



AVEVAWORLD

ACCELERATE INDUSTRIAL INTELLIGENCE



AVEVA WORLD 2026

DESIGN. BUILD. OPERATE. OPTIMIZE - AUTONOMOUS OPERATIONS
WITH ANDRITZ AND AVEVA

DANIEL SCHUCK

ANDRITZ

ANDRITZ improves customer reliability and operational performance with Reliability Twins

Challenge

- Engineering, operations, and maintenance data are siloed
- Equipment degradation was detected too late, causing unplanned downtime
- Operators lacked confidence to run assets closer to optimal conditions
- Value from data stops at dashboards, not actions

Solution

- AVEVA PI System streamed operational data to CONNECT
- CONNECT enabled governed data sharing across the lifecycle
- AVEVA Advanced Analytics detected degradation and failure risk
- ANDRITZ Reliability Twin delivered health scores, risk levels, and actions

Results

- **Reduced unplanned downtime by 1–3 %**
- **Increased production throughput by 1–6 %**
- **Improved productivity by 5–25 %**
- **Reduced maintenance costs by 1–5 %**
- **Improved energy efficiency by 1–9 %**
- **Reduced unplanned downtime through early degradation detection**
- **Clear path from advisory analytics to autonomous operation**



AGENDA



01 Who is ANDRITZ?

02 From Design to Optimization

03 ANDRITZ and AVEVA



01

WHO IS ANDRITZ?

WORLD MARKET LEADER WITH FOUR BUSINESS AREAS



PULP & PAPER



Pulp: **#1**
Paper: **#3**

METALS



Forming: **#1**
Processing: **#1-2**

HYDROPOWER



#1-2

ENVIRONMENT & ENERGY



#1-3

* Share of total Group revenue 2024
Global market position, estimated by ANDRITZ

MAXIMIZE INDUSTRIAL PERFORMANCE



 PROCESS	 ASSET	 HUMAN	 SUSTAINABILITY
MAXIMIZING PROCESS PERFORMANCE	MAXIMIZING ASSETS PERFORMANCE AND SECURITY	EMPOWERING EFFICIENCY, ENHANCING EXPERTISE AND SAFETY	REDUCING EMISSIONS, PRESERVING RESOURCES
 UP TO 6% Production increase	 UP TO 3% Process Availability increase	 UP TO 25% Productivity increase	 UP TO 8% Reduction in emissions
 UP TO 10% Cost reduction	 UP TO 5% Maintenance cost reduction	 UP TO 95% Operator actions reduction	 UP TO 7% Reduction in water usage
 UP TO 25% Quality losses reduction		 Safety Improvement	 UP TO 9% Increase energy efficiency

WHY DIGITALIZATION?

