Agenda - Precision in feed production

- Environmental Impact Services
- Transparency – Overall Equipment Efficiency
- PelletingPro – Next level in pelleting performance

BÜHLER

Bühler Services
Partnering for better outcomes

Environmental Impact Services

We simplify your sustainability journey.

BÜHLER

We believe that sustainability is the outcome of good business decisions.

By quantifying environmental & business metrics, companies can economically reduce their footprint & differentiate their brand and products.

When sustainability is profitable, it will scale.

We **simplify** your Sustainability journey

Assess your business & sustainability performance. Quantify the footprint of your company & products, track key operational metrics to gain transparency and build a strategy to differentiate your products and economically reduce your footprint.
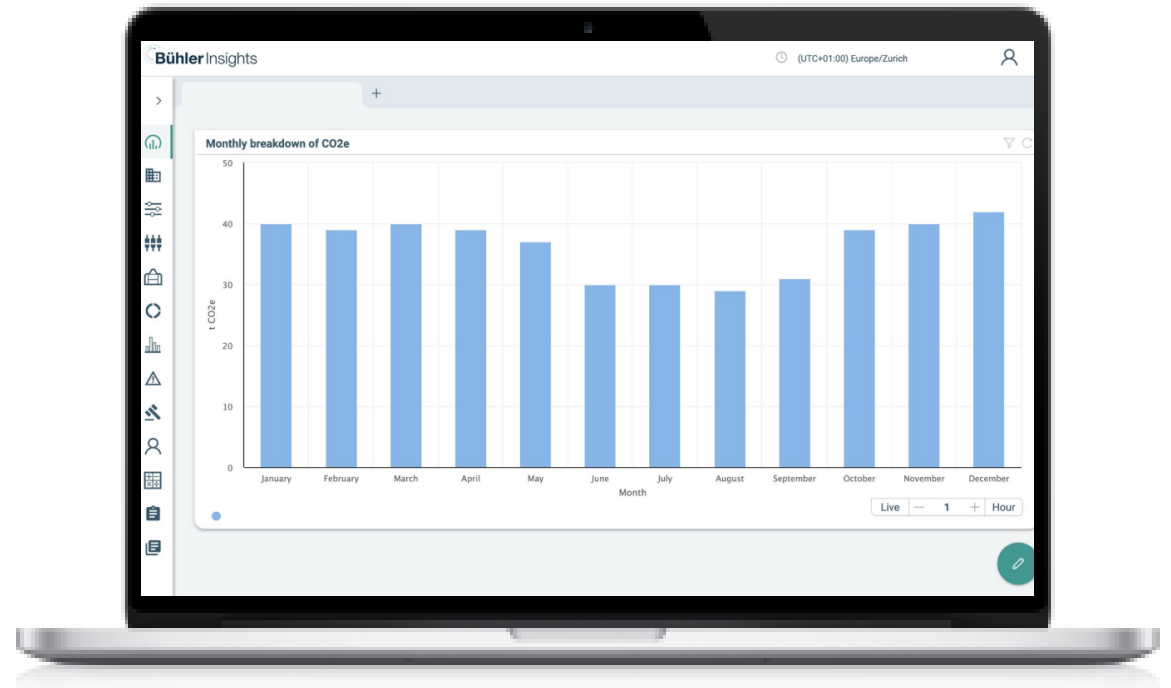
Act on the key levers to optimize your operations & supply chain and communicate outcomes to your stakeholders. Bring your organization together with training and align around one business strategy

