Key Parameters for Milling Excellence

Georg Schafler

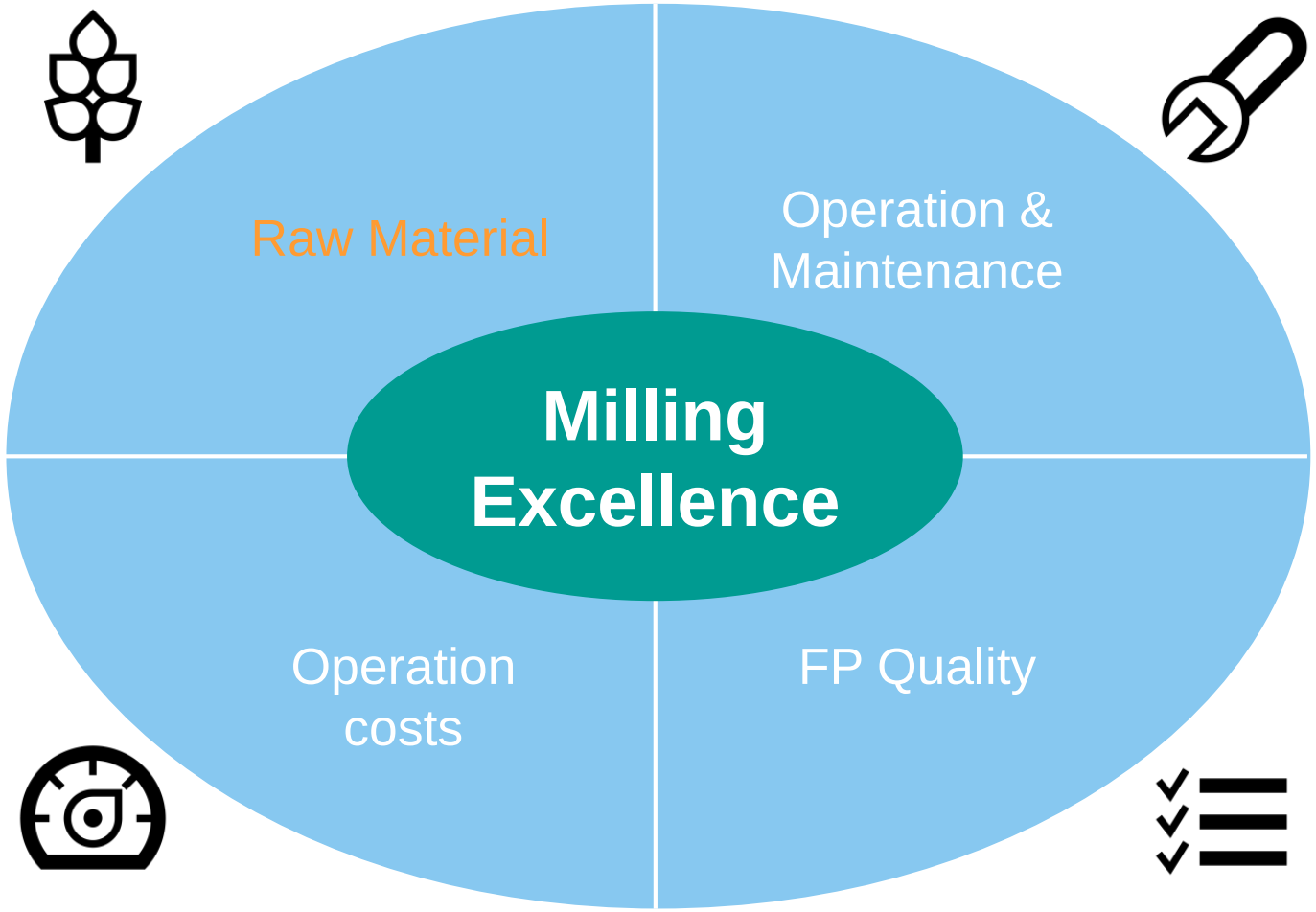
Innovations for a **better world**.