Maximize Industrial Performance



MEASURABLE VALUES



UP TO 6%
Production Increase



UP TO 10%
Cost Reduction



UP TO 25%
Quality Losses Reduction



UP TO 3%
Mill Availability Increase



UP TO 5%
Maintenance Cost Reduction



UP TO 25%
Productivity Increase



UP TO 95%
Operator Actions Reduction



UP TO 9%
Increase Energy efficiency

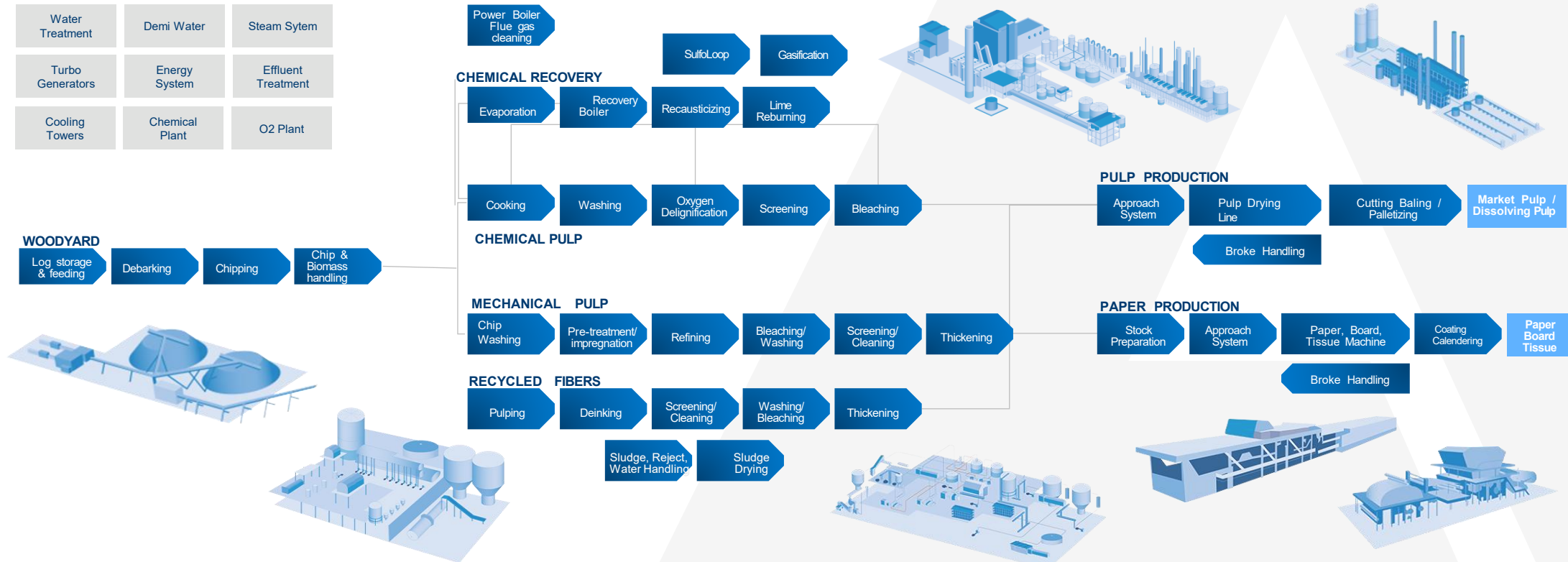


UP TO 8%
Reduction in Emissions



UP TO 7%
Reduction in Water Usage

ENTIRE PLANT



FULL LIFE-CYCLE

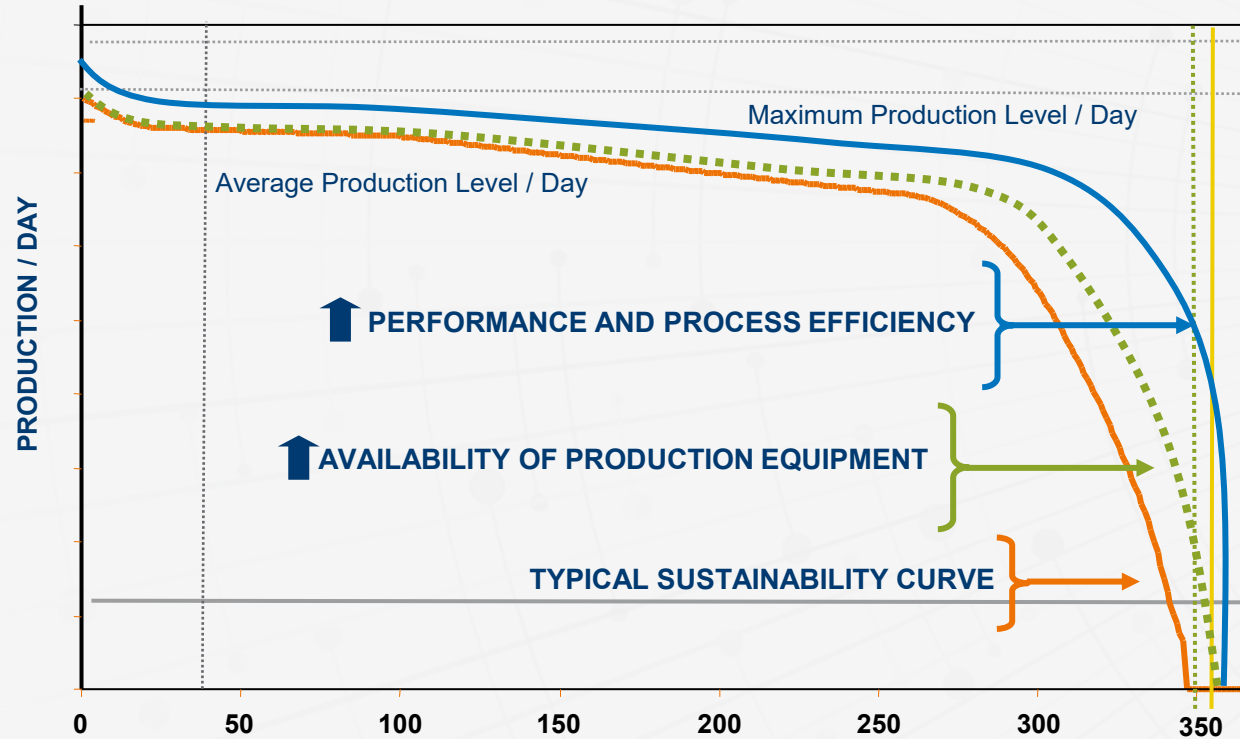
DESIGN

BUILD

OPERATE

OPTIMIZE

HOW TO MAXIMIZE INDUSTRIAL PERFORMANCE



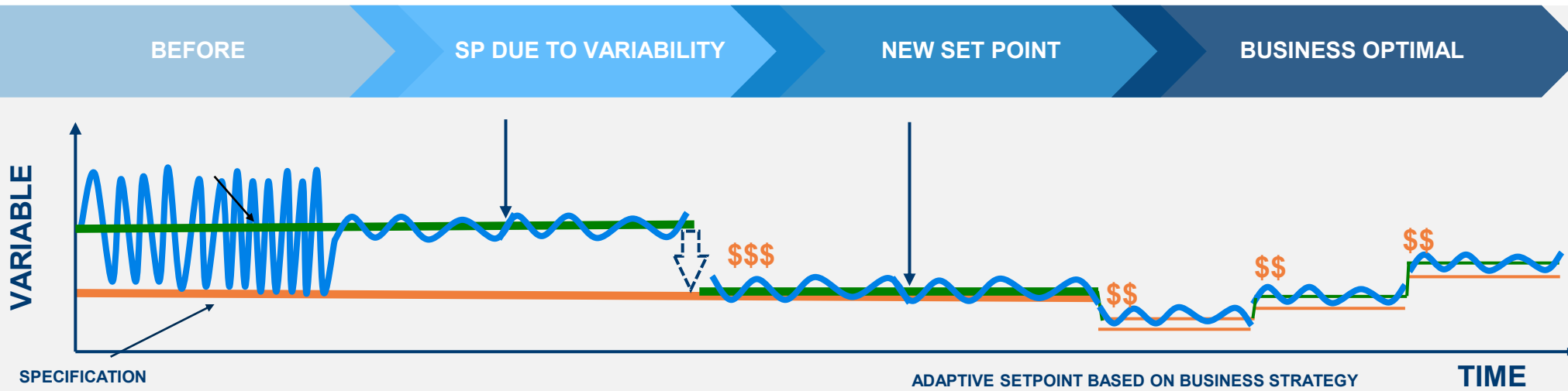
KEY BENEFITS

- Increase production stability
- Reduce process variability
- Fast start-up
- Mill balance
- Operate close to safe limits
- Increase equipment reliability
- Avoid shutdown using automatic slow down system
- Equipment failure prediction
- Risk assessment

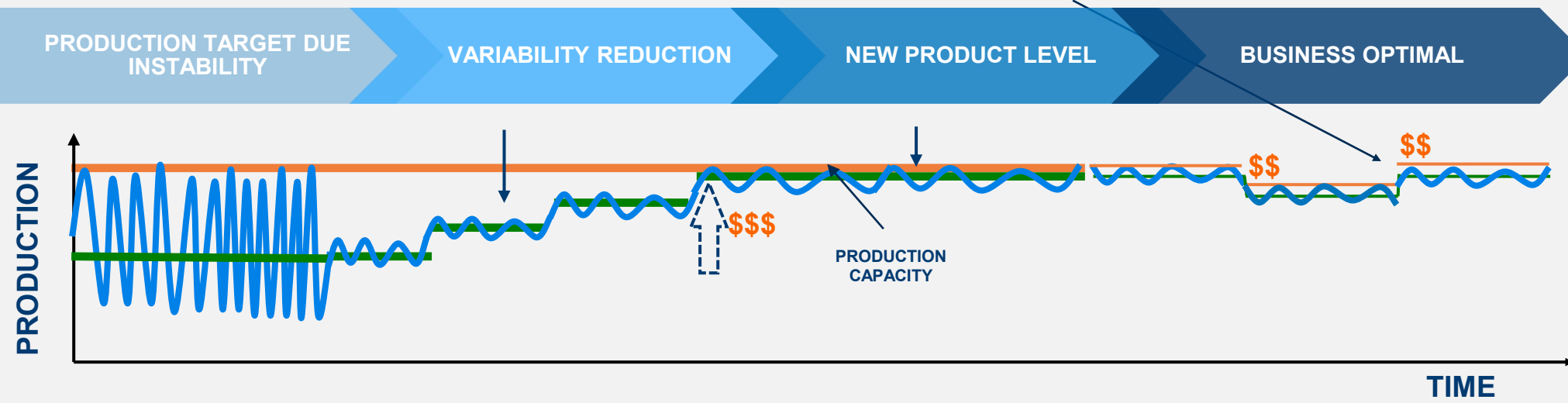
HOW TO MAXIMIZE INDUSTRIAL PERFORMANCE



CHEMICAL OR ENERGY SAVINGS



PRODUCTION INCREASE



ANDRITZ VISION OF THE EMPLOYEE OF THE FUTURE



Operators and maintainers transforms into analysts and optimizers



Analysis of Process and Equipment Performance

Utilizing advanced data analysis and management tools to identify inefficiencies and initiate course of actions



Problem Solving and Optimization

Operators and Maintenance will work in direct cooperation solving and optimizing inefficiencies with less support from engineering and management



Use of assisted support via AI

Application of AI Assistant tools for data processing and troubleshooting support with access to company know-how



ANDRITZ DRIVES FORWARD THE AUTONOMOUS MILL



Customers' global competition and environmental challenges forces industries to act



“ANDRITZ’s aim is to make the fully autonomous mill a reality.”



