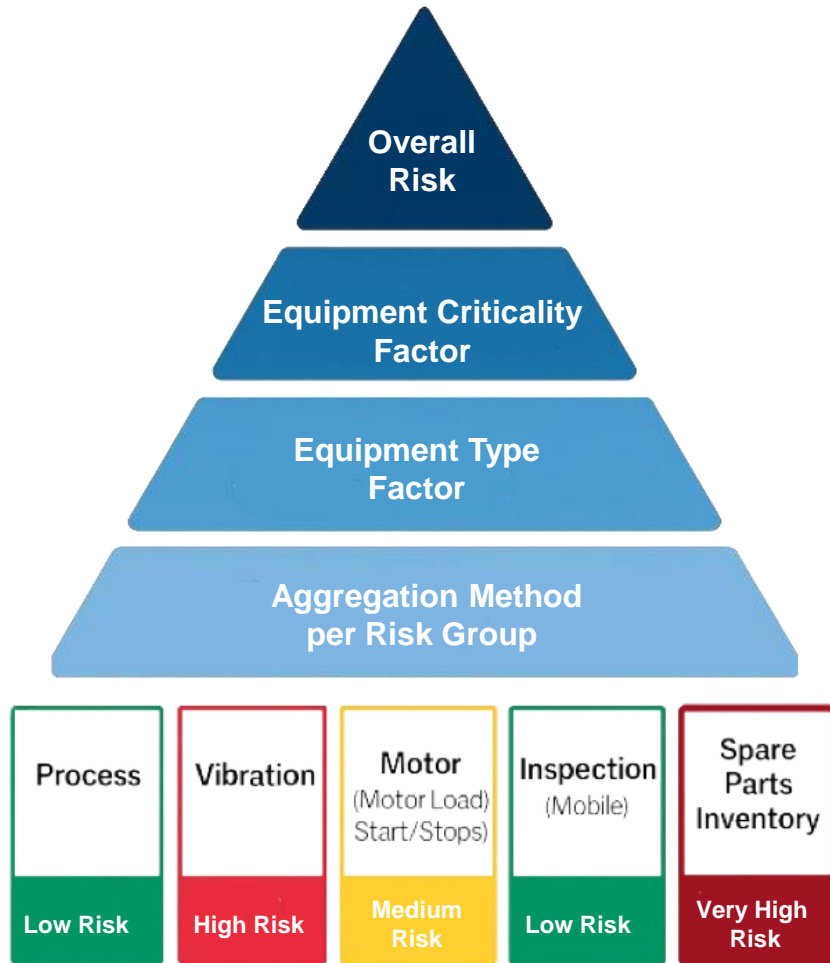


- **Risk-Based Management** is a strategic approach that focuses your maintenance efforts **where they matter most**—on the equipment and systems that pose the highest operational risk if they fail.
- Instead of maintaining all assets on a fixed schedule (like in time-based or preventive maintenance), RBM uses **data, risk assessment and AI** to prioritize actions.

# RISK-BASED MANAGEMENT APPROACH



Address necessary repairs at the appropriate time—neither prematurely nor delayed



The screenshot displays the Metris Platform interface, specifically the 'Summary of Assets' view. The table lists various assets with their associated risk metrics, including Criticality, Risk, Days left, Risk (Max), Risk Distribution, Preventive (Max), Notification (Max), Work Order (Max), Process (Max), Auxiliary (Max), On-Line Predictive (Max), and Installation Local. The table is filtered by 'Risk Composition' and 'Summary of Assets'.

