Initiatives Towards Packaging Digital and Green Transformation

**The International Corrugated Case Association
& World Containerboard Organisation 2025**

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SCGP

Transformative transformation

Initiate change to navigate challenges and seize the opportunity

Business model
transformation

People
transformation

Digital
transformation

Sustainability
transformation

Digital transformation journey
Towards self-optimizing intelligence for operational excellence

Digitization
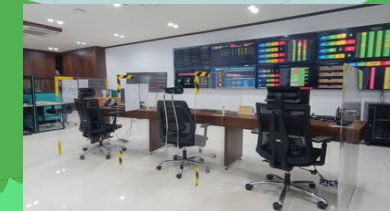
Data-driven decision support

AI-driven decision support

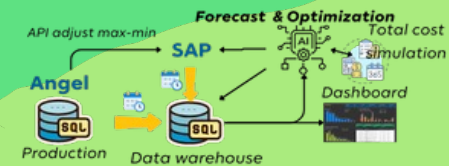**Cognitive supply chain**

Digital twin model

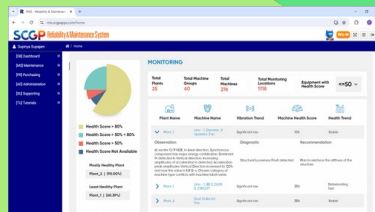Prescriptive maintenance

AI for OE

Scenario simulation & optimization

Performance dashboard

KM AI assistant

Automated warehouse & inventory

Polyfunctional robot

Low cost automation & cobot
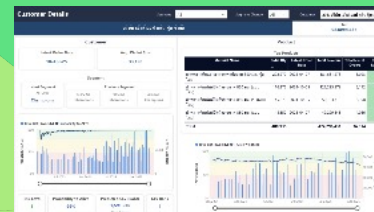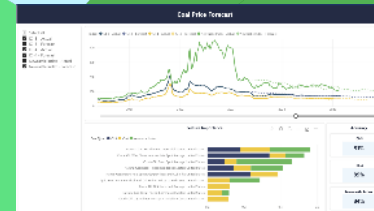
Digitizing manual processes and automating data collection

Leveraging data analytics for informed decision-making

Harnessing predictive analytics and generative AI

Integrating digital twin for adaptive supply chain

Data-driven culture for digital transformation

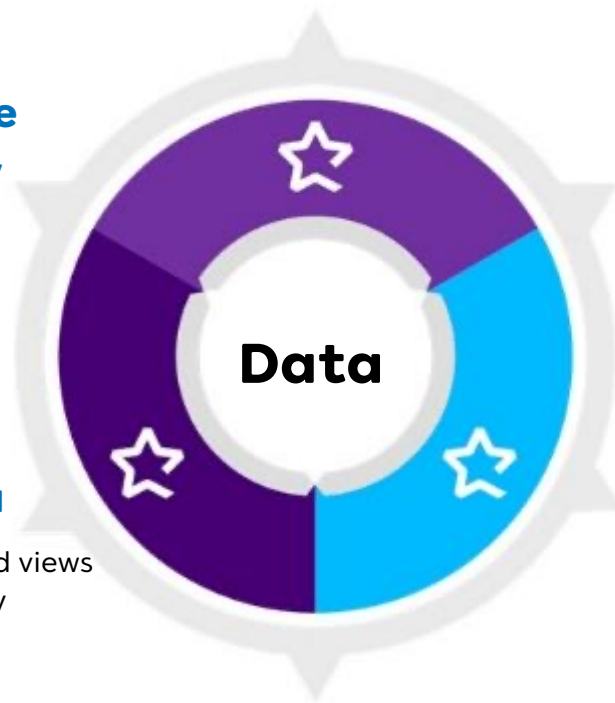Build a data-driven culture - embedding data into the decision-making process at all levels

Clearly define goals and data & AI strategy, secure leadership buy-In and advocacy

Infrastructure & technology
Select appropriate storages and data management tools

Accessible & trusted data
Centralize data, create unified views and ensure data quality

Data

Cross-functional data champions
Identify and empower data advocates in each department to support adoption

Organization-wide competency building
Train both AI users and AI developers in data literacy

Self-service analytics tool
Enable employees to access quality data and independently create dashboard and perform analytics

Key drivers with implementation

Process
- Establish governance standards
- Clarify implementation process

Technology
- Build scalable data pipelines
- Develop AI models to power data-driven & AI decisions

People
- Engage all employees to build awareness and implement change management for sustainable adoption
- Build data literacy and people capability across the organization

4

Employee capabilities build-up

Effectively build multiple competencies to embed productivity across the organization

AI developers

Advanced data scientists (6 persons)

Generative AI	Quantum	Immersive-reality	Deep learning reinforcement

Applied data scientists (3 persons)

Digital & AI roadmap	Business analyst	Project management	MLOpt, DevSecOpt

Data & AI facilitators (339 persons)

Basic (270 persons)	**Intermediate** (69 persons)
Descriptive	Predictive
Diagnostics analytics	Prescriptive