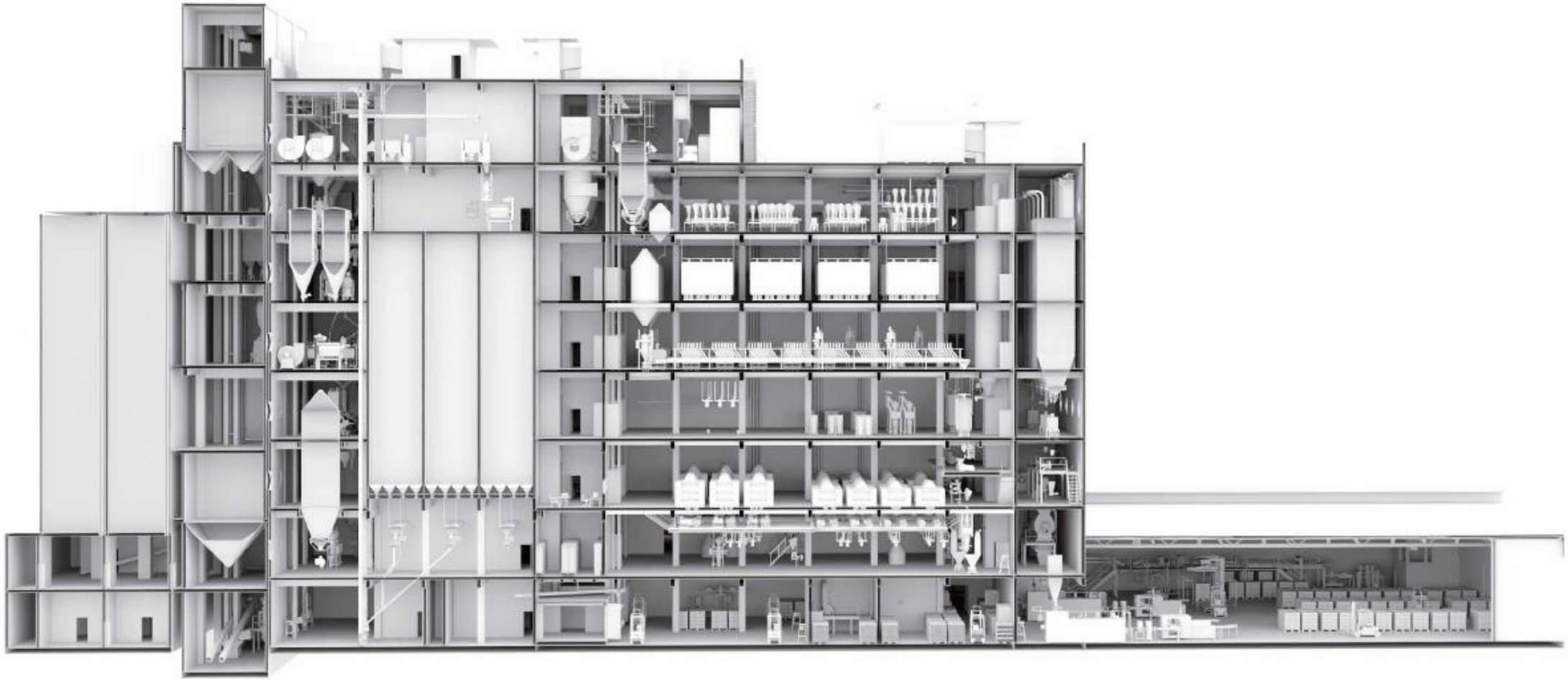
BÜHLER

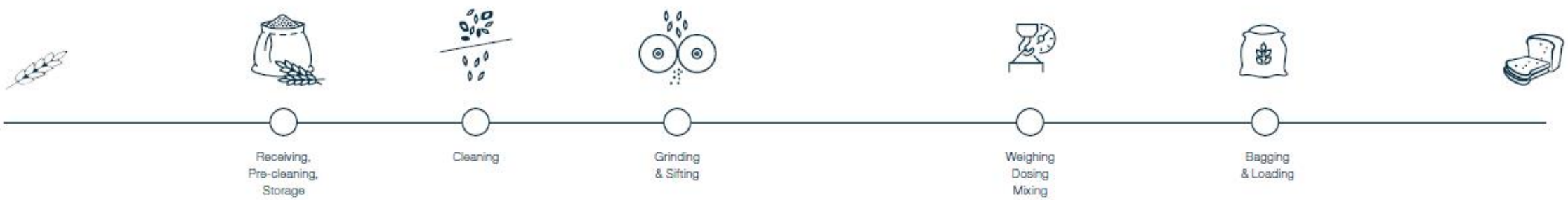
What means Milling Excellence?

What are the targets of Milling Excellence?

Landscape of Milling Excellence.






Receiving,
Pre-cleaning,
Storage
Cleaning
Grinding
& Sifting
Weighing
Dosing
Mixing
Bagging
& Loading

Raw Material.

- Definition and accuracy of wheat blend.
- Design of cleaning process and accuracy of cleaning machines.
- Design and accuracy of wheat dampening and tempering.
- Design of grinding process.
- Yield Management System.

Wheat Blend.

- Is maybe the most important process step at all in flour milling.
- Is the base for raw material costs and finished product quality.
- Requires high accurate dosing devices for constant wheat blends.

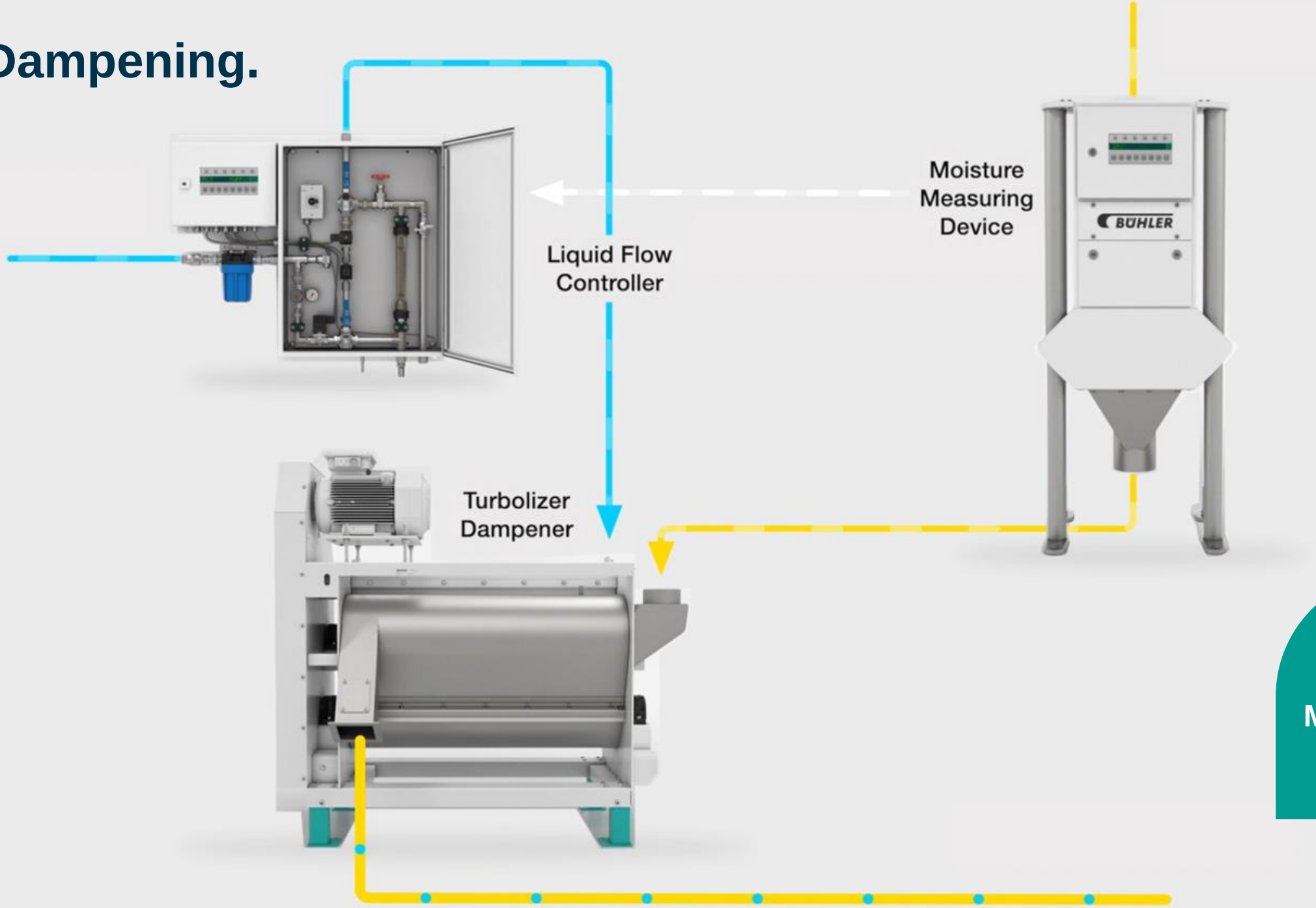
Recipe Management

Cleaning Process.