Installation Local	Description	Criticality	Risk	Days left	Risk (Max)	Risk Distribution	Preventive (Max)	Notification (Max)	Work Order (Max)	Process (Max)	Auxiliary (Max)	On-Line Predictive (Max)	Installation Local
+ C1-1-181	R84 Tertiary Air Fan	1	100 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very High	<input checked="" type="checkbox"/> Installation Local
+ C1-2-007	TG4 Generator	1	100 %		Very High		Very Low	Very Low	Very Low	Very Low	Very Low	Very High	<input checked="" type="checkbox"/> Description
+ C1-1-180	R84 Secondary Air Fan	1	67 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very High	<input checked="" type="checkbox"/> Criticality
+ C1-2-006	TG4 Turbine Journal Bearing	1	58 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very High	<input type="checkbox"/> Risk (Sum)
+ C1-1-189	Dissolving Tank South Agitator	1	38 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very High	<input checked="" type="checkbox"/> Days left
+ C1-1-190	Dissolving Tank NE Agitator	1	38 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input checked="" type="checkbox"/> Risk (Max)
+ C1-1-191	Dissolving Tank NW Agitator	1	38 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input checked="" type="checkbox"/> Risk Distribution
+ C1-1-237	R84 East ID Fan	1	35 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Very High
+ C1-1-236	R84 West ID Fan	1	35 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> High
+ C1-0-011	R84 South Boiler	1	33 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Medium
+ C1-1-179	R84 Primary Air Fan	1	31 %		High		Very Low	Very Low	Very Low	Very Low	Very Low	High	<input type="checkbox"/> Low
+ C1-0-003	R84 North Boiler	1	28 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input checked="" type="checkbox"/> Preventive (Max)
+ C1-1-177	VOC Fan	1	25 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Preventive (Avg)
+ C1-0-098	3rd Effect Circ Pump	1	15 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Preventive (Sum)
+ C1-0-089	7th Effect Circ Pump	1	14 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input checked="" type="checkbox"/> Notification (Max)
+ C1-0-102	2B Effect Circ Pump	1	13 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Notification (Avg)
+ C1-0-100	2A Effect Circ Pump	1	13 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Notification (Sum)
+ C1-0-095	4th Effect Circ Pump	1	12 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input checked="" type="checkbox"/> Work Order (Max)
+ C1-0-092	5th Effect Circ Pump	1	11 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Work Order (Avg)
+ C1-0-091	6th Effect Circ Pump	1	10 %		Very High		Very Low	Very Low	Very Low	Very High	Very Low	Very Low	<input type="checkbox"/> Work Order (Sum)
+ C1-1-153	R84 Decanting Centrifuge	1	7 %		Very Low		Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	<input checked="" type="checkbox"/> Process (Max)
+ 8003	River Pump #1	1	0 %		Very Low		Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	<input type="checkbox"/> Process (Avg)

## Benefits

- Reduced downtime and maintenance period
- Decreased maintenance expenses
- Improved resource utilization
- Enhanced safety and operational reliability

# ASSET RELIABILITY



It calculates and  
**prioritizes risk**



The system monitors  
**complete asset health**



The Risk-Based Management  
provides a **clear, visual risk map** of  
**the entire facility**



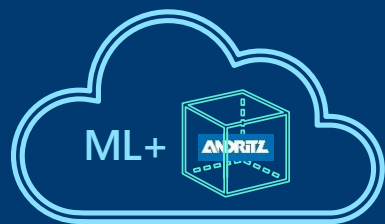
**05**

**EMPOWERING  
OPERATORS WITH AI  
COPILOT**

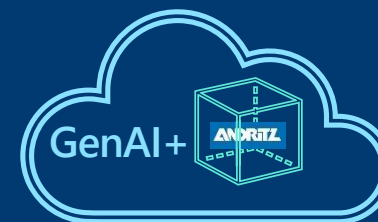
# OPERATOR EMPOWERMENT: AI COPILOT



Nonwoven line  
production



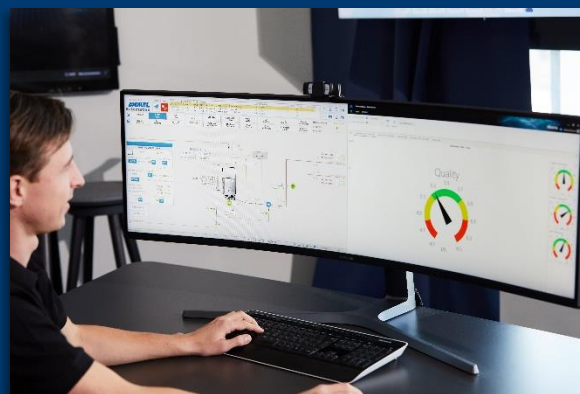
Operator



Metris  
Intelligence



1



**Metris**  
ANDRITZ Digital Solutions

3



**ANDRITZ**

# EMPOWER PEOPLE TO GO BEYOND DATA



Metris Copilot helps your people make the right decisions—faster, safer, and with more confidence

Metris Copilot

What are the variables to optimize a DOW?

To optimize a DOW, the following variables can be adjusted:

- Feed pressure
- Drum speed
- Torque
- Cake consistency

The DOWCakeControlBasic V3 module by Metris ANDRITZ Digital Solutions offers a system to control and optimize washing performance in DD washers, including monitoring and adjusting feed pressure. The system utilizes various instruments such as torque, feed pressure, and cake consistency measurements. The system features two control loops: the cake consistency control loop and the torque control loop. The lesser result of these two is considered the control output and is then fed to the pressure controller. The MovingTime and Tuning parameters come into play to adjust the safety margin for feed pressure.