HUMAN

Empowering efficiency, enhancing expertise, and safety



ASSET

Maximizing asset performance and security



PROCESS

Maximizing process performance



SUSTAINABILITY

Reducing emissions, preserving resources

Dr. Joachim Schönbeck
President & CEO, Executive Board Member

“ANDRITZ can and will contribute towards society by developing technologies that enable respectful and sustainable utilization of our planet’s resources.”

DECISION LEVELS IN A MILL



MILL MANAGEMENT	Budget control Budget control, Speed, Economy, Balanced (It defines show mill balance should work), Schedule shutdown	DAILY
PRODUCTION MANAGER	Mill Balance control Start-up/Stop sequence, Speed-up/Slow-down, Recipes (35 controls)	MINUTES TO HOURS
OPERATOR	Control of complex variables Kappa, Brightness, Moisture, Dry-solids, etc. (75-100 controls)	3 - 300 SECONDS
	Control of simple variables and avoid interlocks Flow, Temperature, level, pressure (1000 controls + 2000+ interlocks)	0.1 - 1 SECONDS

JOURNEY TO AUTONOMOUS PLANT



INFORMATION LEVEL 0	HANDS-ON LEVEL 1	HANDS OFF LEVEL 2	EYES OFF LEVEL 3	MIND OFF LEVEL 4	TOTAL AUTONOMY LEVEL 5
Zero autonomy; the operator performs all control tasks.	Operator assistance. The “ears, eyes and arms”: additional data, info and field actuators for smarter operation	Normal functions performed automatically. Area operation is optimized	Operators are notified and advised if something goes or tends to go wrong	Equipment does not need to be monitored continuously. Only rare events require human intervention.	All functions are managed automatically. The operator may have the option to control the plant.

AI Expert Agent - Digital Assistant

AI Powered

Asset Performance Management

- Risk Based Management
- Control Performance Assessment
- Alarm Management
- Condition Monitoring / Vibe
- Control Valves
- On-off Valves
- Motors
- Inspection
- Calibration Management
- Planning (Weekly, Commissioning, Shutdown, etc.)
- Root Cause & Problem Elimination
- Bypass Management
- Management of Changes

Mill-Wide Optimization

Mill Balance – Production, Cost and Energy Management

- Area-specific production control
- Area-specific quality tracking and forecast
- Area-specific cost tracking and forecast

Adaptive Sequence

- Start with one click
- Stop with one click
- Recipe management

- Autonomous operations dashboard
- Mill-wide Production Management
- Mill-wide Cost and Energy Management
- Mill-wide Quality Tracking

- Anomaly management

Digital Twin

Virtual Plant

- Engineering-Construction-Service (ECS) Platform
- Digital Plant (DIP)
- eXtended Reality (XR)

Optimizer

AI Powered

- Instrument health check
- Soft sensors (First principles / AI based)
- Setpoint optimization
- Operating limits
- KPIs
- Forecasting
- Product Tracking
- Cost Optimization

Reliability

AI Powered

- Anomaly score
- Downtime probability
- Ideal conditions
- Remaining Useful Life (RUL)

PIMS (Plant Information Management System)

- Data Analytics
- Display Studio
- Reports
- Product Tracker
- AI / Machine Learning
- Kanban
- Logbook
- Statistical Process Control
- LIMS (Laboratory)
- OEE
- Cost Management
- Energy Management
- Carbon Footprint

APC (Advanced Process Control)

- Watchdog and Safeguards
- Production Control
- Advanced Regulatory control
- Model Identification and Auto-tune
- Sensor Corrections
- Grade Change

AI Powered

OTS (Operator Training Simulator)

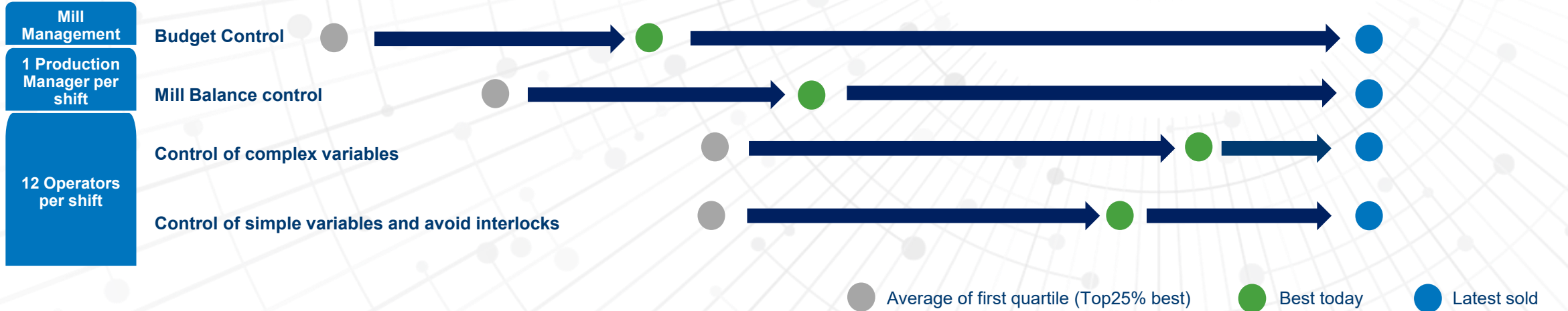
Cybersecurity

AI ENABLES
HIGH
AUTONOMY!

LEVELS OF AUTONOMY



Level	0	1	2	3	4	5
Degree of Automation	NO AUTOMATION	OPERATOR ASSISTANCE	PARTIAL AUTOMATION	CONDITIONAL AUTOMATION	HIGH AUTOMATION	FULL AUTOMATION
Level by automotive definition (Tesla)	Information	Hands On	Hands Off	Eyes Off	Mind Off	Full Autonomy
Description	Zero autonomy; the operator performs all control tasks.	Plant is controlled by the operator, but some automation is included in the plant design.	Plant has combined automated functions, like flow and temperature control, but the operator must remain engaged with the plant and always monitor the situation.	Operator is a necessity but is not required to watch the displays continuously. The operator must be ready to always take control with notice.	The automation is capable of performing all control actions under certain conditions. The operator may have the option to control the plant.	The automation can control perform all control functions under all conditions. The operator may have the option to control the plant.