- Correct choice of cleaning machines.
- Correct order of cleaning machines.
- Special focus on magnets.
- Special focus on scales for screenings.

Weighing of Screenings

Dampening.

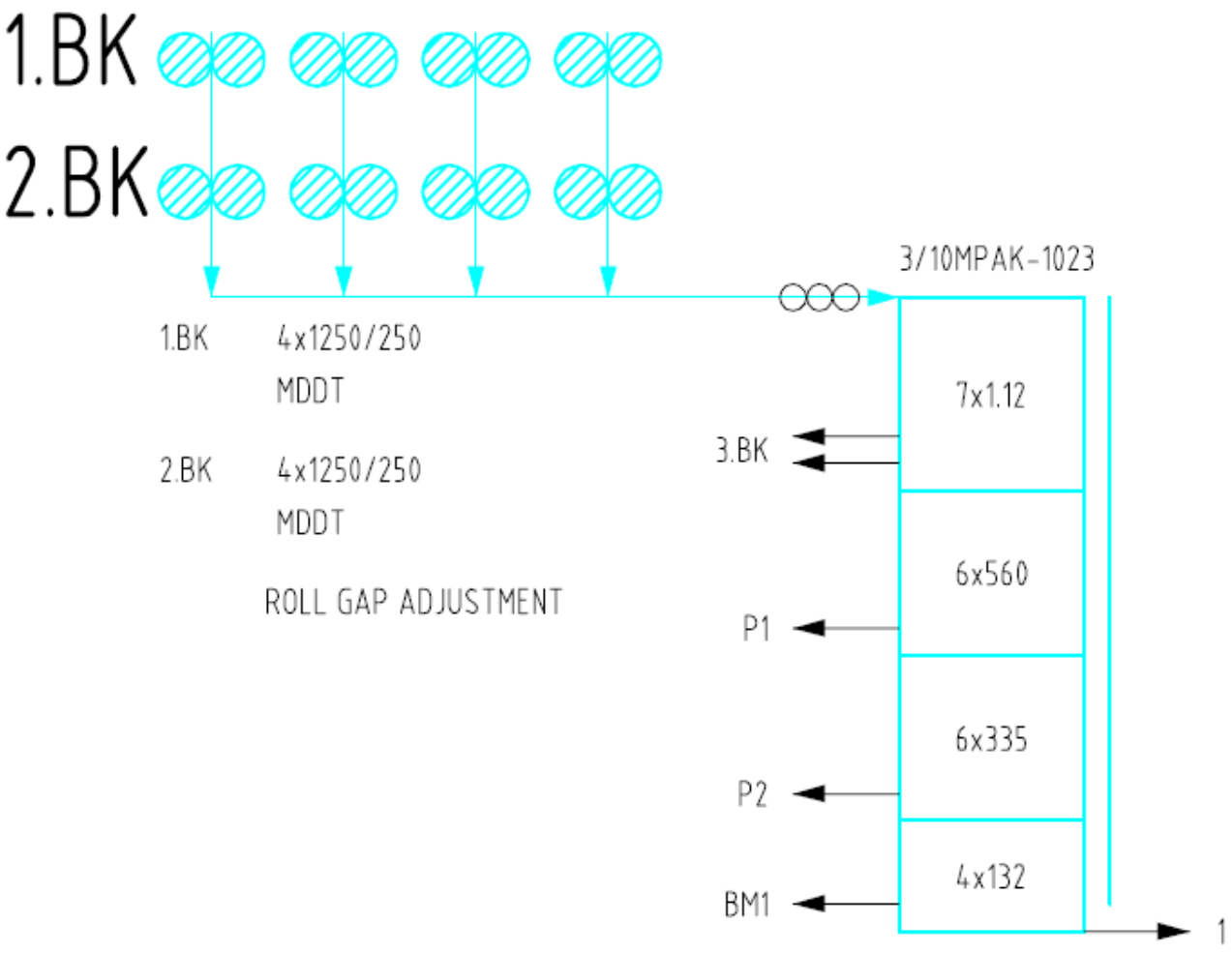


Calibration Management

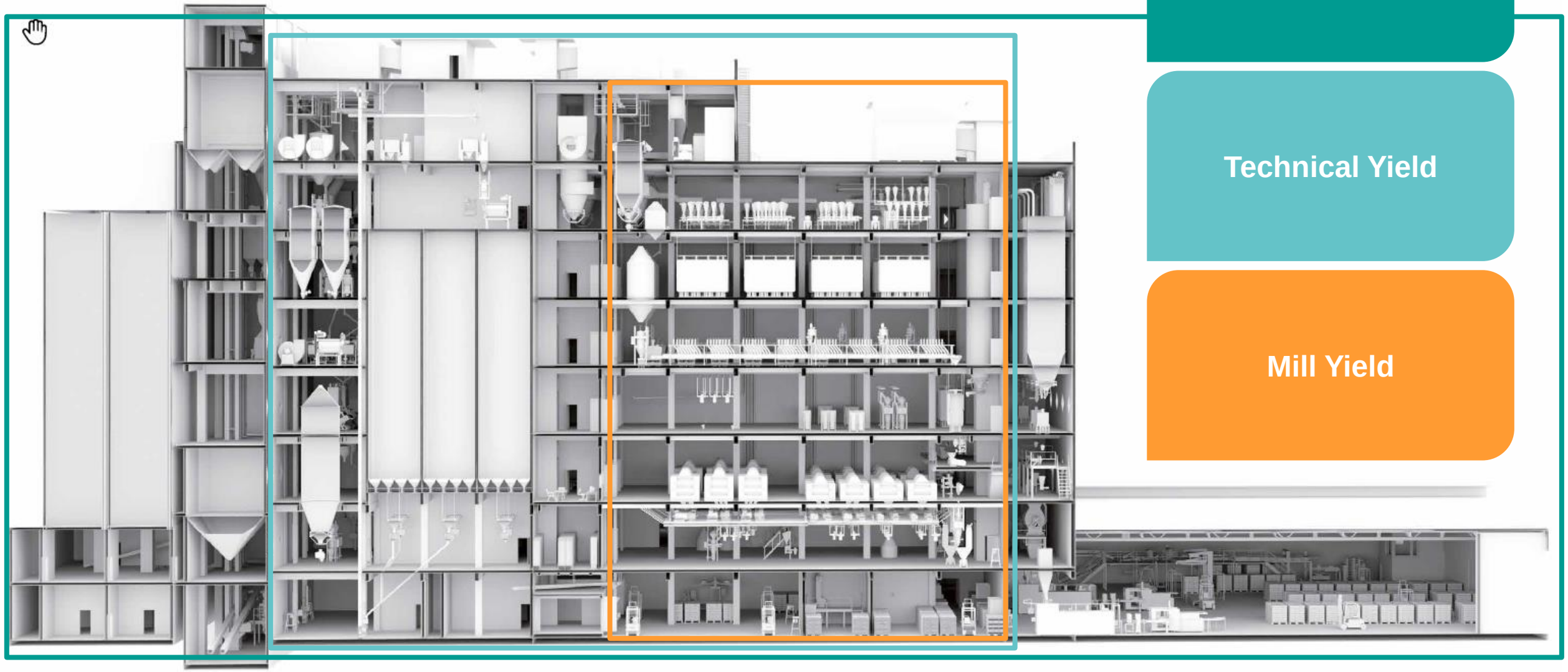
Design Grinding Process.