Monitor your implementations to build momentum, generate business & sustainable outcomes. Mitigate future risk against competition, price volatilities & regulations.
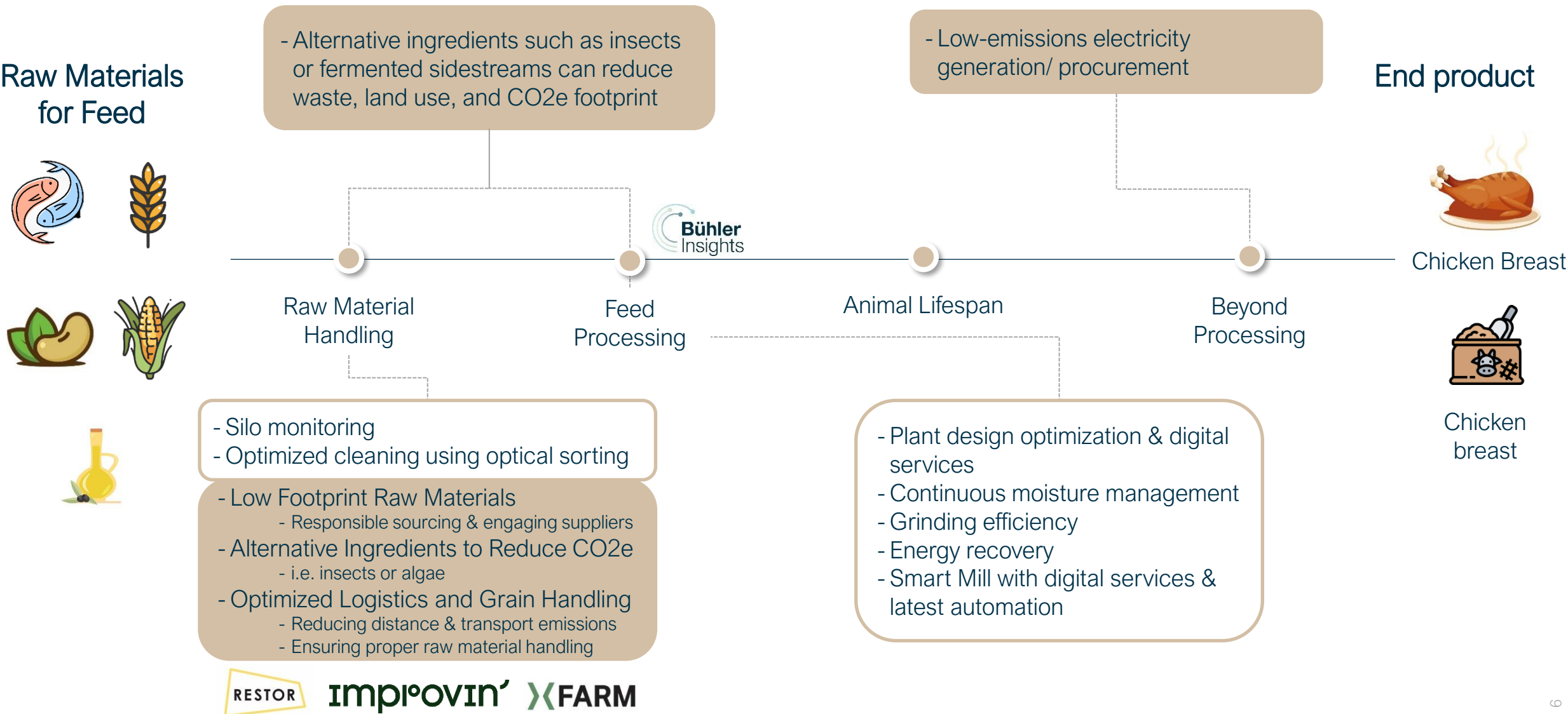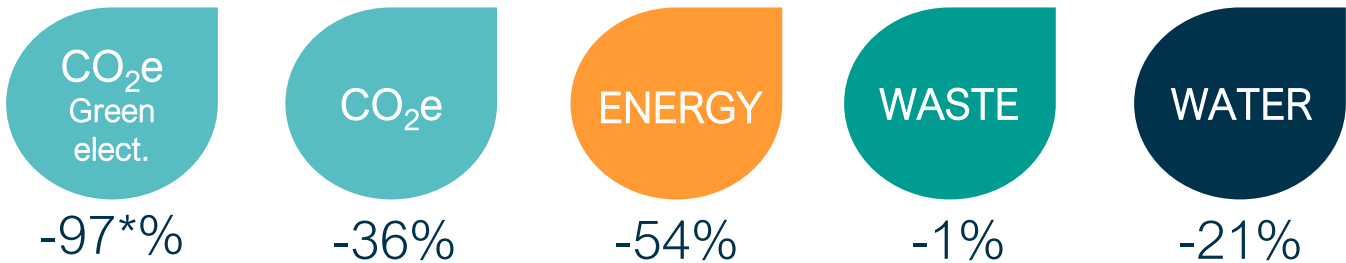
Assess your business & sustainability performance
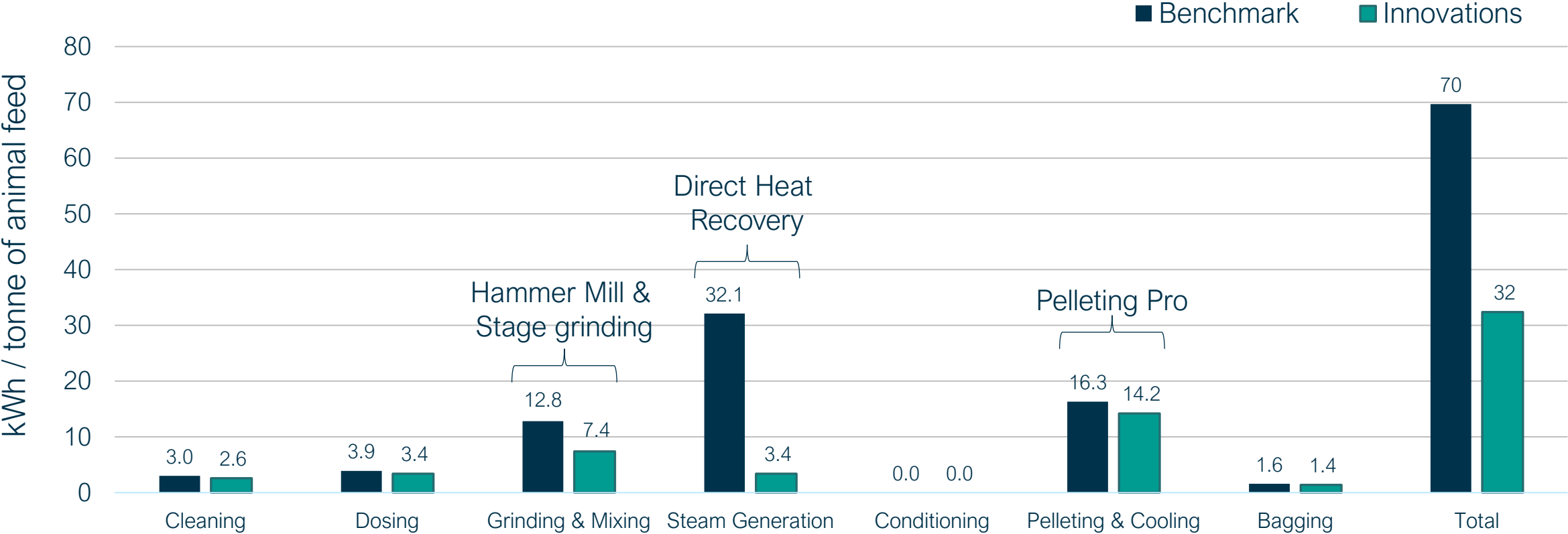## Across the entire animal protein value chain

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Raw Materials for Feed

- Alternative ingredients such as insects or fermented sidestreams can reduce waste, land use, and CO_2e footprint

- Low-emissions electricity generation/ procurement

End product

Bühler
Insights

Chicken Breast

Raw Material Handling

Feed Processing

Animal Lifespan

Beyond Processing

Chicken breast

- Silo monitoring
- Optimized cleaning using optical sorting

- Low Footprint Raw Materials
  - Responsible sourcing & engaging suppliers
- Alternative Ingredients to Reduce CO_2e
  - i.e. insects or algae
- Optimized Logistics and Grain Handling
  - Reducing distance & transport emissions
  - Ensuring proper raw material handling

- Plant design optimization & digital services
- Continuous moisture management
- Grinding efficiency
- Energy recovery
- Smart Mill with digital services & latest automation

RESTOR IMPROVIN' XFARM

Act on key levers to optimize your operations

CO$_2$e Green elect.
-97*%

CO$_2$e
-36%

ENERGY
-54%

WASTE
-1%

WATER
-21%

Actions for reduction at the plant level:

- Energy reduction through plant optimization actions plan from PAW

■ Benchmark   ■ Innovations

kWh / tonne of animal feed

	Cleaning	Dosing	Grinding & Mixing	Steam Generation	Conditioning	Pelleting & Cooling	Bagging	Total
Benchmark	3.0	3.9	12.8	32.1	0.0	16.3	1.6	70
Innovations	2.6	3.4	7.4	3.4	0.0	14.2	1.4	32

Hammer Mill & Stage grinding

Direct Heat Recovery

Pelleting Pro

Monitor implementation & build momentum with digital & automation solutions

BUHLER

Annual performance of key operational metrics & carbon footprint

Site by site to identify economic reduction potential & gain ownership

Absolute & normalized values to account for business performance

Optimize electricity, gas & water use to reduce cost and footprint. Track reductions in process, building & infrastructure

Annual, monthly and/or real time consumption. APIs available.

Use historical data to identify trends

Annual Monthly Consumption
for Organisation Name

From	To	Site	
2022 ▼	2024 ▼	Overview ▼	Generate

Absolute　**Normalized**

Electricity (Normalized)

Legend: 2022, 2023, 2024

y-axis: kWh / Ton (0, 2, 4, 6, 8)

x-axis: January, February, March, April, May, June, July, August, September, October, November, December

Key success factors: integrating operational & sustainability metrics, establish ownership across the company, one aligned strategy

Differentiate your product and your brand with product assessments

BUHLER

Chocolate LCA

Load

Ingredients Recipe

Milk Chocolate ▾

Edit | New

Packaging Recipe

Simple LDPE + Paper ▾

Edit | New

Production Settings

Global Average Production Settings ▾

Edit | New

Distribution Transport

Germany ▾

Edit | New

Save | Download ...