REAL RESULTS FOR CUSTOMERS



Highest autonomous pulp mill in 2024

Eldorado, Três Lagoas, Brazil

PRODUCTION RECORDS AND AUTONOMOUS OPERATION

Production records within one year (1.5 million → to 1.7 million tons/a in 2017)

+18% production increase

Holistic asset performance management enables drawing attention to the most critical assets for maintenance activities

→ Outcome: 95% overall equipment availability

Eldorado mill runs in automatic mode 97-98%



+7 million tons/year
Production
Increase



7%
Increase
Energy efficiency



7%
Cost Reduction



Quality Losses
Reduction



95%
Operator
Actions Reduction



Maintenance Cost
Reduction



95%
Mill Availability
Increase



From 89.2% to 95%
Productivity
Increase



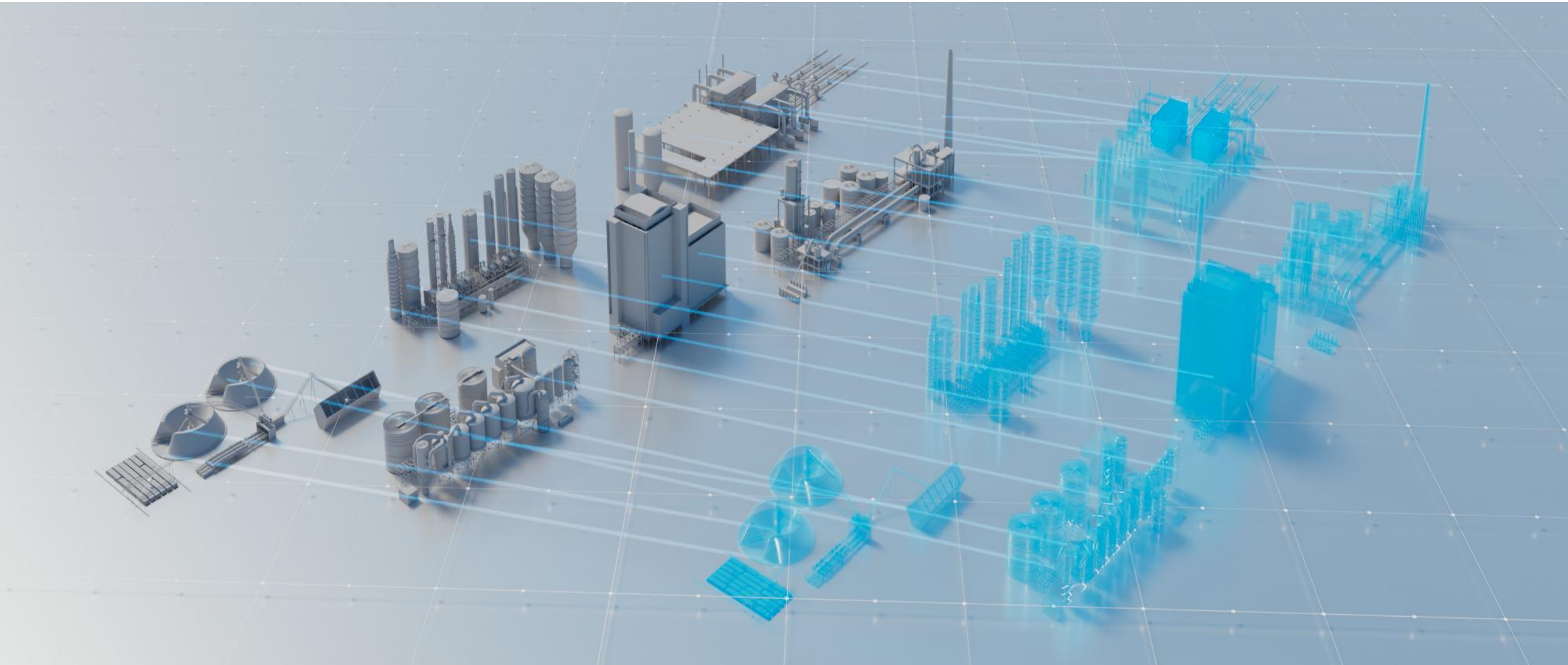
02

FROM DESIGN TO OPTIMIZATION

FROM VISION TO EXECUTION



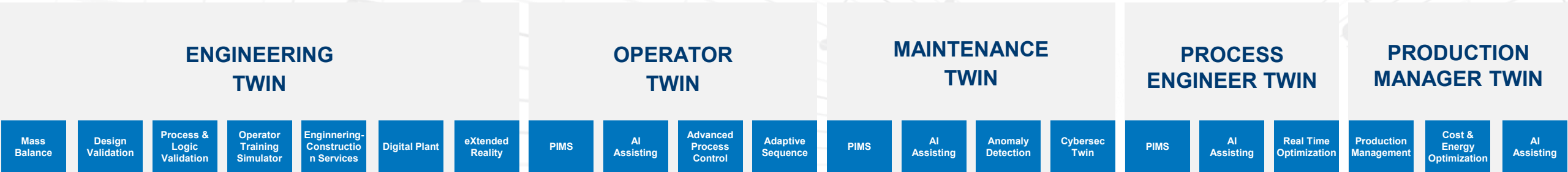
A structured framework to identify high-Confidence Reliability Twin opportunities