What is cake consistency and how is it measured?

How does torque affect drum speed in a DOW?

What is the purpose of adjusting feed pressure in a DOW?

Ask me anything...

Process Optimization related questions

Metris Copilot

7/27/2024 1:16 PM What is the purpose of washing?

The purpose of washing in the Brown Stock Washing process is twofold: first, to cleanse the pulp for further treatment and second, to remove and recover waste liquor. The washing process removes waste liquor generated during the cook from the stock, which contains dissolved wood and chemicals. The purpose is to clean the pulp for further treatment to reduce the consumption of bleaching chemicals, reduce the material going to bleaching effluents, facilitate pulp treatment, and prevent pulp strength from deteriorating too much in oxygen delignification. The purpose is also to recover waste liquor (Black liquor) and burn it to recover the cooking chemicals for regeneration and reuse and to utilize the energy of the dissolved wood in the waste liquor.

What is the washing loss mainly comprised of?

What are the primary functions of washing methods?

How does the quality of washing fluid affect the quality of pulp derived from the washer?

Ask me anything...

Troubleshooting and Training

Metris Copilot

What is the recommended dilution factor to reach 10% of dry solids to evaporation?

Answer: The recommended dilution factor to reach 10% of dry solids to evaporation is not provided in the given sources. However, the OnlineDFOptimizer software can be used to calculate the ideal values for the Dilution Factor (DF) based on various factors, including the percentage of solids in WBL, COD transfer, and entire costs related to chemicals and steam usage under the recommended DF. It is recommended to use the software to optimize the dilution factor for the specific pulp washing process.

What are the factors that affect the ideal dilution factor?

How does the OnlineDFOptimizer software work?

What are the benefits of optimizing the dilution factor in pulp washing?

Ask me anything...

Combining multiple data sources to find an alternative

Metris Copilot

What are the safety measures to ensure the maintenance of the DOW?

Answer: To ensure safe maintenance of the DOW, the following safety measures should be taken:

- Before starting any maintenance work, all personnel involved should study and understand the Operation and Maintenance manual.
- Maintenance work should only be performed when the machine is stopped and all necessary valves and isolates are locked properly.
- The equipment should be locked, disassembled, and isolated from other processes according to mill safety rules.
- When working, inspection facilities and instructions, which should be taken.
- Personnel performing maintenance work should follow specific permit-to-work guidelines.
- Before starting any work on the equipment, the current to the driving motor should be switched off at the safety switch or disconnect, and it should be locked to prevent the motor from being switched on by unauthorized persons.
- Locked-out isolation valves should be closed and locked.
- Specific permits should be used for lockage, and they should be clear with an isolation of all high pressure and an additional X00 g every 1000 mpa.

What are the specific guidelines for ensuring the safety of the DOW?

What are the safety measures recommended for working in the DOW?

What are the safety measures guidelines for the DOW?

Ask me anything...

Safety and maintenance instructions

## BENEFITS

- Utilize Generative AI to enhance seamless interaction between humans and machines.
- Merges Microsoft's machine learning capabilities with ANDRITZ Process intelligence.
- Integrates information from multiple sources, including documentation and Metris ACE.
- Supports maintenance and process teams by providing straightforward guidance on maintenance.

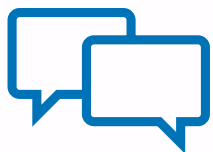
# ANOMALY DETECTION AND SOLUTION SEARCH



## BENEFITS

- When an anomaly is detected, Metris Copilot recommends actions
- Metris Copilot searches for variables with anomalies and opens the trend with the related data.
- When the anomaly is back to normal, the operator receives a notification