Bar chart — kg CO_2e / tonne of product vs Lifecycle Phase:
- Ingredients: 8756
- Packaging: 268
- Transport: 27
- Manufacturing: 290
- Distribution: 12
- Total: 9352

Match your product assessments to your operations

Save multiple recipes & settings provide product-level

Integrate third party data to build low-footprint products & support your customers sustainability journey

Load different recipes & product settings and reduce reporting time

Key success factors: combine supply chain strategy & product assessments, train product management & sales to use material

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Partnering for better outcomes

Transparency – Overall Equipment Efficiency
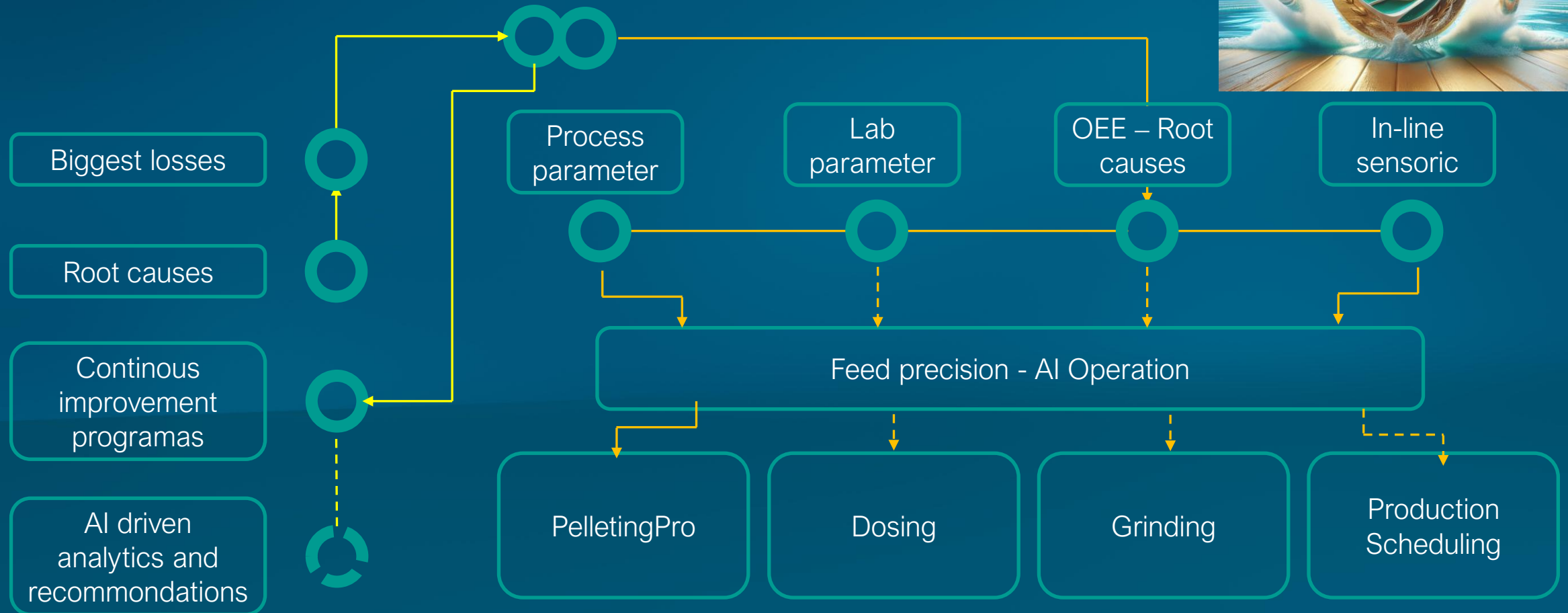
Feed production- Requirements

Olympic in operation

- Digital twin of all plants

- Same KPI's for all plants

- Consolidated view on corporate level

- AI production

| Qualified OEE A x P x Q | KPI's | Continuous improvement program (AI support) | Digital Twin (AI support) |

AI Companion & AI Production

Digital Products - OEE Calculation

OEE is a metric that measures the **operating efficiency** of equipment. This indicator reflects the true productive capacity of industrial equipment and reveals process waste (waste, rework, stoppages, breakdowns, slow speed, etc.) that prevent it from operating at full capacity.
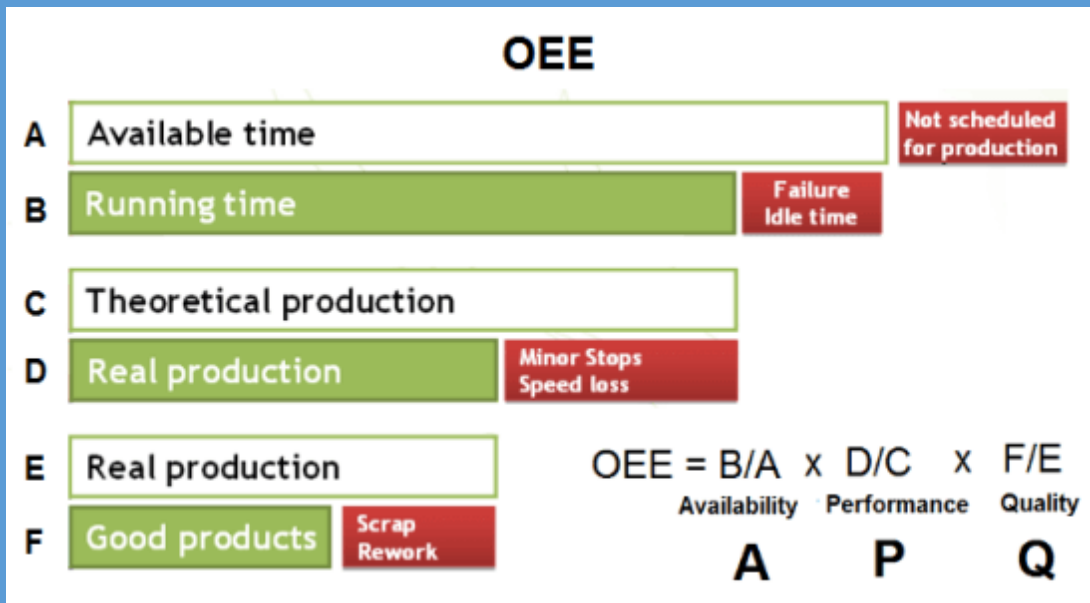
AVAILABILITY: It is calculated by comparing the actual production time with the planned production time.