DIGITAL TWIN IN THE LIFE-CYCLE MANAGEMENT

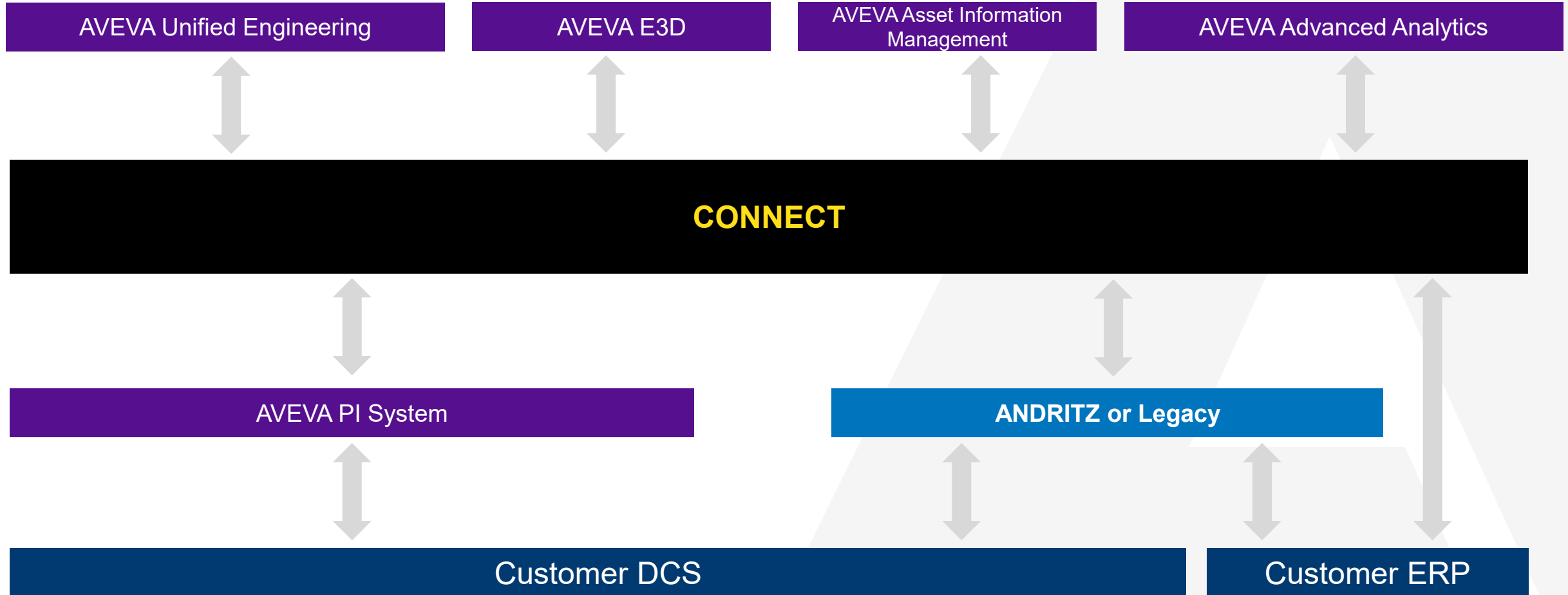


Context: It is a complex topic and complex to manage

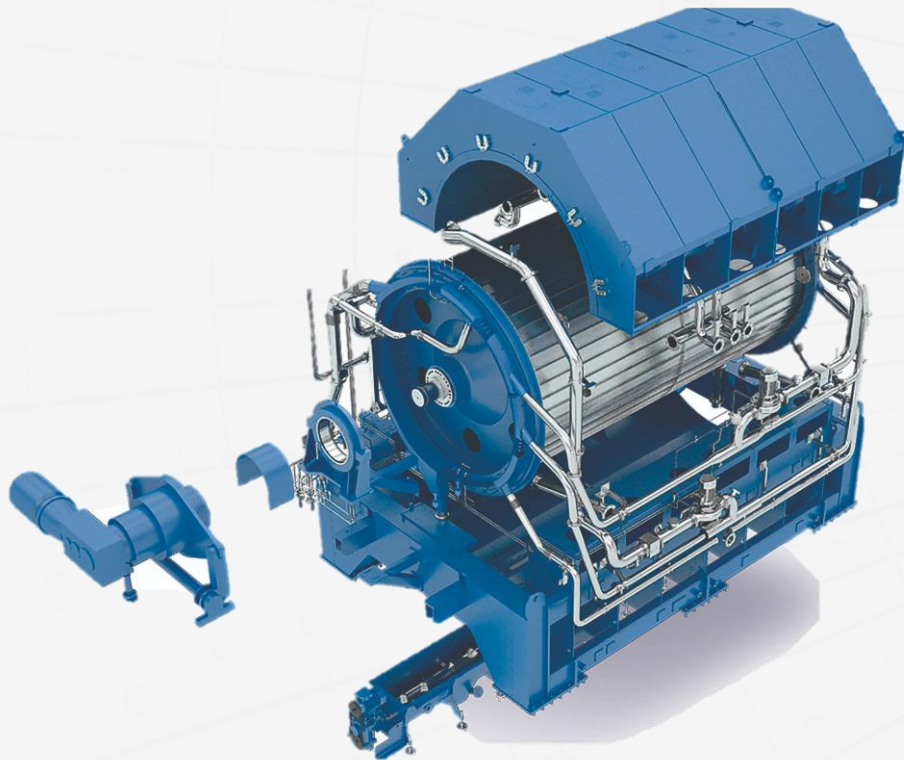


Types / Formats	Sources	Applications	Benefits
• First principles, Physics-based models, Simulation • Historians (time series data) • Visual models (3D, P&ID, laser scans, drawings, photos, images, etc.) • ERP/CMMS data (Asset structure, components, inspection etc.) • Documents (manuals, procedures, spreadsheets, etc.)	• PIMS • DCS • ERP • CMMS • Document Management System • Engineering platforms • Condition monitoring systems • IoT platforms • Etc.	• Softsensors • Setpoint optimization • Operating limits • KPIs • Forecasting • Product tracking • Asset health check • Anomaly detection • Failure anticipation • Etc.	• Reduction of chemical, energy, and fuel consumption • Increase production, working closer to limits • Reduction of production losses • Increase availability • Reduce time to repair • Etc. • Autonomy Level 3-4

ARCHITECTURE



DDW RELIABILITY TWIN



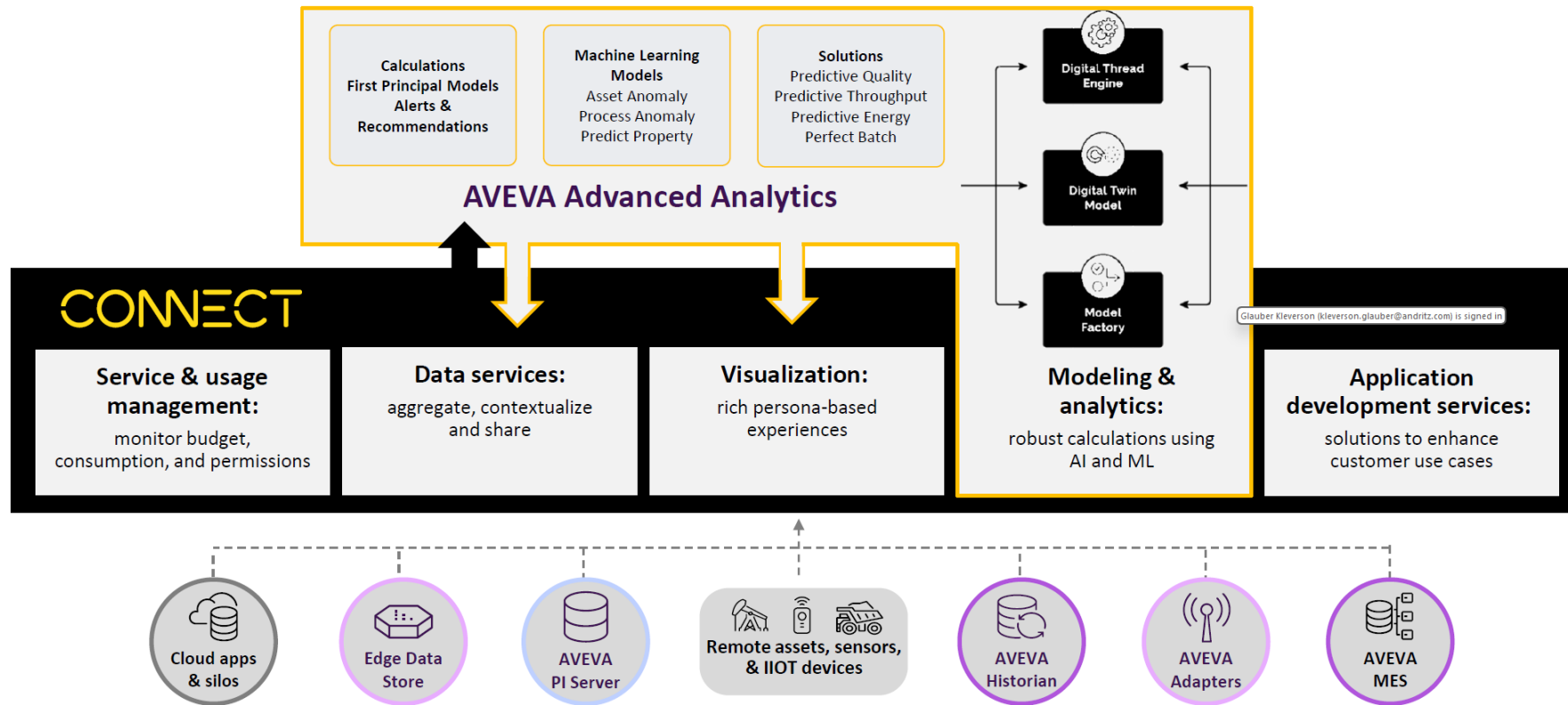
AVEVA ADVANCED ANALYTICS

AI-driven optimization for industrial excellence



Connect AI with all industrial data and visualization

Open and neutral, providing rich data insights for your unified industrial ecosystem