- Design according raw material quality and finished product specs.
- Taking raw material changes into account.
- Special focus on specific roller length and sifter surface.
- Involve design specialist.

Yield Management



Different Yield Calculations.



Commercial Yield

Technical Yield

Mill Yield

Different Yield Calculations.

Commercial yield taking into account:

- Content of screenings/impurities separated in silo and cleaning section
- Change of moisture content from raw wheat at intake to finished and by products (end of flour silo).
- Common commercial yields is difficult to determine perfectly due to huge time lags caused by the raw material and finished product storage bins.

Technical yield taking into account:

- Content of screenings/impurities separated in the cleaning section.
- Change of moisture content between raw wheat before cleaning to finished and by products (end of the flour mill).
- Common technical yield is between 98 - 102% based on cleaning section scale.

Technical yield taking not into account:

- Moisture loss in the finished products handling area.

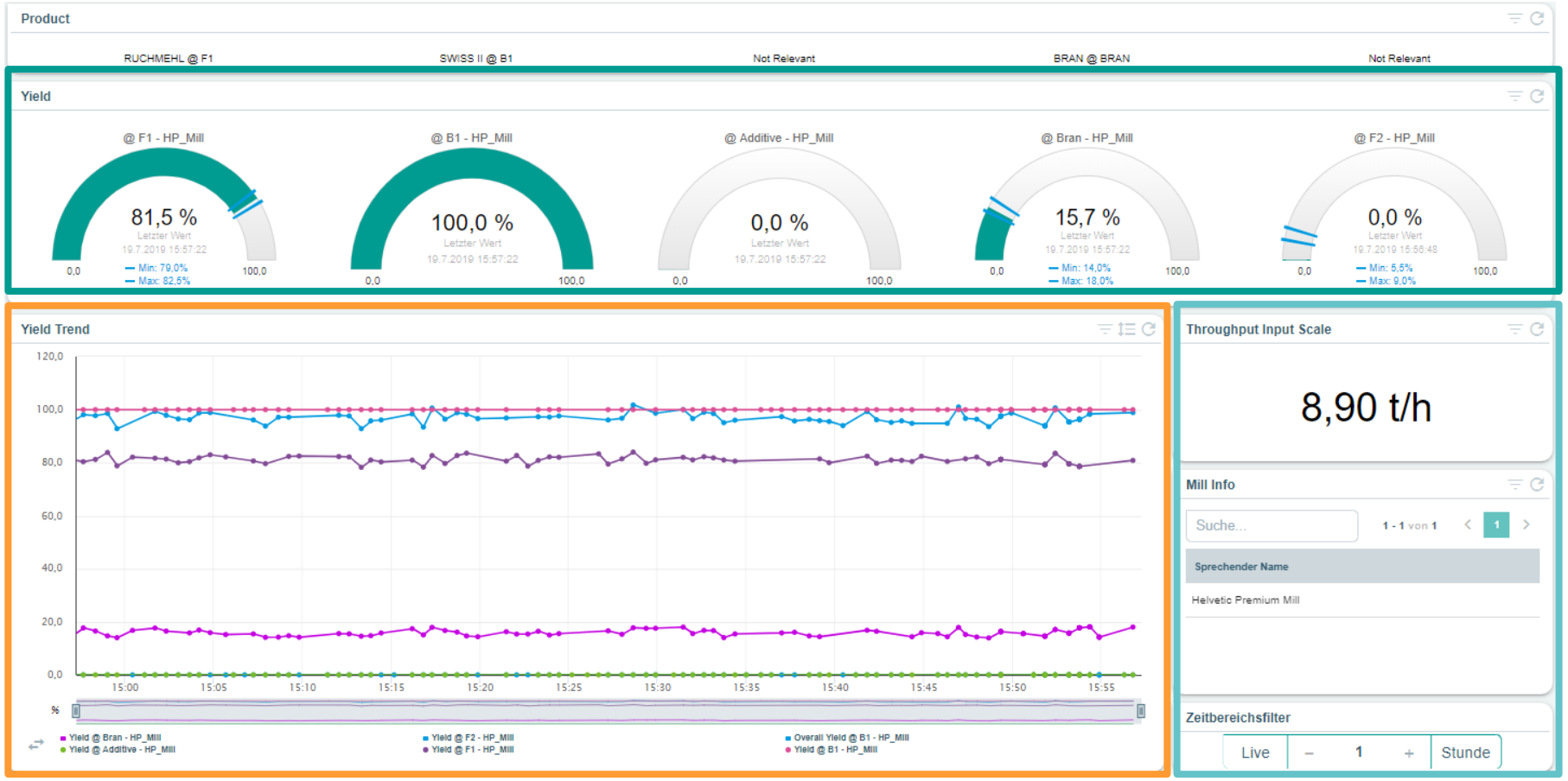
Mill yield taking into account:

- Moisture loss during milling.
- Change of moisture content between 1.Bk wheat to finished and by products (end of the flour mill).
- Common mill yield is between 96 – 99% based on 1.Bk.

Mill yield taking not into account:

- Moisture loss in the finished products handling area.
- Added screenings before the bran scale. A separate screenings scale is needed to correct the values of the bran scale by the screenings amount.