AI users   1,878 users

Artificial intelligence

Machine learning

Deep learning

Predictive AI

Generative AI
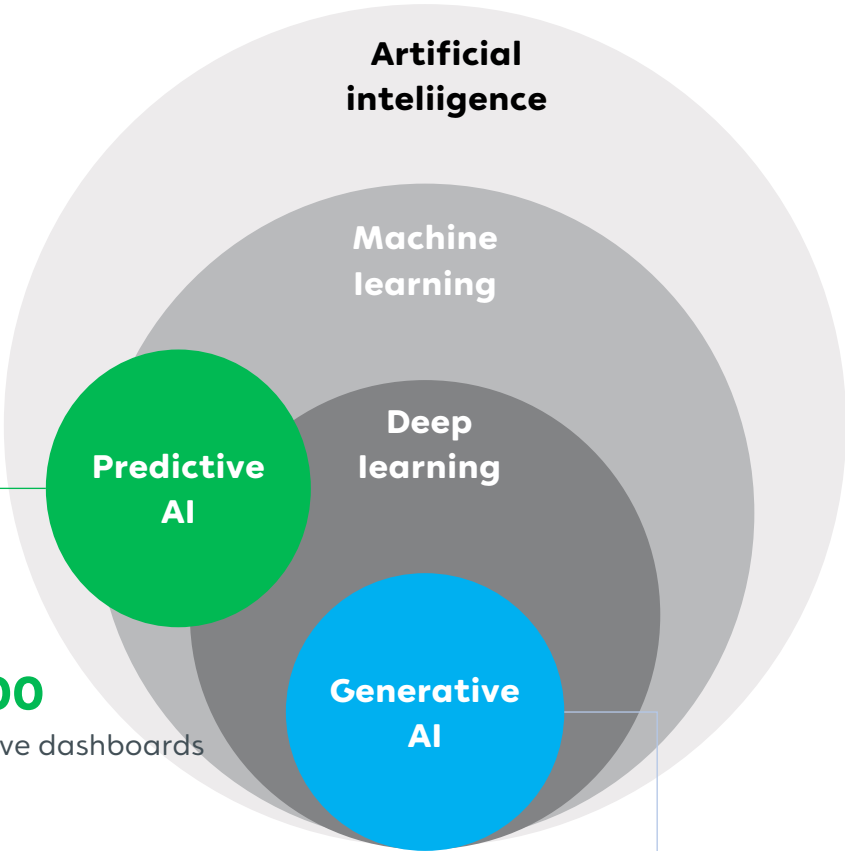
>1,000 Interactive dashboards

>100 Optimization use cases

>118 Internal AI initiative projects

- **Professional tools**
- **Co-pilot in daily work applications**
- **Internal knowledge management**

AI implementation across the value chain

Develop AI initiative solutions to enhance organizational competitiveness

AI implemented areas

1. Customer and market insights
2. Packaging design & product reliability
3. Production scheduling
4. Raw material sourcing
5. Manufacturing and process optimization
6. Asset maintenance
7. Quality control and inspection
8. Warehouse and logistics
9. People
10. Finance

4 patents and 2 petty patents

1. Roll surface inspection system using deep learning techniques (2103002761) - Granted
2. Fault detection system for rotating machine (2001007097)
3. A device and system for monitoring the operation of an electric motor and the method thereof (2301007192)
4. Odor detecting and monitoring system and the method thereof (2001003760)
5. A method for odor sensing and monitoring, and the system thereof (2301006345)
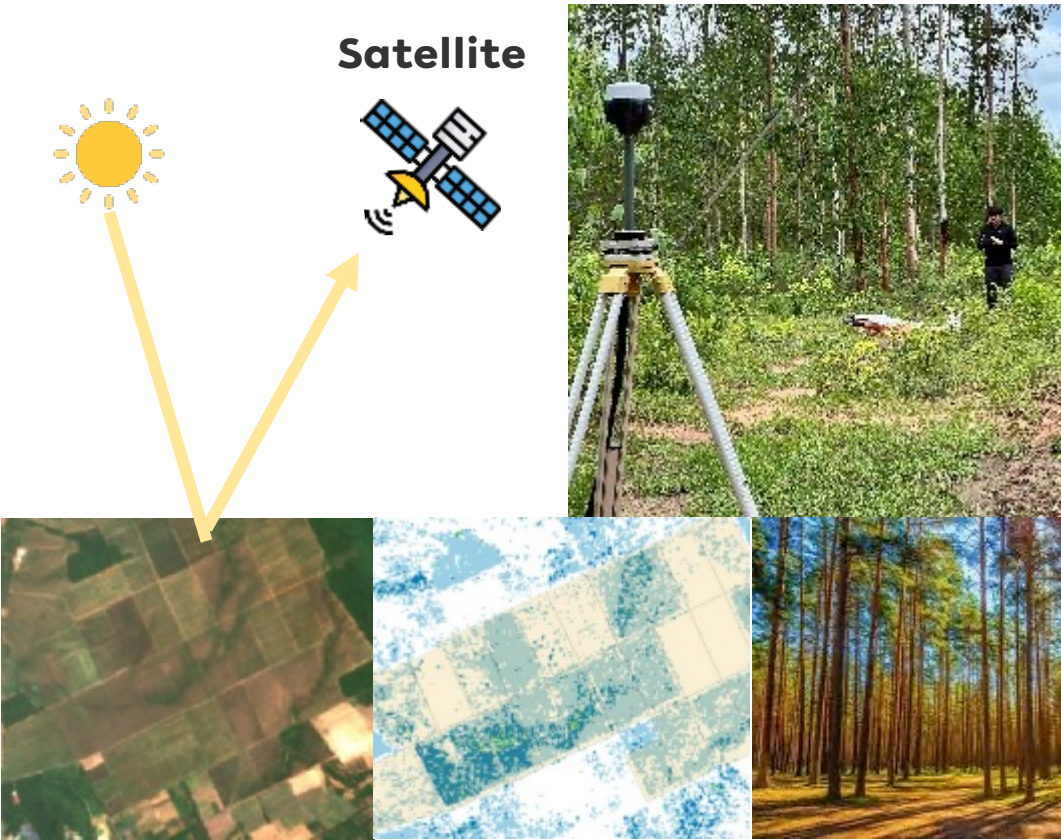6. Device for detecting contaminants in pulp slurry (2403001022)