RELIABILITY TWIN



KPIs	Description	Benefits
HEALTH SCORE	Composite index (0–100) reflecting deviation from healthy baseline	• Provides an immediate, intuitive view of overall asset and process health. • Allows operators, maintenance and management to speak the same language. • Enables fast comparison across assets, lines or mills. • Acts as an early warning signal before alarms, trips or failures occur. • Creates a clear entry point for digital health monitoring adoption.
ANOMALY SCORE	Detects Degradation. Real-time anomaly intensity indicator	• Shifts ANDRITZ from reactive troubleshooting to proactive performance management. • Detects hidden degradation before alarms or trips occur. • Protects ANDRITZ equipment reputation by reducing unexpected failures. • Creates a technical basis for value-based service contracts.
FAILURE PROBABILITY	Assesses operational risk. Probability of failure within 7d / 30d horizon	• Quantifies the risk of unplanned shutdowns in customer language. • Enables ANDRITZ to prioritize actions on the most critical assets. • Supports customer decision making on when to intervene versus continue operation. • Reduces production loss risk on ANDRITZ-supplied process islands.
IDEAL CONDITIONS	Reduces stress and slow down failure progression	• Identifies operating windows that minimize mechanical and process stress. • Extends asset lifetime without additional hardware investments. • Links process operation directly to equipment health. • Strengthens ANDRITZ positioning as a process and equipment expert, not only an OEM.
RUL	Estimated remaining useful life (RUL). Enables maintenance planning at the right time	• Moves maintenance from calendar-based to condition-based. • Avoids both premature maintenance and late interventions. • Improves customer maintenance planning and spare parts readiness. • Enabler for ANDRITZ services, spares and upgrades.
RISK LEVEL	Consolidated risk classification (Low / Medium / High)	• Provides a clear and simple decision signal for operations and maintenance. • Aligns operators, maintenance, management and ANDRITZ service on priority. • Enables fast triage across assets, areas or mills. • Reduces decision latency during abnormal situations. • Supports escalation logic and service response models. • Forms a natural trigger for condition based services and SLAs.
PRESCRIPTION	Recommended maintenance or inspection actions	• Converts insights into clear actions for operations and maintenance. • Reduces mean time to repair by guiding teams to the right intervention. • Avoids unnecessary inspections by focusing only where value exists. • Improves coordination between operations, maintenance and ANDRITZ service. • Enables condition based service contracts and SLAs. • Protects availability and performance of ANDRITZ supplied equipment. • Creates a repeatable, scalable service model across assets and mills.

DEFINING TARGET ASSETS



STEP 1 - IDENTIFY POTENTIAL CUSTOMER / PLANTS

What we analyze:
Pulp & Paper / Energy / Continuous Process Industries
Preference for:
• Modern equipment
• Low customization
• High replication potential across sites

How we identify them:
Does the customer have scale potential (multi-site / multi-asset)?
NO → Deprioritize / Treat as a one-off case
YES → Continue

STEP 2 - IDENTIFY CRITICAL PLANT AREAS

What we analyze:
Downtime-driven losses
Production bottlenecks
Recurring operational losses

How we identify them:
Historical production & downtime data
Pareto analysis by plant area
Operational and maintenance expertise

Example: Pareto of theoretical production losses by plant area

STEP 3 - IDENTIFY HIGH-IMPACT ASSETS (BAD ACTORS)

What we analyze:
High economic impact assets
Recurring failures
Low reliability

How we identify them:
Pareto analysis by equipment / asset
Downtime and failure contribution
Maintenance and operational expertise

RELIABILITY DIGITAL TWIN

ANOMALY SCORE: 22%

DOWNTIME PROBABILITY: 15%

IDEAL CONDITIONS: 71%

RUL: 2800 HOURS

STEP 5 - CHECK FAILURE MODES AVAILABILITY

What we check:
Existing failure modes and degradation mechanisms

Typical sources:
RCM / FMEA from the customer
ANDRITZ Services studies
OEM / domain knowledge

DECISION 4 - Failure Modes Defined
Are failure modes defined or accessible?
NO → High risk / Additional effort
YES → Continue

STEP 4 - ASSESS ASSET REPLICABILITY

What we assess:
Same equipment type across plants
Similar operating conditions
Variations manageable via parameterization

Why it matters:
Enables scale across customers and sites
Reduces engineering and deployment effort
Increases production potential

DECISION 3 - Replication Feasibility
Can this Digital Twin be replicated with reasonable effort?
NO → Deprioritize / Treat as a one-off case
YES → Continue

DECISION 2 - BUSINESS VALUE

DECISION 2 - Is there a clear and measurable economic impact?
• NO → Reassess asset or return to Step 3
• YES → Continue to asset replicability assessment

STEP 6 - CHECK ONLINE INSTRUMENTATION AVAILABILITY

What we check - Online Instrumentation Availability:
Vibration
Temperature
Pressure
Electrical / process variables

Key question:
For each critical failure mode:
Is there a signal capable of anticipating the failure?

DECISION 5 - Implementation Feasibility
Is there adequate instrumentation for the critical failure modes?
NO → Include instrumentation as part of DT scope
YES → Continue

STEP 7 - ASSESS DATA AVAILABILITY & QUALITY

What we check - Data Readiness:
Sufficient historical data (≥ 6-12 months)
Data reliability and consistency
Adequate variability for learning
Limited gaps / low noise
Sensors properly calibrated

Why it matters:
Enables robust model training
Reduces false positives / unstable models
Ensures trustworthy predictions

DECISION 6 - Machine Learning Readiness
Is the data suitable for Machine Learning?
NO → Data remediation or select a new use case
YES → Continue

STEP 8 - BUILD ML-BASED RELIABILITY DIGITAL TWIN

What we build:
ML models aligned to failure modes
Asset-level reliability intelligence
Hybrid approach, data-driven, physics-informed (when applicable)

Key outputs:
Downtime Probability
Anomaly Score
Ideal Conditions
Remaining Useful Life (RUL)

What this enables:
Proactive maintenance decisions
Reduced unplanned downtime
Scalable, repeatable DT product