PERFORMANCE: This parameter indicates the production performance during the operating time compared to what should have been produced at the ideal cycle time

QUALITY: It is the result of the calculation of the good product in relation to the total number of finished products produced.

Companion Plus App
Flexible data input
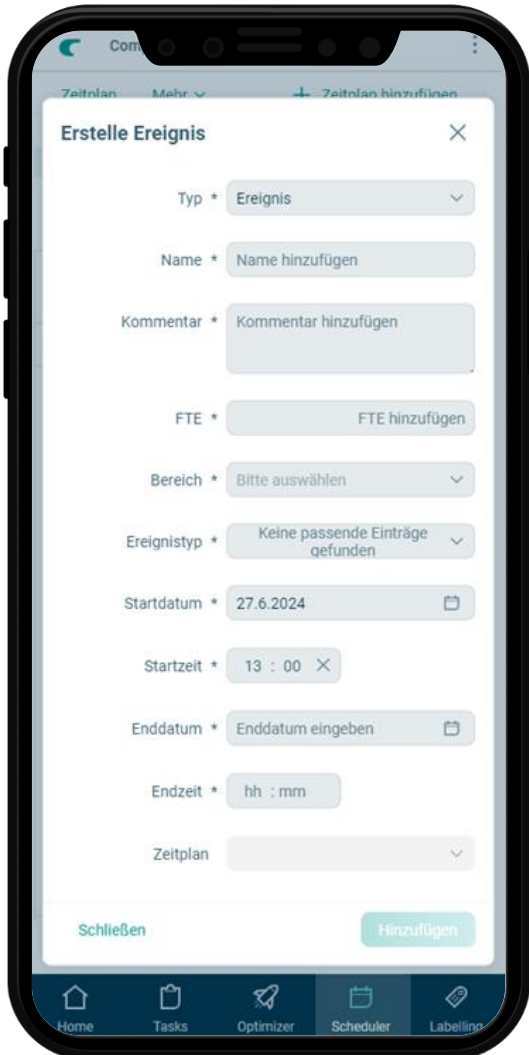
The Companion Plus App allows flexible data inputs like:

- production related task management
- production time scheduling
- labelling of events
- direct connection to Bühler Insights via API
- AI features

Overall Equipment Effectiveness (OEE) – Dashboard information
## Do you know your plant efficiency?

Benchmark: 90%

80%

Benchmark: 95%

85%

Benchmark: 99%

95%

Benchmark: 85%

65%

Availability

Solutions to measure and improve:
- Companion Plus App (measure & label)
- Pelleting Essential
- Pelleting Companion (+1%)
- PelletingPro (+2%)
- Plant Essential

Performance

Solutions to measure and improve:
- Companion Plus App (measure & label)
- Pelleting Essential
- Pelleting Companion (+1%)
- PelletingPro (+10%)
- Plant Essential

Quality

Solutions to measure and improve:
- Companion Plus App (measure & label)
- PelletingPro
- Plant Essential

OEE

Numbers show typical OEE values and show world-class benchmark* as comparison.

* Source: https://www.oee.com/world-class-oee

Overall Equipment Effectiveness (OEE) – Dashboard information & Digital Twin
- Implementation of continuously improvement programs

Root cause analytics · Digital Twin
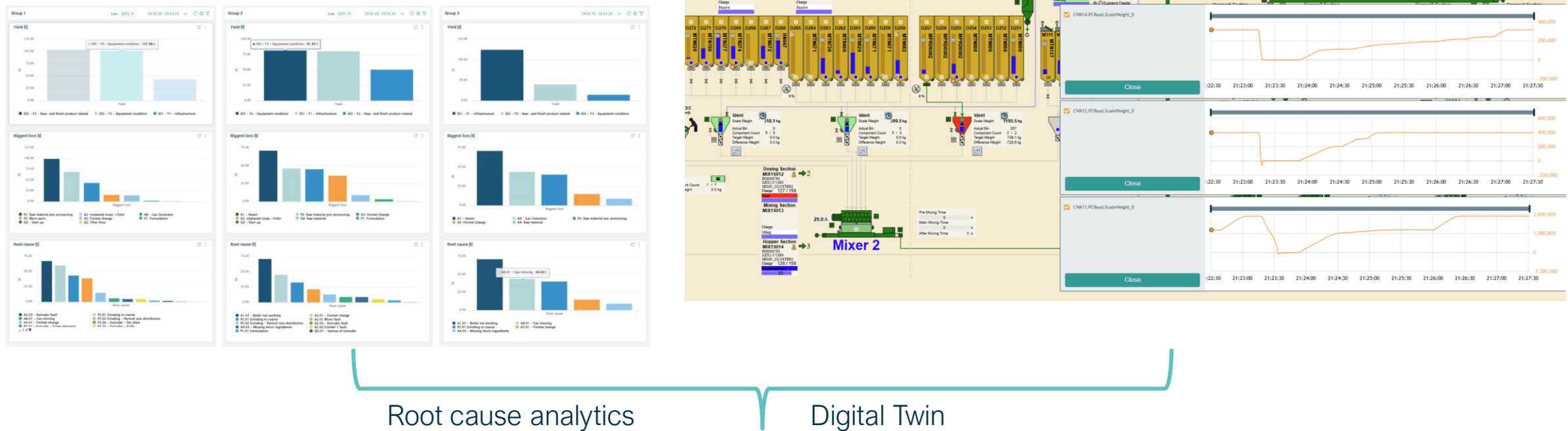
Continuously Improvement Programs (OPEX improvement)