Use case: Plantation sourcing management

Elevate eucalyptus yield monitoring and ensure log size accuracy

Satellite x AI solution for plantation

Implement satellite, and drone LiDAR to predict yield, monitor health and support harvesting decisions

Satellite

Results:

Sourcing Labor cost
▼ **50%**

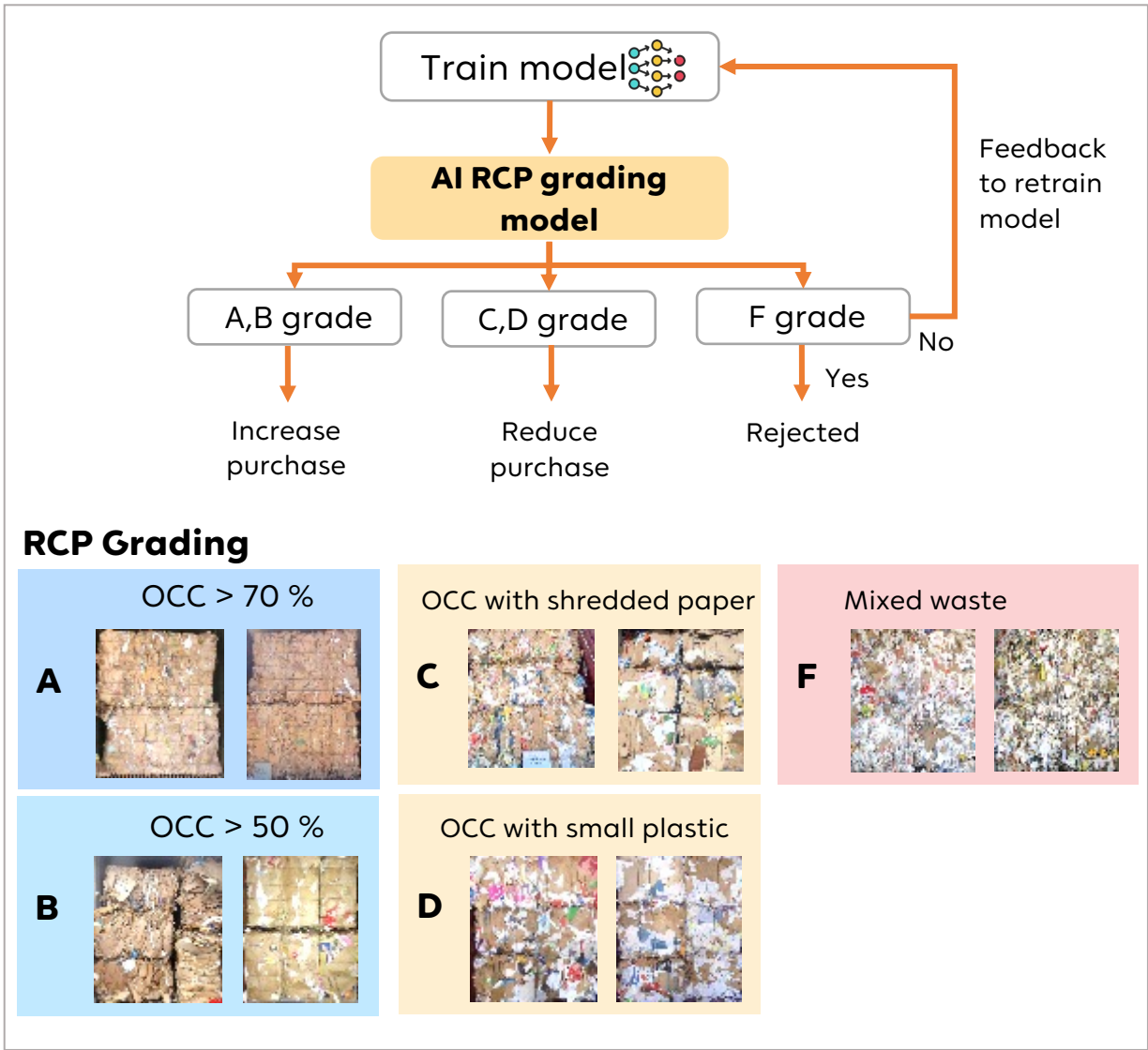## AI Image analysis for log size detection system

AI-image log size detection to automate measurement, improve yield and enhance equipment reliability via mobile and real-time CCTV.
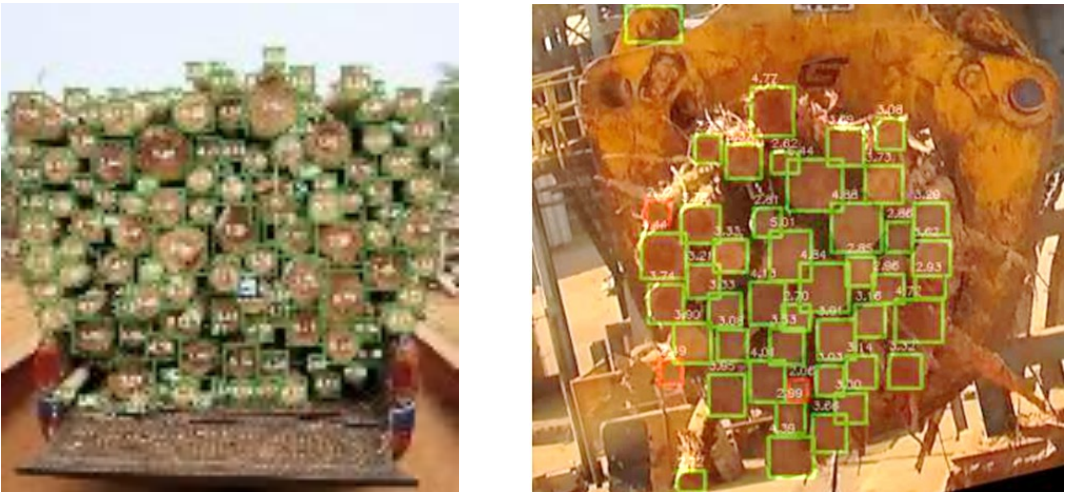
Results:

Yield
▲ **3%**

Use case: RCP quality detection
Ensure RCP quality, supply availability and minimized risk

Suppliers send images of each uploaded layer and upload them to operation system

Train model

Feedback to retrain model

AI RCP grading model

A,B grade → Increase purchase

C,D grade → Reduce purchase

F grade → No / Yes → Rejected

Upload image

Response outcome

RCP Grading

A — OCC > 70 %

B — OCC > 50 %

C — OCC with shredded paper

D — OCC with small plastic

F — Mixed waste

1

2

3

4

HAMU 189873
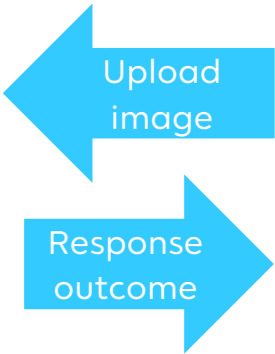
Results: **% Reject**

Use case: Paper quality prediction

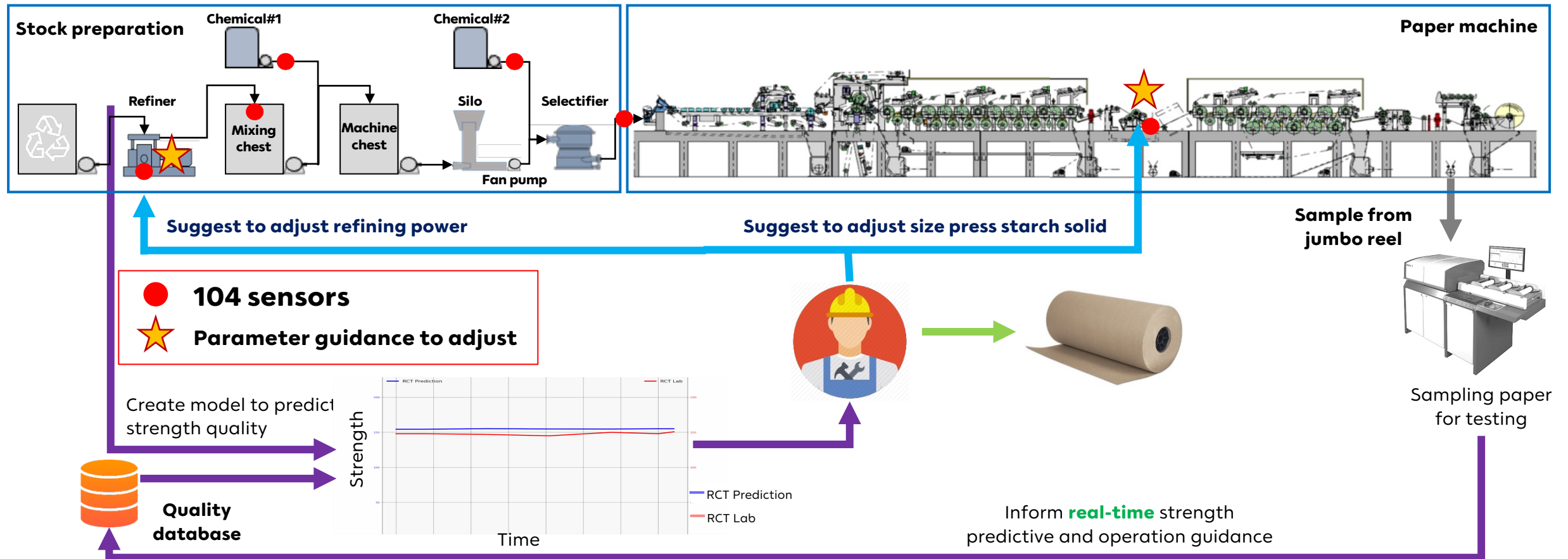Formulate an AI-based paper strength predictive model for real-time quality monitoring and process adjustment