Yield Management System.



Thresholds for fast recognition of deviations

Filtering based on the job, section and time periods

Trend analysis of yield & throughput

Landscape of Milling Excellence.

Operation & Maintenance.

- **Operation**
  - Skills of employees.
  - Regular machine checks and settings.
  - Hygiene, cleanliness and pest control.
  - Break release in mill.
  - Etc. etc.

- **Maintenance**
  - Skills of employees.
  - Roll re-fluting.
  - Structured, computer-aided maintenance management system.
  - Plansifter fabrics and cleaners.
  - Exhaust filters.
  - Etc. etc.

Training Center Uzwil & African Milling School.

Human Skills & Machine Efficiency = Sustainable Improvements.

Hygiene, cleanliness and pest control.

- Hygiene and cleanliness at the workplace serve the reputation of the company, ensure a good working environment and above all contribute significantly to safety and health at work.

- Pest control is important to protect the raw material and finished products from any damage. It is the prerequisite to supply safe food to the consumers.

Break Release Method.

- Adjust the break roll as good as possible.
- Take a sample from one side of a roller pair directly underneath the rolls.
- Scale the sample (150-200g) and put it into a laboratory sifter with a screen size 1120my.
- After 3min of sifting check the through product and calculate how much in percentage it is.
- Repeat the same with the other side of the roller pair.

Break Release Standard.

- Standard release with 4 rollstands:
  - B1: 25-30%
  - B2: 50-55%
  - B3: 50-55%

- Standard release with 8 rollstands for B1/2:
  - B1: 25-30%
  - B2: 65-70%
  - B3: 50-55%

- The break release depends on wheat quality, specific roller length, number of break passages, required extraction, etc. etc.

The perfect Break Release.

- Is the base for a stable production.
- Standard values can be applied but onsite determination of the «perfect break release» is recommended.

Target is to reach maximum semolina production and maximum extraction with target ash content.

	Throughs 20W	Throughs (B1 base)	Overs 20W (B1 base)
B1	20	20.0	80.0
B2	51	40.8	39.2
B3	52	20.4	18.8
		81.2	

	Throughs 20W	Throughs (B1 base)	Overs 20W (B1 base)
B1	30	30.0	70.0
B2	44	30.8	39.2
B3	52	20.4	18.8
		81.2	

	Throughs 20W	Throughs (B1 base)	Overs 20W (B1 base)
B1	25	25.0	75.0
B2	48	36.0	39.0
B3	52	20.3	18.7
		81.3	

	Throughs 20W	Throughs (B1 base)	Overs 20W (B1 base)
B1	15	15.0	85.0
B2	54	45.9	39.1
B3	52	20.3	18.8
		81.2	

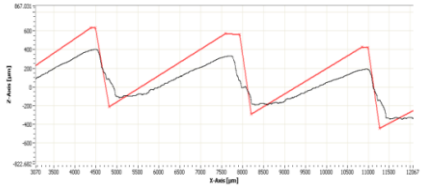
Solution for optimal use of rollers.

The right time for a roller service or roller change is crucial for a consistent high product quality and cost optimization.

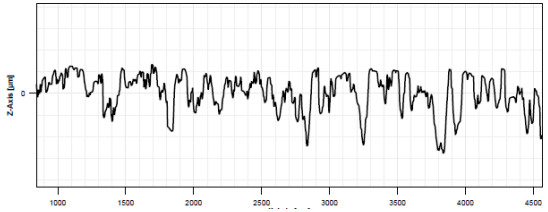
- The wear depends on roll material, purity of grain, hardness of the grain and used grinding force.

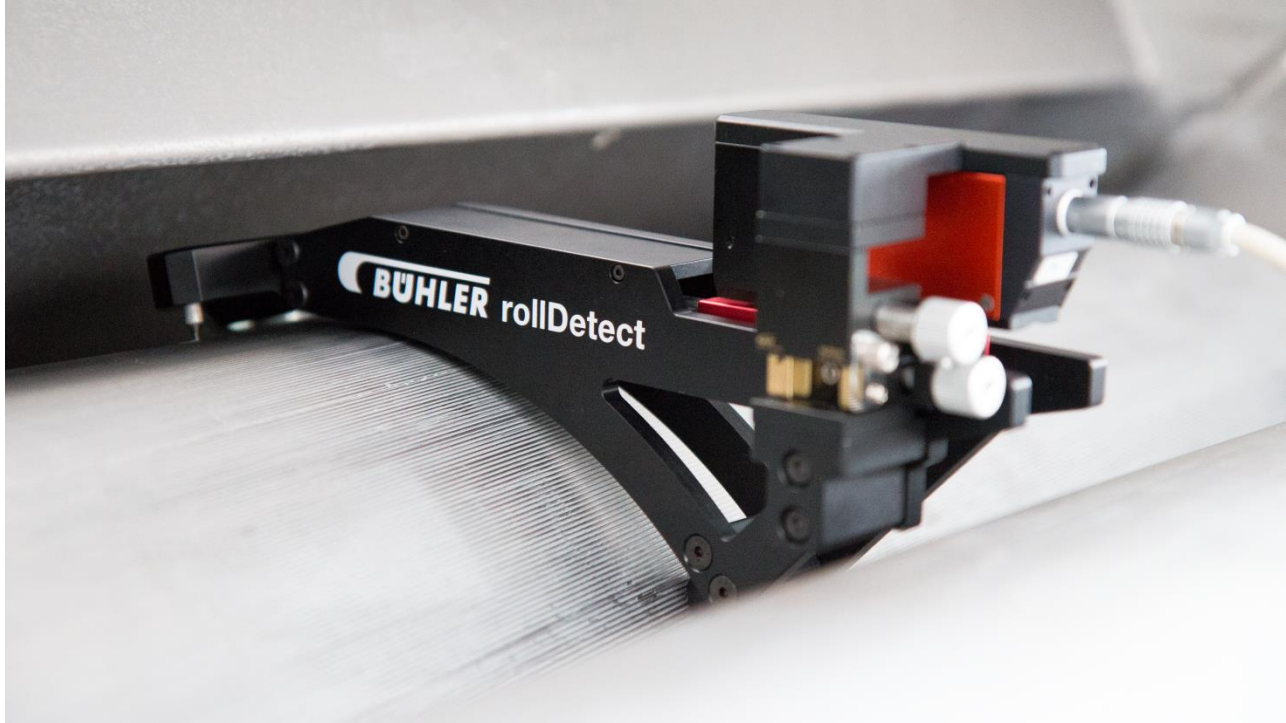
Therefore, the condition and wear of rollers needs to be continuously measured and objectively evaluated.