RELIABILITY TWIN OUTPUTS

HEALTH SCORE

ANOMALY SCORE

FAILURE PROBABILITY

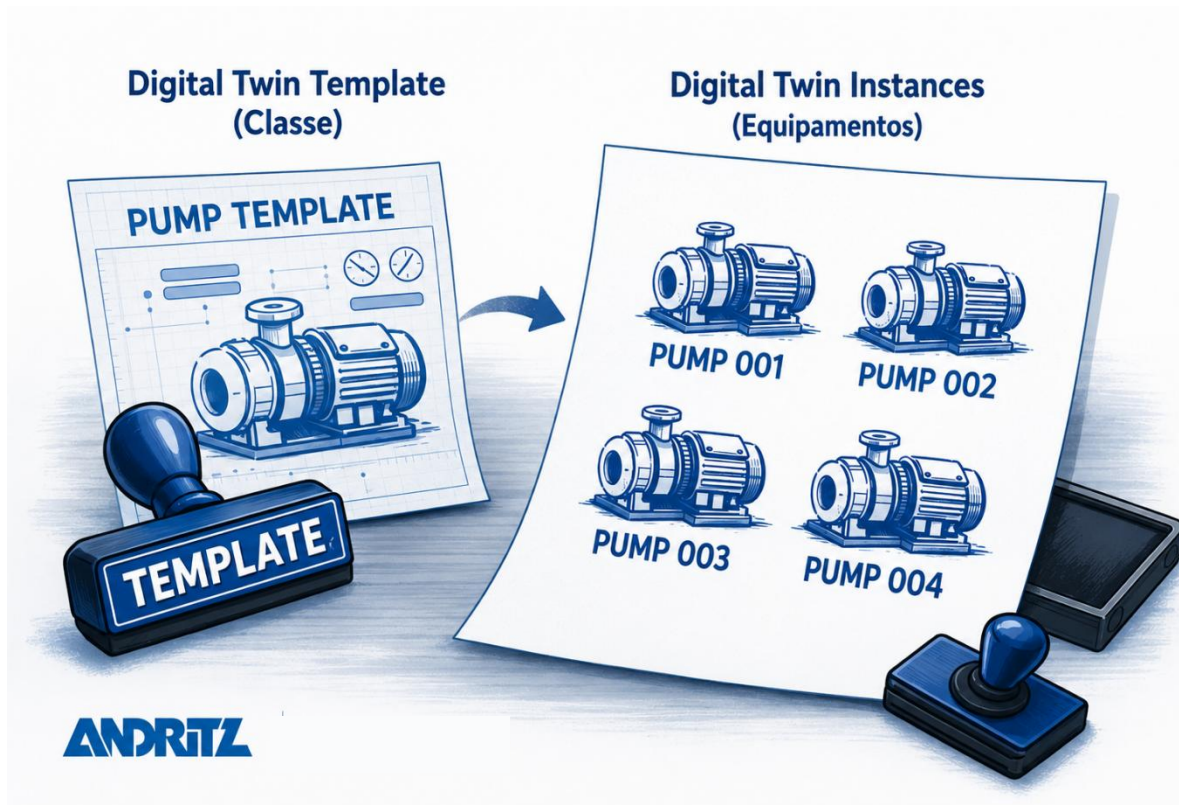
IDEAL CONDITIONS

REMAINING USEFUL LIFE

RISK LEVEL

Greenfield → Based on FMEA + criticality analysis
Brownfield → Same as greenfield or based on production losses (constrained budget)

TEMPLATE VERSUS INSTANCES + REQUIRED DATA



MINIMUM INSTRUMENTATION (MANDATORY)

- Radial vibration (DE/NDE): Primary indicator for bearing degradation and imbalance
- Axial vibration: Required for thrust bearing and hydraulic instability detection
- Bearing temperature: Secondary confirmation of mechanical degradation
- Motor current: Indirect load and hydraulic resistance monitoring
- Flow: Operational regime classification and cavitation detection
- Suction pressure: Critical parameter for cavitation risk assessment

RECOMMENDED ENHANCEMENTS

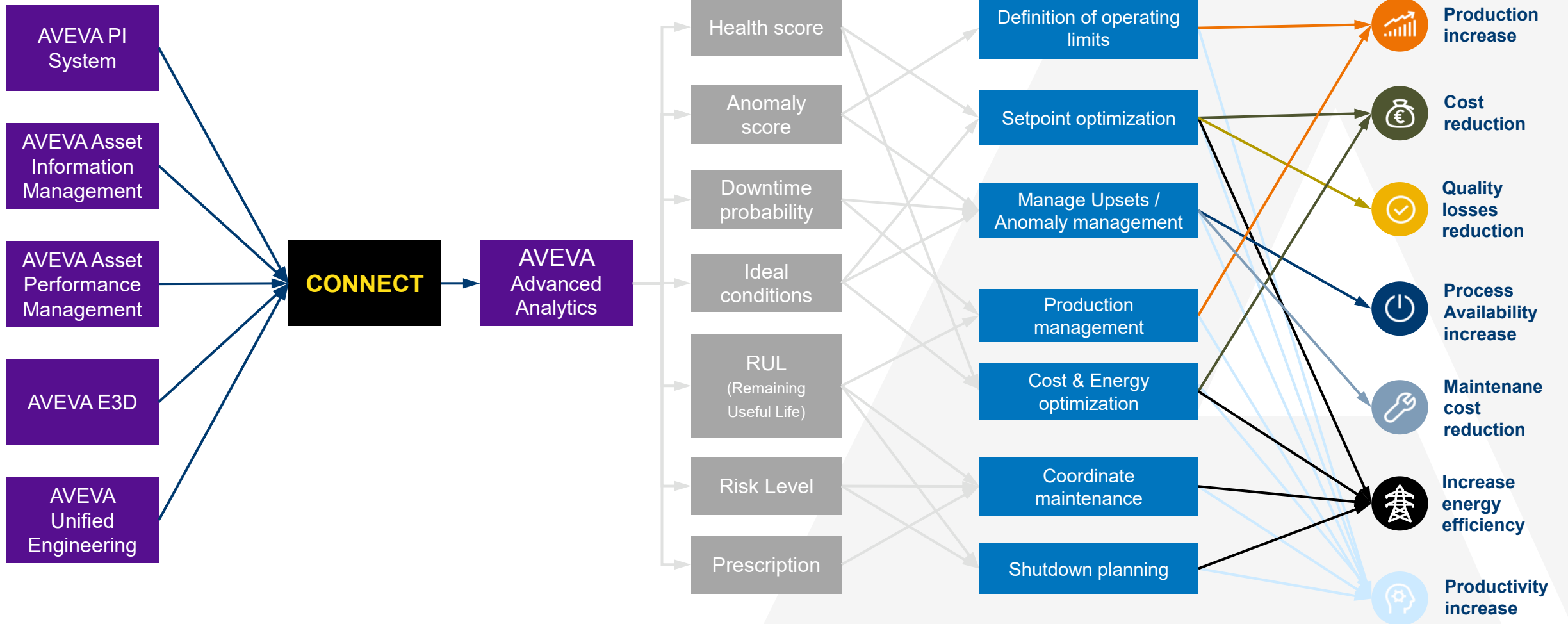
- Envelope vibration: Early-stage bearing defect detection
- Ultrasonic sensor: Cavitation and lubrication anomaly detection
- Torque: More accurate load monitoring
- Differential pressure: Hydraulic efficiency monitoring