Stock preparation

Chemical#1

Chemical#2

Paper machine

Refiner

Silo

Selectifier

Mixing chest

Machine chest

Fan pump

Suggest to adjust refining power

Suggest to adjust size press starch solid

Sample from jumbo reel

● **104 sensors**

⭐ **Parameter guidance to adjust**

Create model to predict strength quality

Strength

Time

RCT Prediction

RCT Lab

RCT Prediction

RCT Lab

Quality database

Sampling paper for testing

Inform **real-time** strength predictive and operation guidance
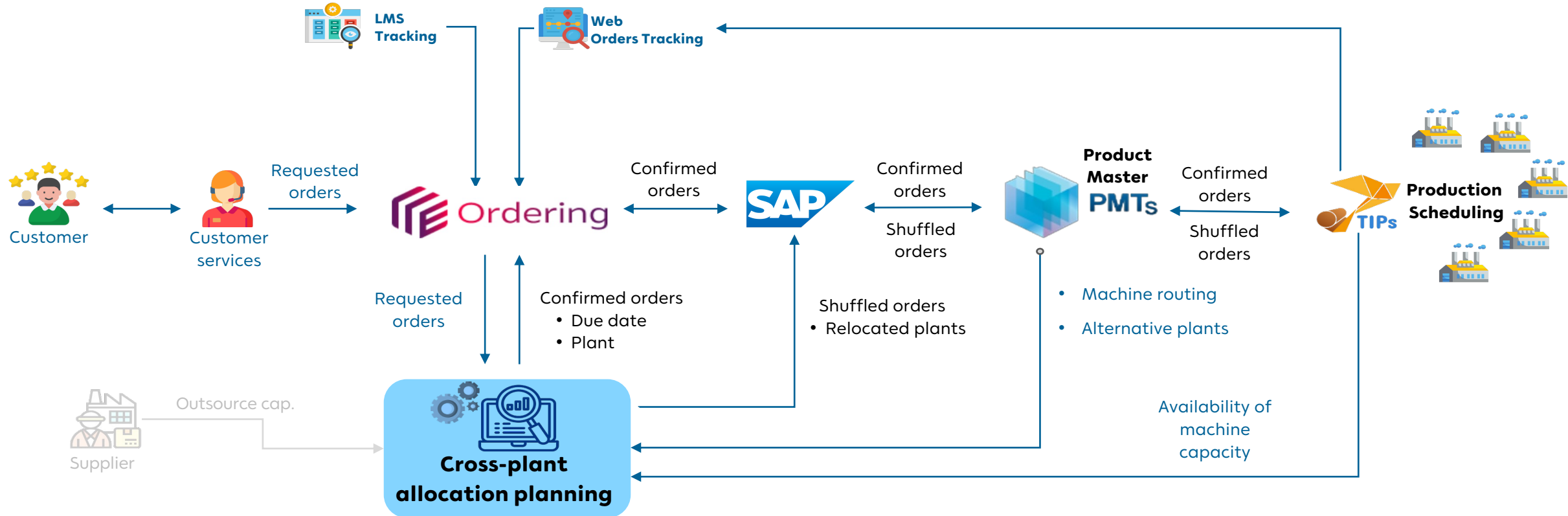
Results:

% Waste reject ▼

Cost reduction ▼

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Use case: Cross-plant allocation planning

Manage orders by allocating them across 15 plants to meet customer due dates with production cost efficiency

LMS Tracking

Web Orders Tracking

Customer

Customer services

Requested orders

Ordering

Confirmed orders

SAP

Confirmed orders

Shuffled orders

Product Master PMTs

Confirmed orders

Shuffled orders

Production Scheduling

Requested orders

Confirmed orders
- Due date
- Plant

Shuffled orders
- Relocated plants

- Machine routing
- Alternative plants

Availability of machine capacity

Supplier

Outsource cap.

Cross-plant allocation planning

Results:

Order lead time

▼ **28%**

Cost saving from plant relocation

▼ **15%**

Use case: Sheetboard allowance optimization

Develop a ML model to optimize sheetboard allowance for production planning, reducing waste and minimizing rework

Identify significant parameters:
from a pool of 85 variables across machines, operations and product specifications data

Color	Significant
CutSheetLeng	Significant
CutSheetWid	Not Significant
Order_Quant	Highly Significant
Total Process	Not Significant
Flute	Significant
Machine	Significant
Weight	Significant

Machine learning model (MAPE=81.5%):
Enhance predictive performance by using a stacked ensemble approach

Production scheduling integration:
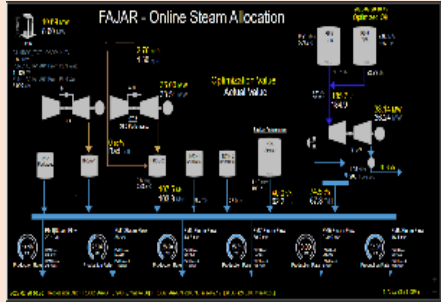Real-time allowance guideline for production planner

% Excessive waste

Baseline

Goal

2024   2025
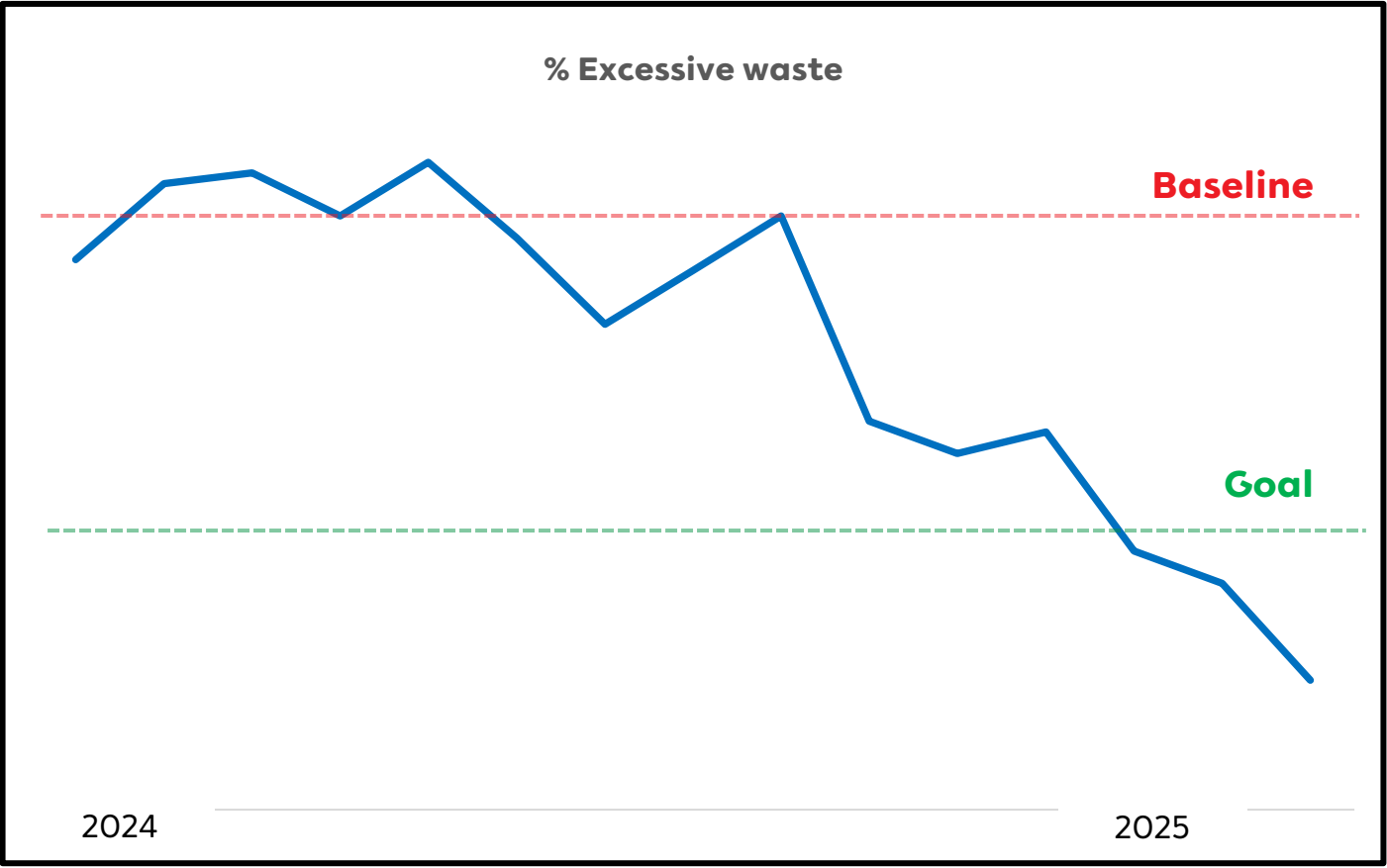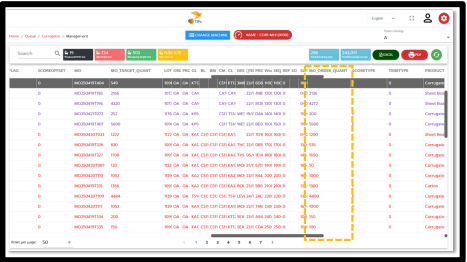
Results:

Excessive waste	Re-plan work
▼ **43%**	▼ **49%**

Use case: Energy efficiency improvement

Integrate AI technologies to fully optimize energy consumption across demand and supply

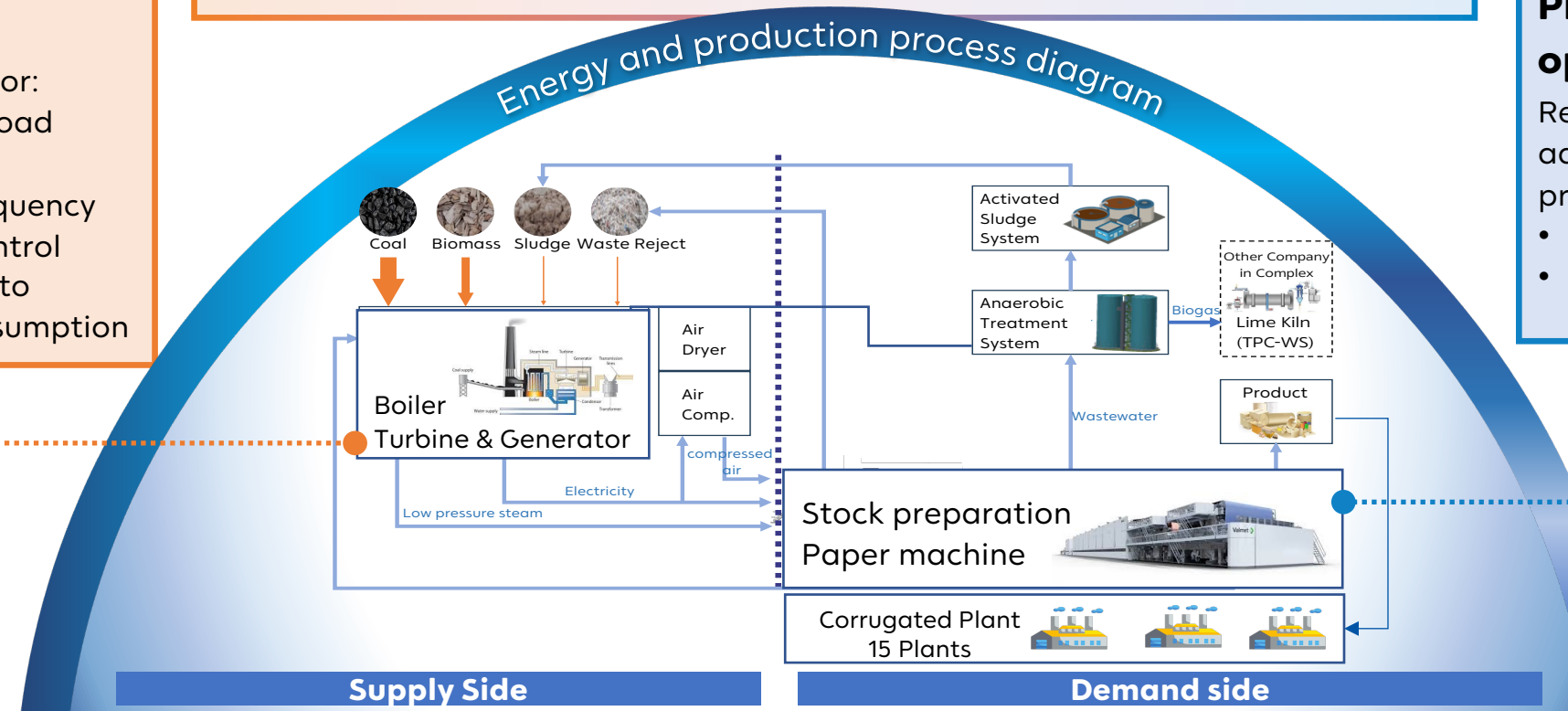## Energy common platform

Increase machine reliability

- Anomaly detection: early warning of equipment failure or performance issues such as condenser tube fouling, condenser heat overload, or motor malfunction
- Self-service analytics : enable engineers to develop machine learning models to enhance machine reliability