- Contour measurements for corrugated rollers

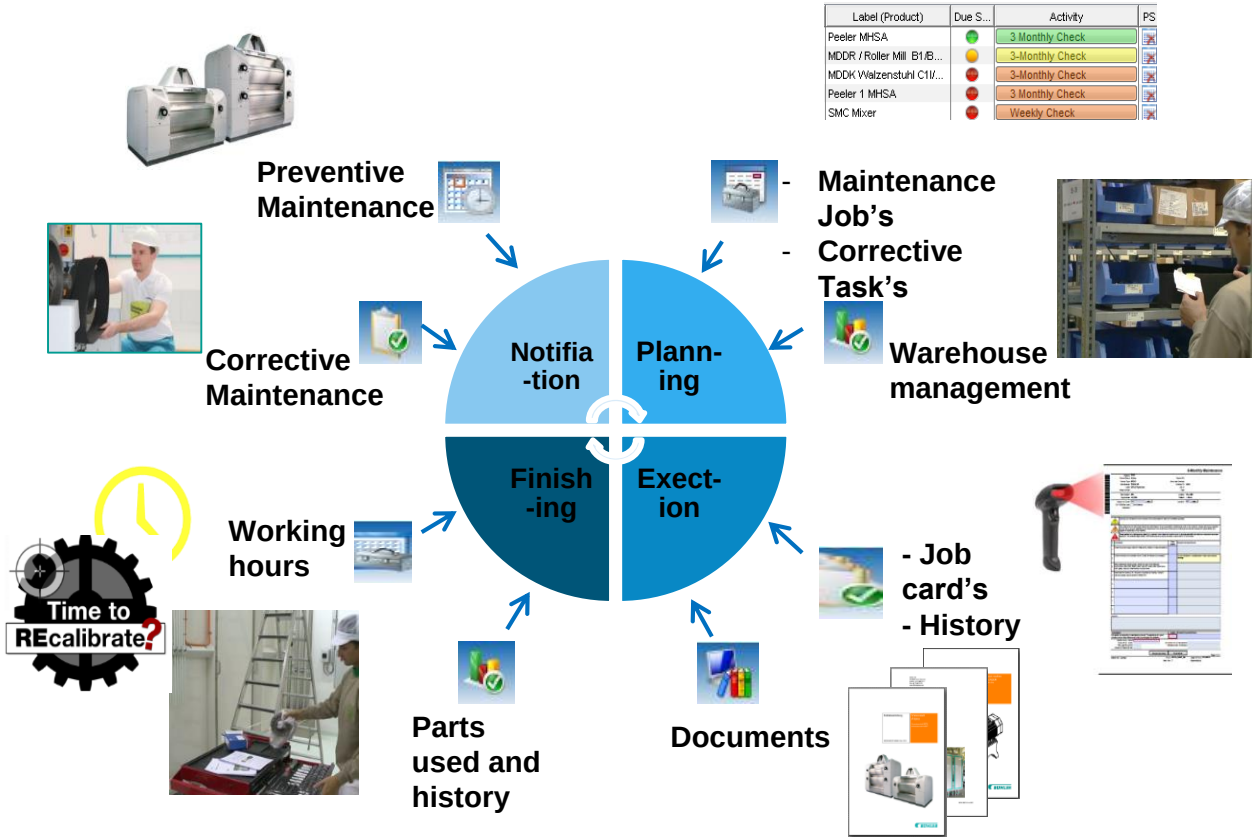


- Roughness measurements for smooth rollers





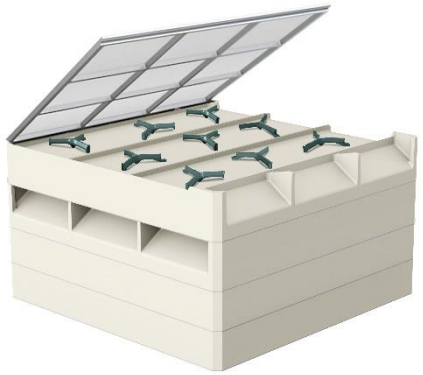
Eco-system of a modern maintenance management system.



Label (Product)	Due S...	Activity	PS
Peeler MHSA		3 Monthly Check	
MDDR / Roller Mill B1/B...		3-Monthly Check	
MDDK Walzenstuhl C1/...		3-Monthly Check	
Peeler 1 MHSA		3 Monthly Check	
SMC Mixer		Weekly Check	

Maintenance @ plansifters.

- The plansifters are a key factor for quality and efficiency.
- Regular maintenance is crucial to achieve constant yield and quality.
- The right choice of the sieve cleaners is important to reduce maintenance effort.