by AI analytics for

Categories/ Biggest losses / Stable production

PelletingPro
Next level in pelleting performance

01

PelletingPro - Challenges

Producing safe, high-quality feed at minimum cost

Raw material

Quality | Availability
Moisture | Sustainability

Production

Capacity | Stability
Operator skills | Energy

Weather effects

Product moisture | Yield
Feed safety

PelletingPro - Challenges
Yield in the feed plant
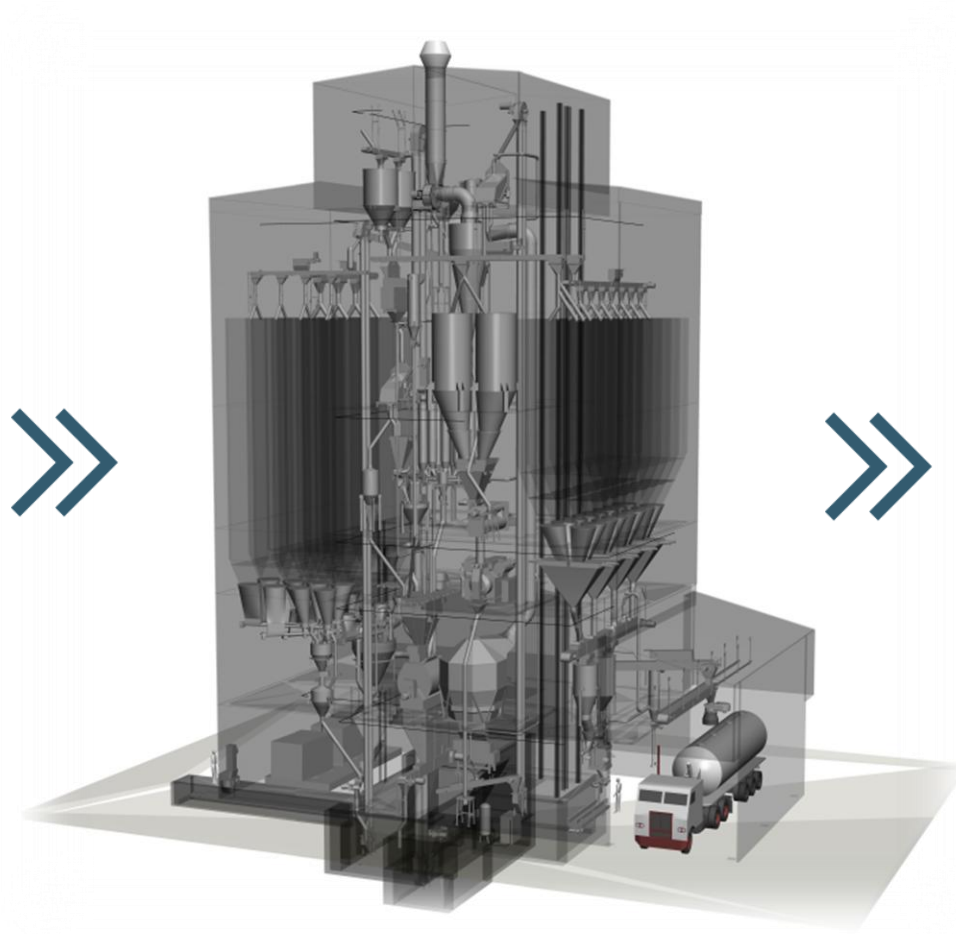
100'000 tons raw material input
Yearly capacity of a pelleting line

1% or 1'000t yield loss*
equals to 300'000 € of lost raw material
*mainly through inconsistent product moisture

PelletingPro - Challenges
Pellet-moisture and seasonal effects

Raw Material

Seasonal effects lead to raw material moisture content fluctuation

Moisture content of raw materials in mixer
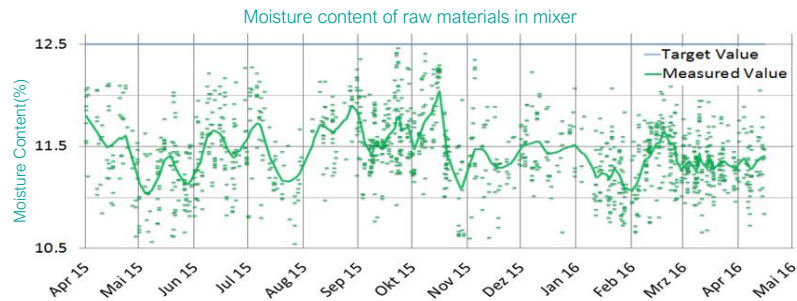
Solution: DCMA moisture addition batchmixer

Operation

Unintended drying during cooling affected by seasonal variability

Moisture content of war materials in mixer
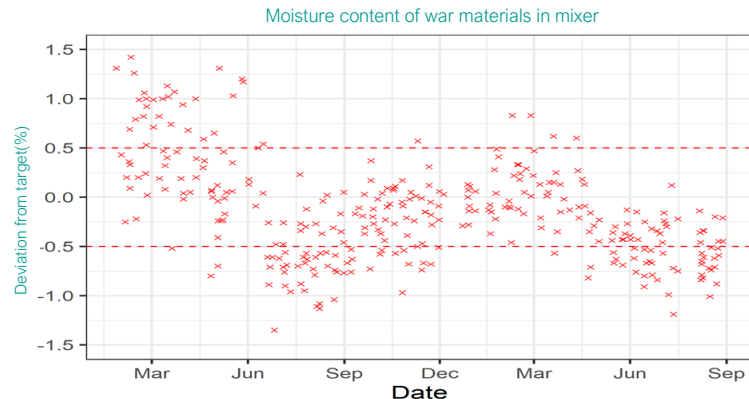
Solution: DCMA moisture addition batchmixer

02

PelletingPro - benefits

PelletingPro
Next level in pelleting performance

up to **+1%…**

Yield increase on the pelleting line saves 1'000 tons of raw materials or 300'000 € in costs per year, ROI < 1 year

up to **+20%…**

Pelleting line throughput up to plus 20'000 tons a year

up to **-20%…**

Less specific energy consumption saves up to 300 MWh or 100 tons of CO_2e per year

PelletingPro | Sales presentation

PelletingPro
Next level in pelleting performance

01 Stabilization of pellet moisture in a range of +/- 0.5 pp of the defined target value

02 Throughput increase due to process stability and increased machine availability

03 Less required interaction of operators

04 Positive effect on feed safety

05 More efficient use of micro-ingredients

03

PelletingPro

What is it?

PelletingPro – Next level in pelleting performance
How does it work?

Step 1
Define pellet moisture target

Step 2
Detect feed mash moisture incl. climate and process conditions

Step 3
Regulate water dosing by using smart, predictive algorithm

Step 4
Optimized pellet moisture distribution & process stability
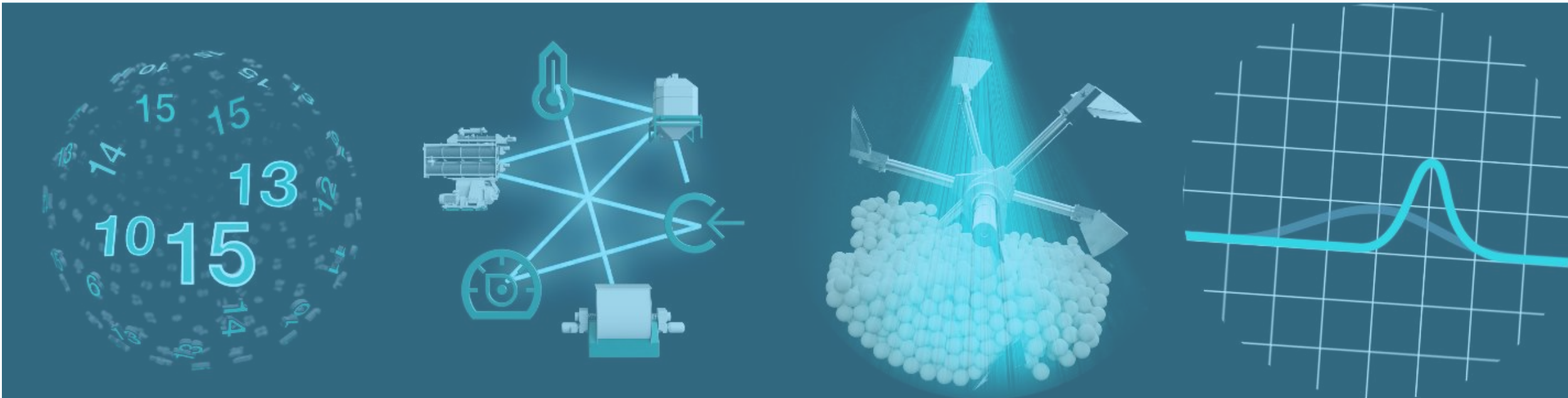
PelletingPro – Next level in pelleting performance
The result