Power plant optimization

- Turbine generator: optimal steam load allocation
- Soot blower frequency
- Combustion: control excess O_2 levels to reduce fuel consumption
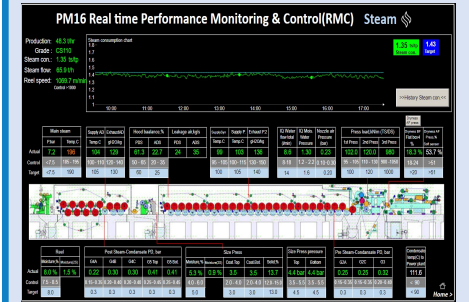
Production energy optimization

Recommend operational adjustments in the production process for:

- Steam reduction
- Power reduction

Energy and production process diagram

Coal   Biomass   Sludge   Waste Reject

Boiler Turbine & Generator

Air Dryer

Air Comp.

Activated Sludge System

Anaerobic Treatment System

Biogas

Lime Kiln (TPC-WS)

Other Company in Complex

compressed air

Electricity

Low pressure steam

Wastewater

Product

Stock preparation Paper machine

Corrugated Plant 15 Plants

Supply Side
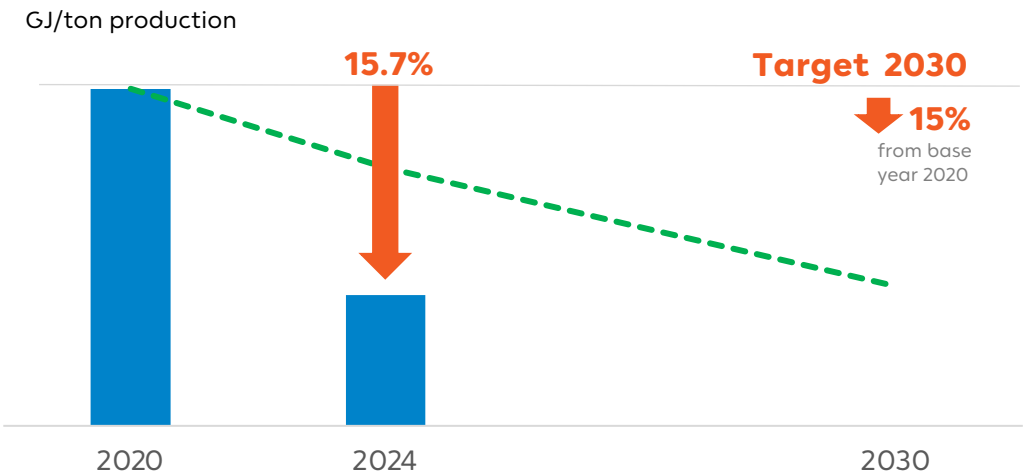
Demand side

Results:
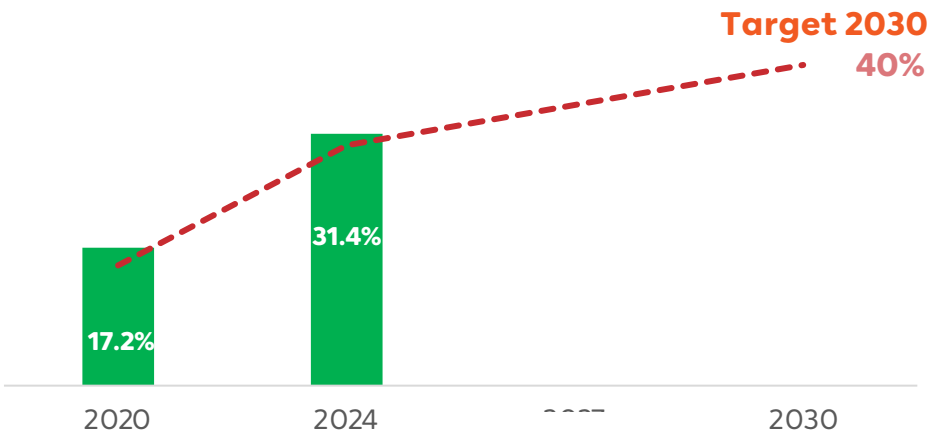
Power consumption

▼ **7%**

GHG reduction roadmap and sustainability performances

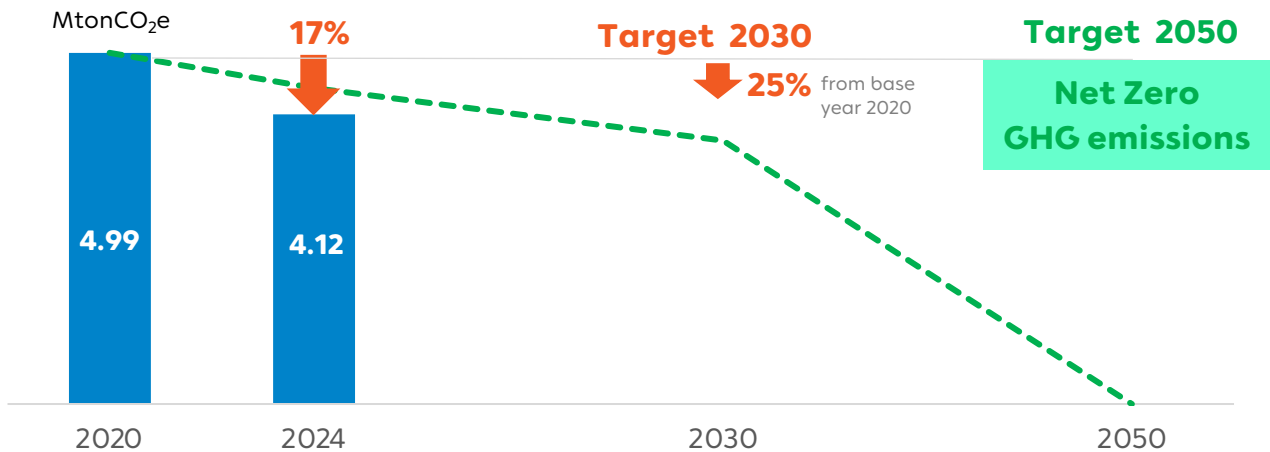Digital transformation is one of key strategies to reduce energy consumption and achieve net zero roadmap by 2050
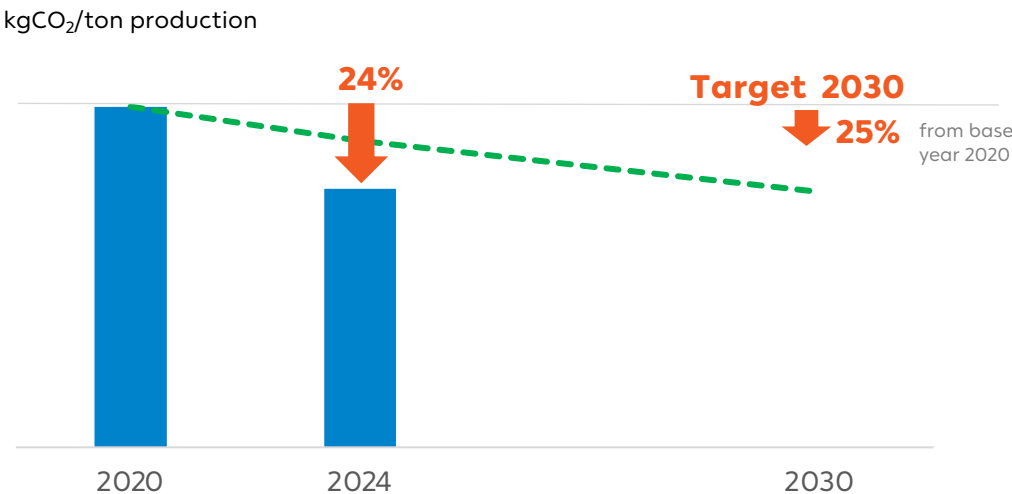
Energy intensity

GJ/ton production

15.7%

Target 2030

⬇ 15%
from base year 2020

2020   2024   2030

% Renewable energy