FROM AVEVA PI DATA TO AUTONOMOUS DECISIONS



AVEVA Technologies

ANDRITZ know-how





03

ANDRITZ AND AVEVA

PARTNERSHIP ANDRITZ + AVEVA



WHY

*Customers in the Pulp & Paper industry are constantly searching for ways for **Maximizing Industrial Performance**. ANDRITZ and AVEVA partnership is focused on creating measurable value for our customers throughout the full life-cycle (Design, Build, Operate and Optimize) and the entire value stream by combining AVEVA's excellence and global leadership in industrial software with ANDRITZ's global leadership and deep know-how in process, maintenance, automation, and digitalization in the Pulp & Paper industry.*

HOW



- Value-driven solutions in digitalization in the Pulp & Paper industry well recognized by customers
- E2E offering for building plants, systems, and equipment
- Deep know-how in designing, building, maintaining and optimizing Pulp & Paper process plants
- Globally-oriented and innovation-driven corporate DNA
- ANDRITZ and AVEVA products can be integrated to solutions bundles to bring the best-in-class value to our customers
- [...]



- Comprehensive software suite covering the entire value stream and the full life cycle
- Most trusted solution for data historian and visualization
- State-of-the-art integration and predictive analytics capabilities
- Part of ANDRITZ engineering is already done in AVEVA products, which can bring seamless integration
- Proven approach for mutually benefiting partnerships
- [...]

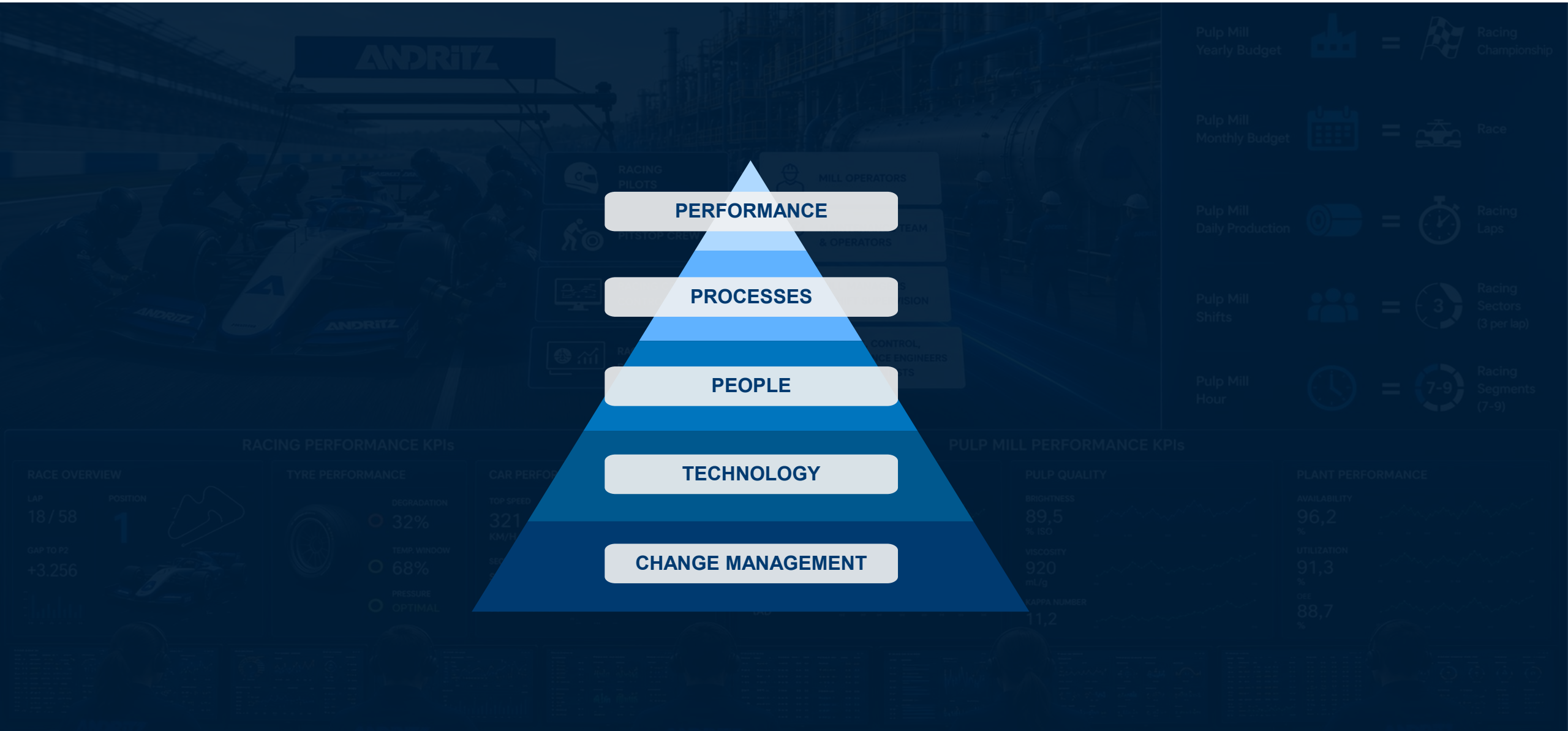
TECHNOLOGY EMPOWERS PEOPLE TO DO MORE!



Pulp Mill Yearly Budget		=		Racing Championship
Pulp Mill Monthly Budget		=		Race
Pulp Mill Daily Production		=		Racing Laps
Pulp Mill Shifts		=		Racing Sectors (3 per lap)
Pulp Mill Hour		=		Racing Segments (7-9)



TECHNOLOGY EMPOWERS PEOPLE TO DO MORE!



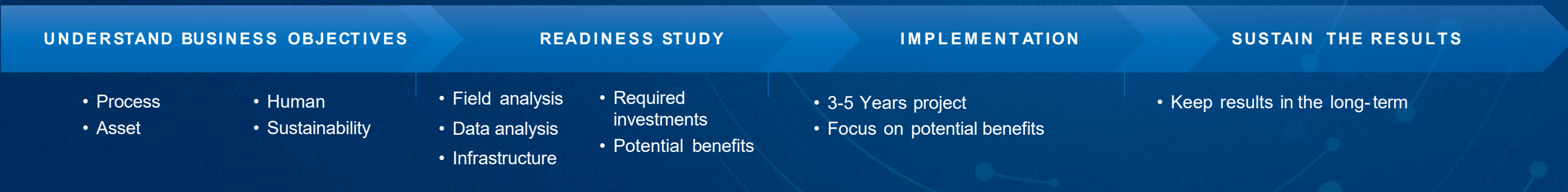
BENEFITS AND ROADMAP



BENEFITS



ROADMAP





THANK YOU!

WANT TO KNOW MORE?
LET'S CONNECT:



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**ANDRITZ.
FOR GROWTH
THAT MATTERS.**

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