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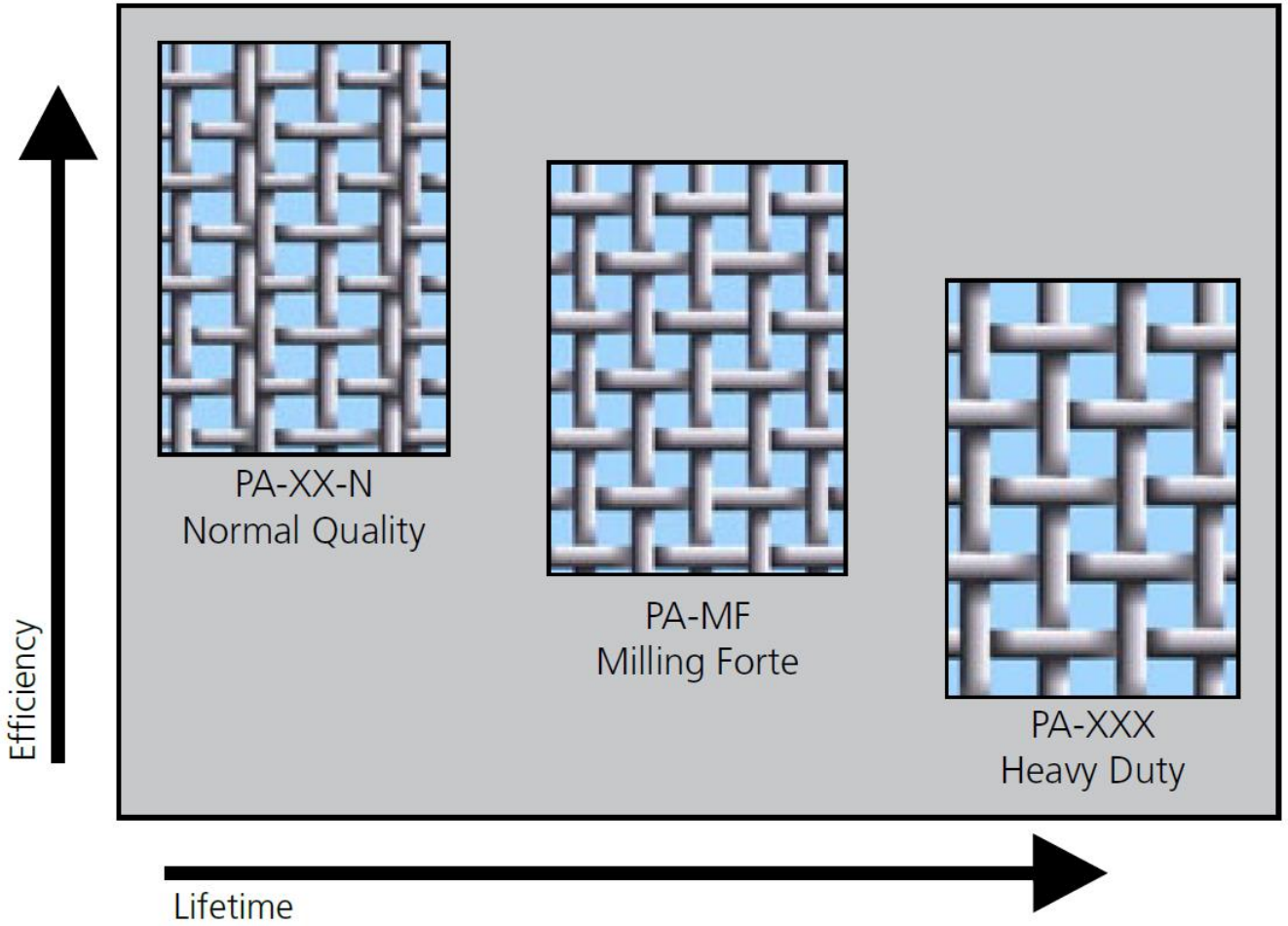
Sieve fabrics application for wheat milling.

- Wire mesh sieves is used for scalping sieves at break passages.
  - > 900µ
- Polyamide (PA-GG) is used for coarse / medium size sieves in plansifters.
  - 315 – 1000µ
- Polyester (PET-GG) is used for purifier sieves.
  - 250 – 1400µ
- Polyamide (PA-N/MF/XXX) is used for flour sieves in plansifters.
  - < 300µ



Maintenance @ filters.

- Proper working filters and exhaust systems ensure a good working environment (cleanliness) and contribute significantly to safety and health at work.

- Filters and exhaust systems are playing very often a key role for some machines (e.g. aspiration channels, destoners, purifiers, pneumatic conveying, etc.).

The differential pressure gauge and rinsing air pressure is a key control point. Max. pressure for safe operation is between 14 – 18mbar. Low pressure filters require a stable rinsing air pressure of 0.5bar.

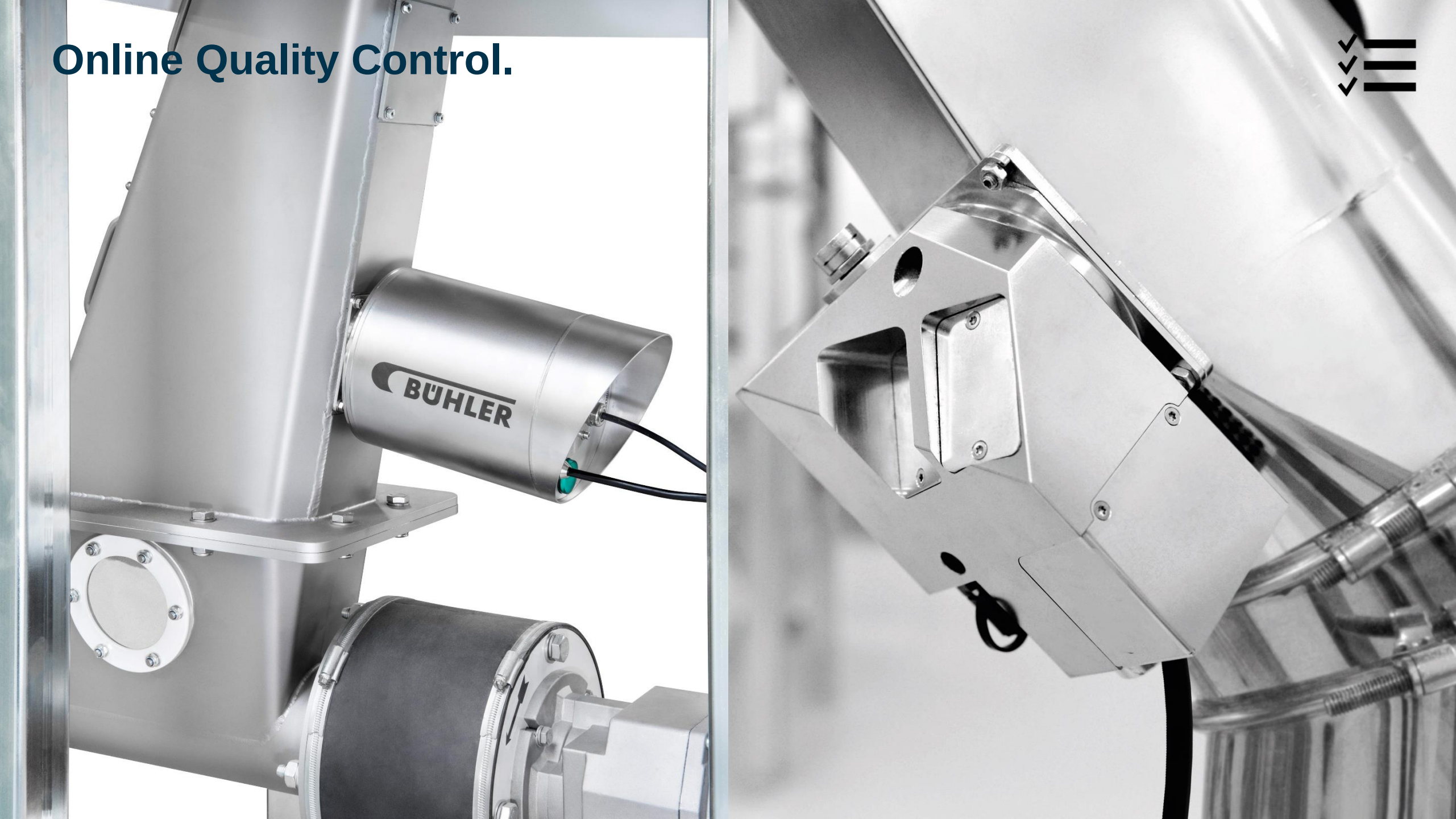
Landscape of Milling Excellence.