Target 2030
40%

17.2%   31.4%

2020   2024   2030

Scope1+2 GHG emission

MtonCO$_2$e

17%

Target 2030

⬇ 25% from base year 2020

Target 2050

Net Zero GHG emissions

4.99   4.12

2020   2024   2030   2050

GHG intensity

kgCO$_2$/ton production

24%

Target 2030

⬇ 25% from base year 2020

2020   2024   2030

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Performance Dashboard

Visualize and monitor process performance for sustainable continuous improvement
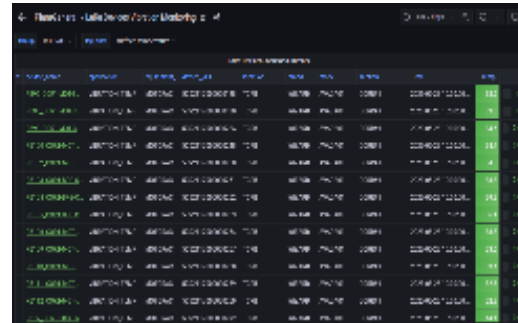
Overview
- Machine performance
- Machine status
- Automated WIP

Maintenance
- Vibration monitoring via LoRa sensor

Corrugating Process
- Steam & Boiler efficiency
- Quality inspector status
- Glue kitchen operation

Converting Process
- Process capability
- Quality inspector status
- % Replan

Utility
- Electricity consumption
- Solar panel efficiency
- Air compressor performance

Quality Control
- % Returned goods
- Non-conformity
- Process control

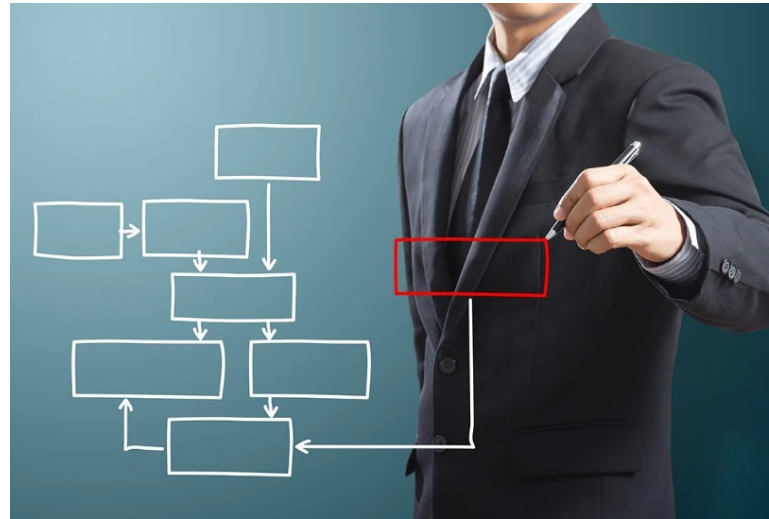## Planning & Logistics
- Order DTR-DTP
- Paper roll inventory

Safety
- Risk area
- Site inspection status

Key takeaway

Lean, automation, digitization & AI

Process approach

Culture & employee involvement

End of presentation