Pellet moisture variation: ± 0.5 ppt

Pellet moisture variation with *PelletingPro*
(continuous measurement)
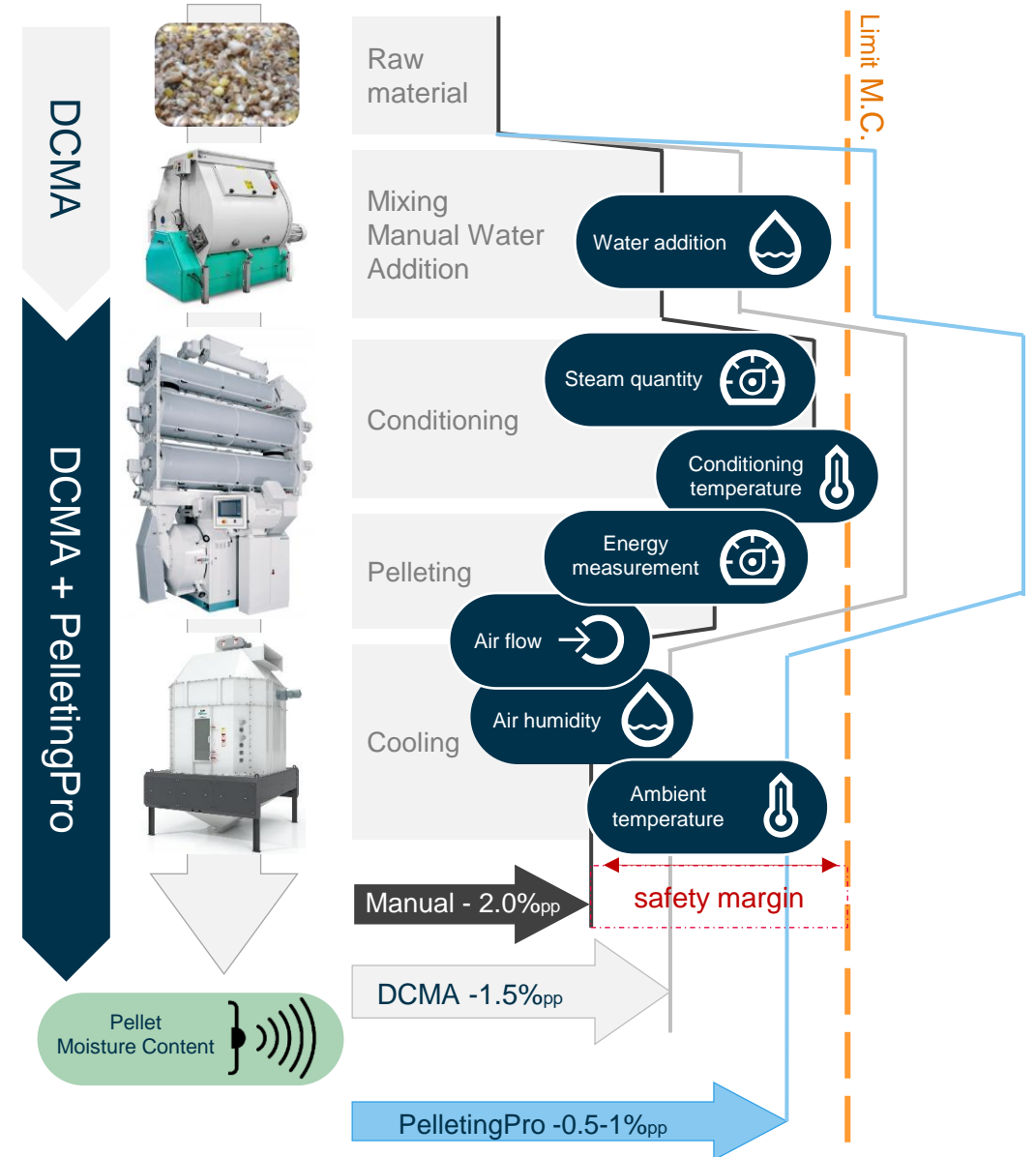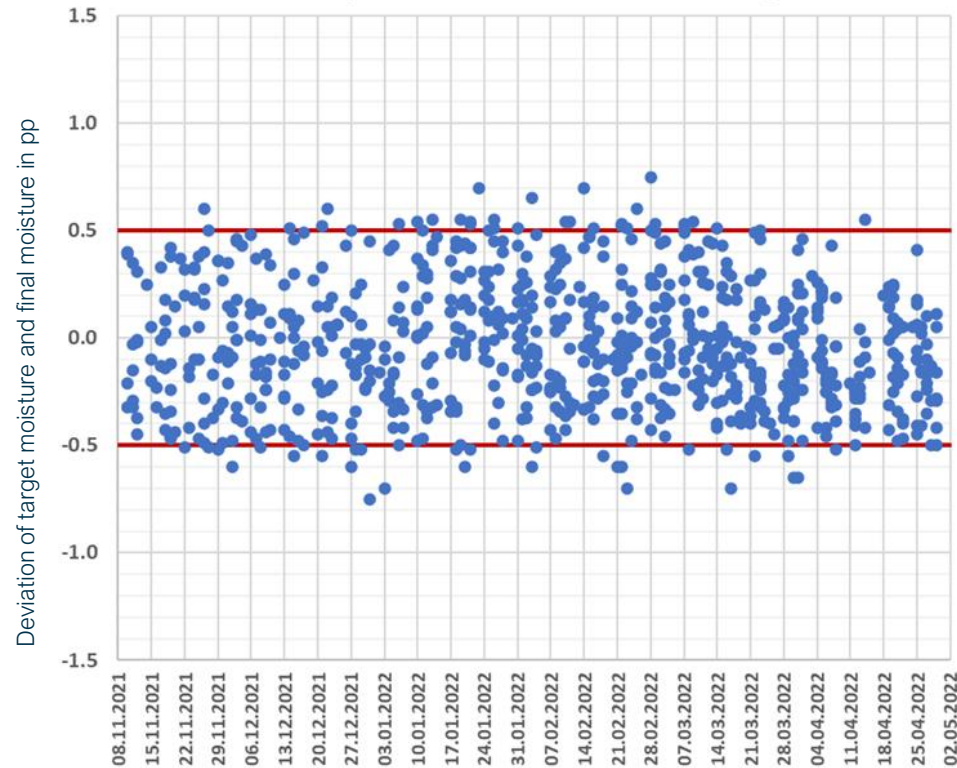
Multi NIR-Inline System