# EMPOWERING OPERATORS WITH AI COPILOT



It acts as a **real-time digital assistant** for operators in any **languages**



Copilot helps **detect and prevent** faults



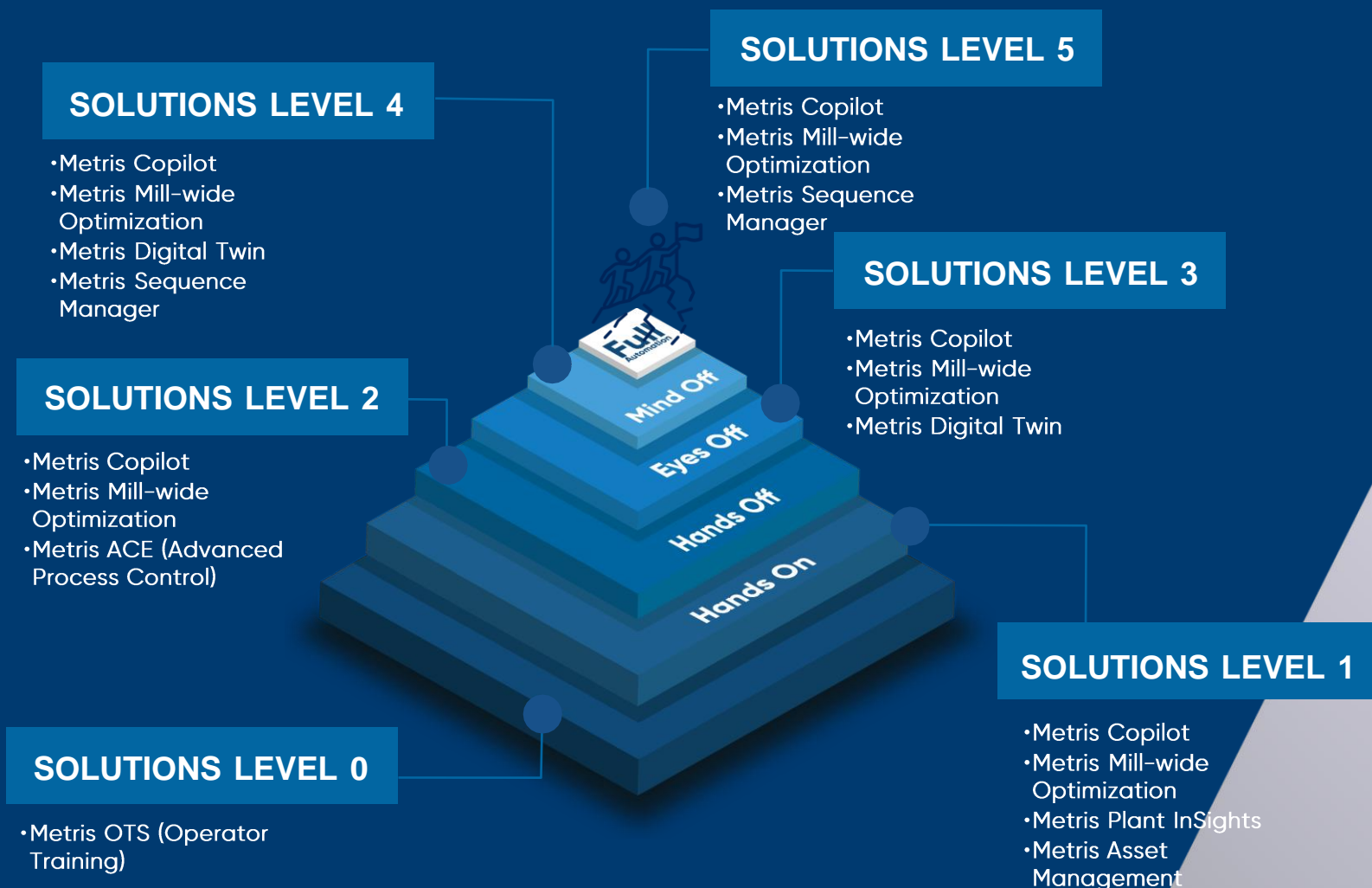
It enhances **operator training** and **daily routines**



**06**

**LET'S DO IT TOGETHER**

# METRIS: RECOGNIZED BY INDUSTRY, TRUSTED BY CUSTOMERS



5 Solution Levels  
enabled by :



# Metris

ANDRITZ Digital Solutions

# KEY TAKE AWAYS

- **Autonomous operation** combines **advanced technology** and **deep nonwoven process expertise** to help plants achieve **greater autonomy, efficiency, and reliability**—while **keeping operators at the center**
- With **proven solutions** like ACE, Optimizer Twin, Metris Copilot, and Risk-Based Management, we deliver **measurable value to tackle producers pain points**
- **Autonomous operation** represents a **new paradigm** for nonwoven production. It's not a quick fix, but a **long and transformative journey**. The transition will be challenging, making it even more important to **start now**.
- **Take the next step: Partner with ANDRITZ** to **unlock the future of autonomous nonwoven operations** and **secure your competitiveness**

# THANK YOU FOR YOUR ATTENTION!



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ANDRITZ.  
FOR GROWTH  
THAT MATTERS.

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