Smart pelleting process control

Moisture control sensor package

Pellet moisture sensor

PelletingPro – Features
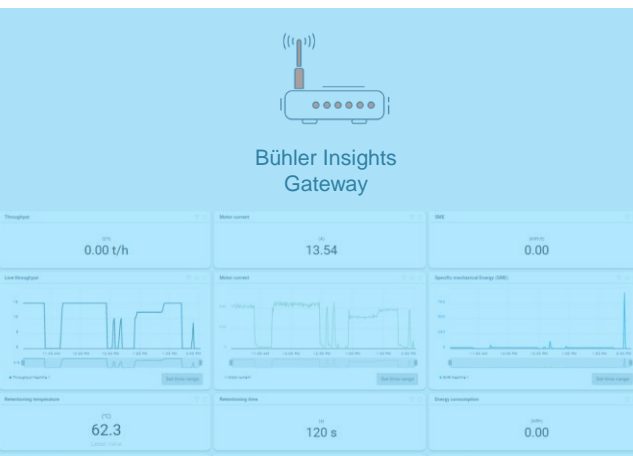
Bühler Insights gateway & Pelleting Essential

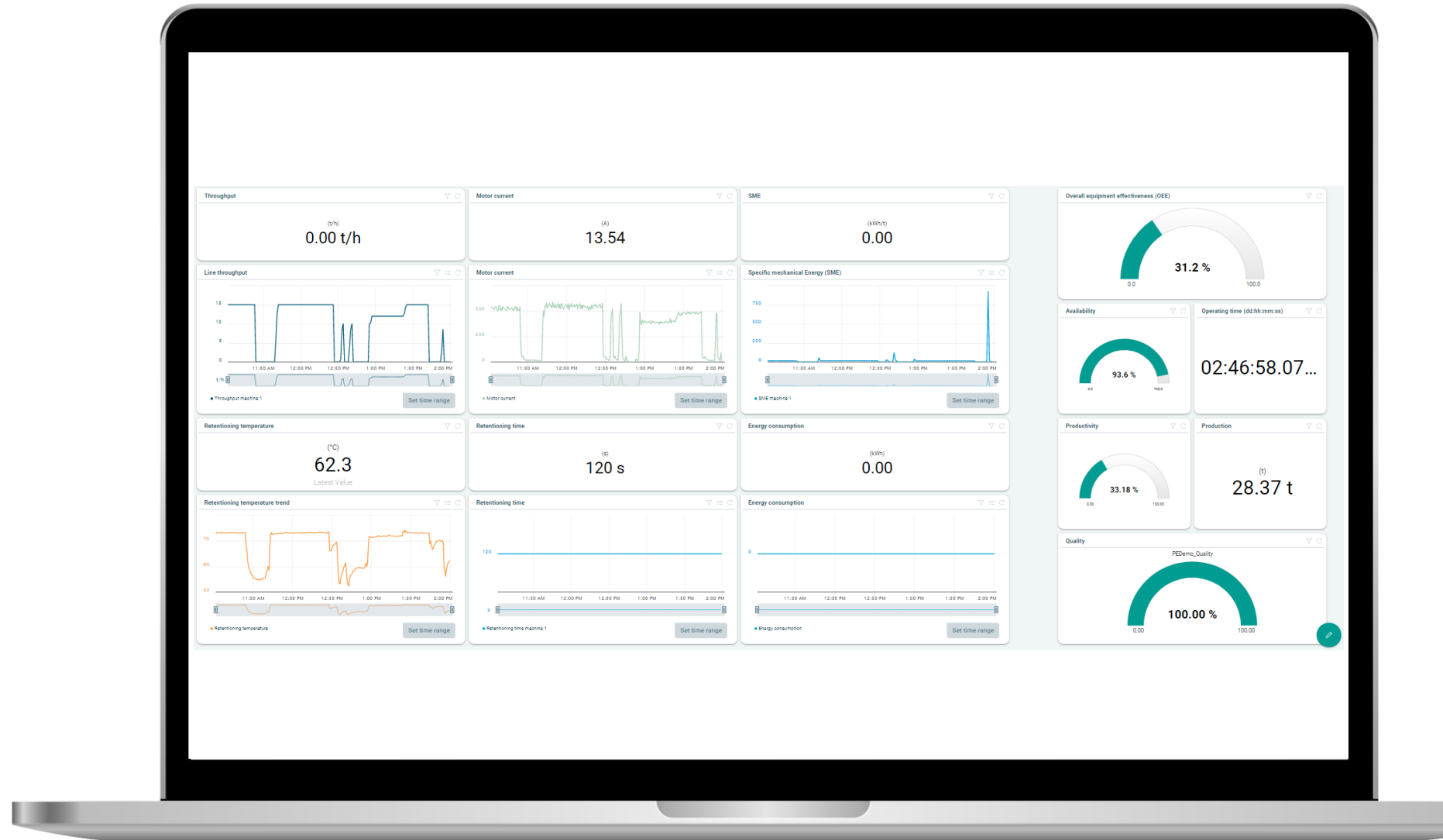Automatic pellet moisture control

Moisture optimization algorithm

PelletingPro dashboard

PelletingPro
Pelleting Essential dashboard

Pelleting Essential

The Bühler Insights dashboard ensures maximum transparency about pelleting performance and KPIs.
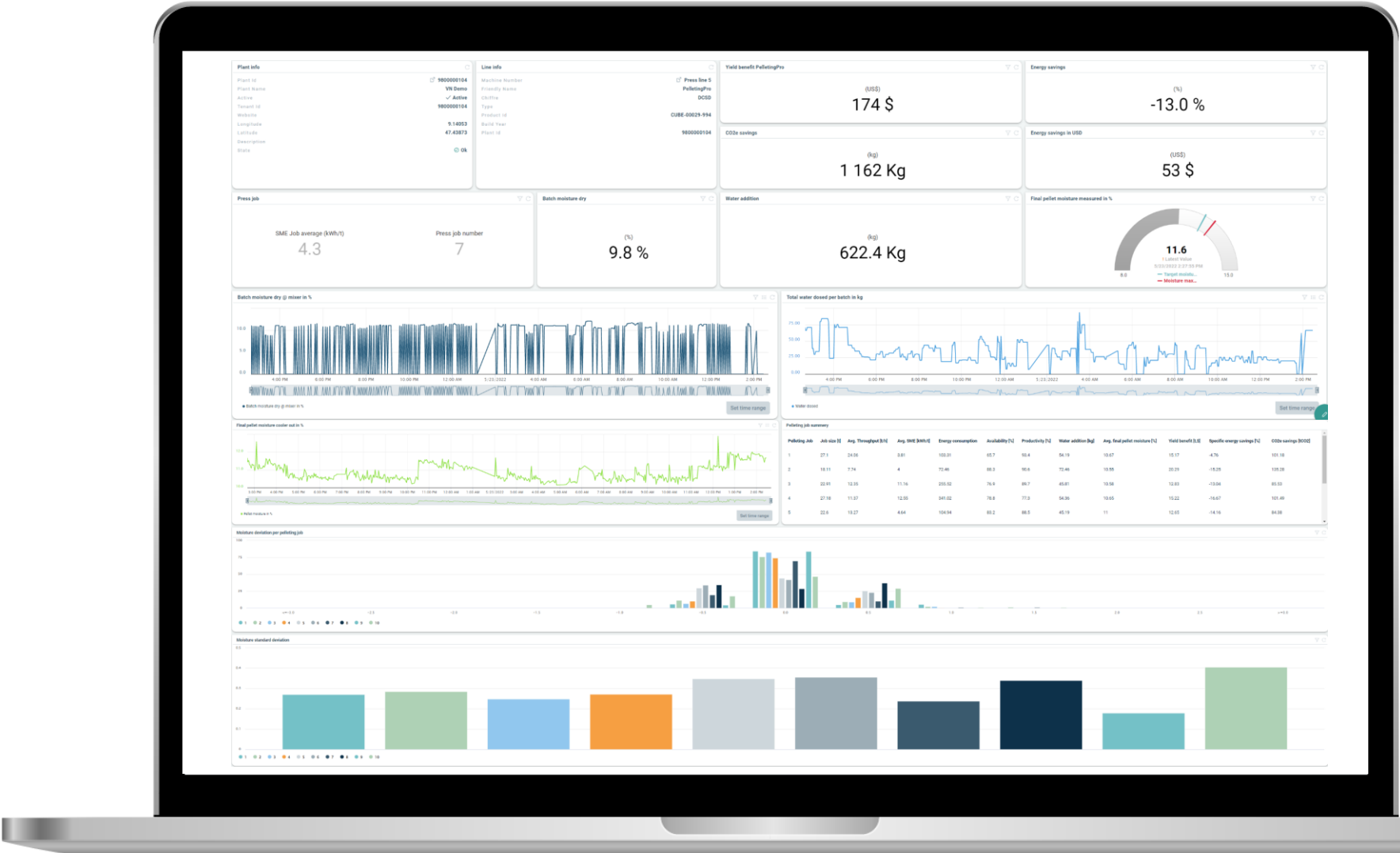
PelletingPro
PelletingPro dashboard
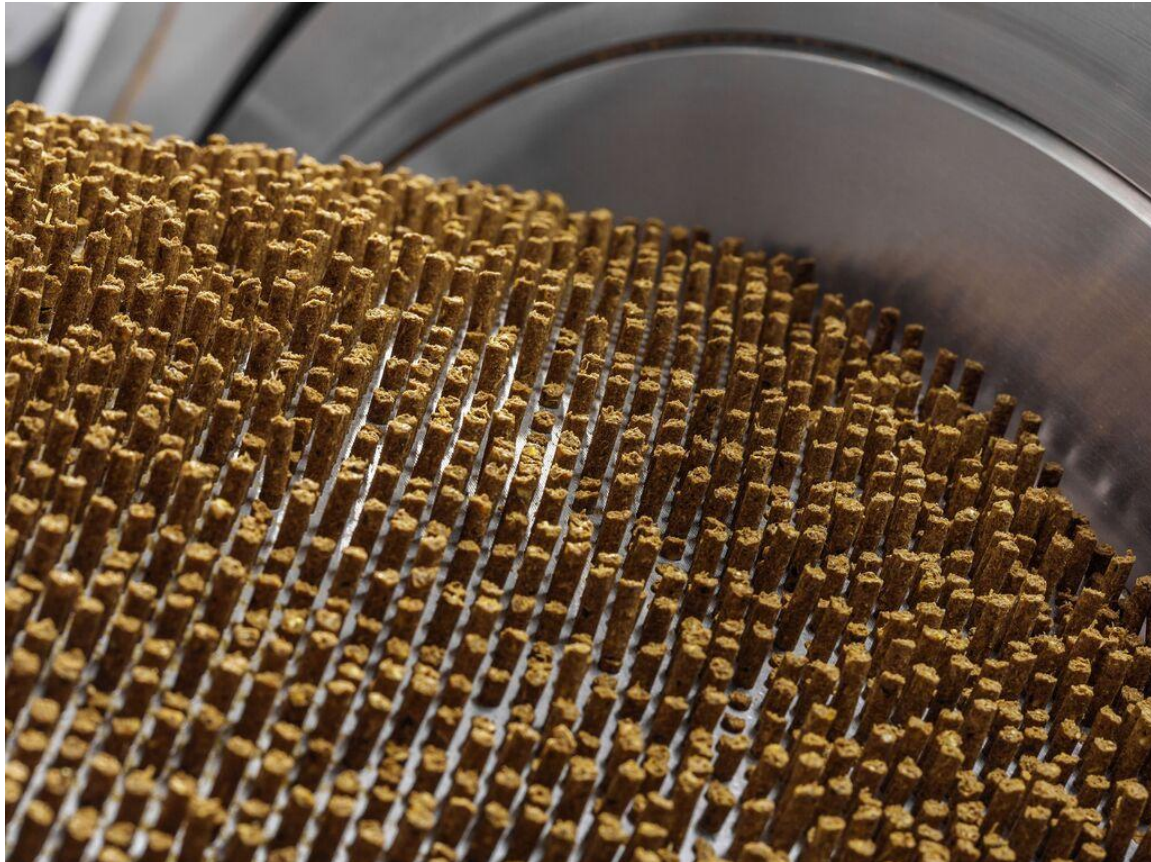
PelletingPro

The specific PelletingPro dashboard summarizes the performance of the solution.

04

Sustainability – CO_2e savings

Environmental quantification

Customer Benefit

* of 100,000 tons/year @1% yield increase

Considering a typical pelleting line*,

PelletingPro can save up to
2,000 tonnes CO_2e/year,

which is equivalent to the drawdown

capacity of
100'000 trees/year.

Operational Excellence

Recap: How to win the Olympic gold medal

- Implement a digital vision
  - Developed a Digital Strategy for your Company
  - Start with transparency. OEE, Biggest Losses, AI reporting
- Collect data wherever possible and make them for AI Analytics and AI Models available
- Do the implementation step by step.
  - Take care on change management
- Have your cost under control

A view tips

- Use as less as possible platforms
- Data must present a holistic 360° view
- Implement teams for process optimization and continuously improvement programs