The mill laboratory.

- The mill laboratory is the main hub for all decisions about the raw material and finished product quality.
- Organization wise is it recommended to integrate the lab fully into the organization of the operation.
- The lab should be equipped with all necessary analytical methods. Long-term employees are key.

Sampling process and analysis methods must be aligned with production and traceability system.

Online Quality Control.

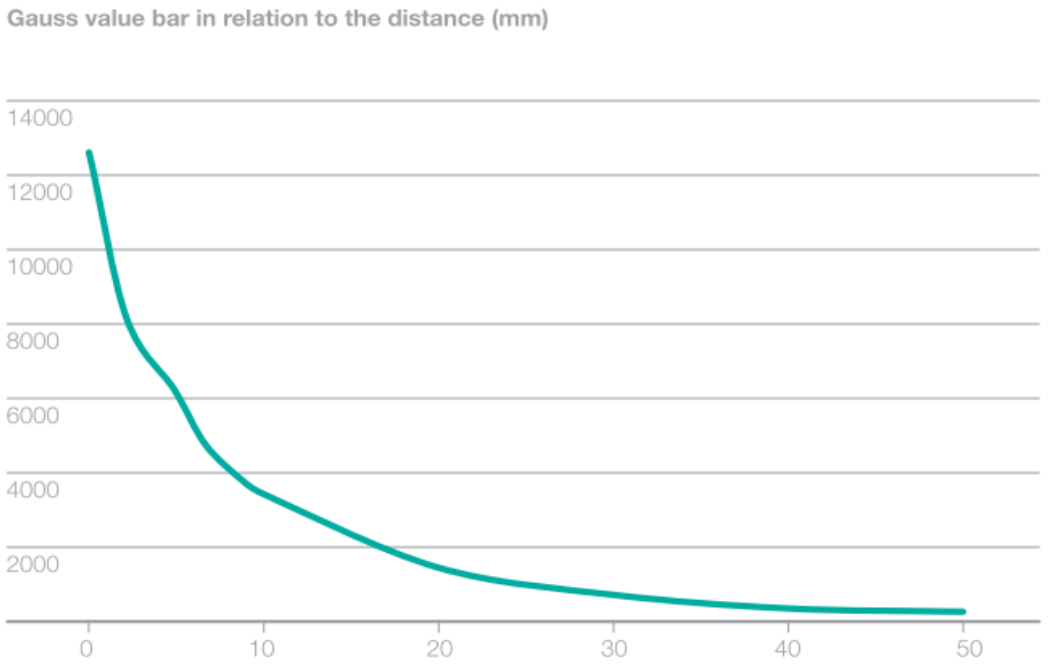


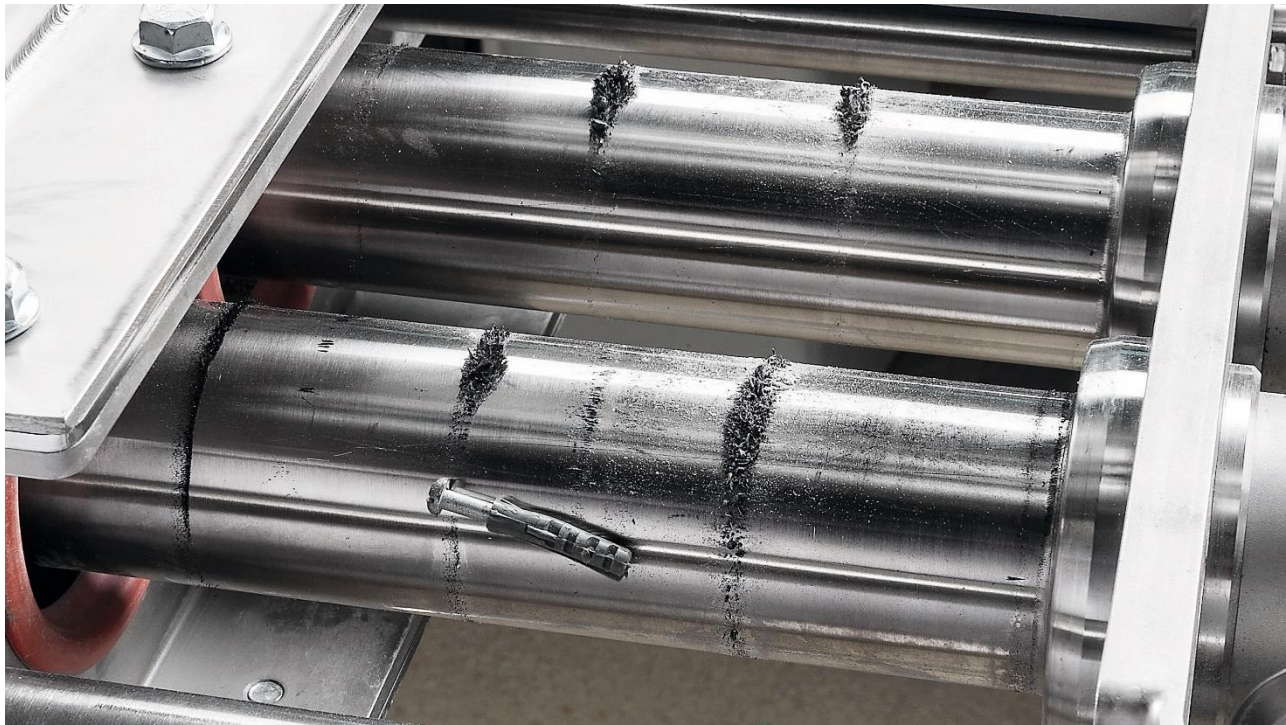
CCP Magnets.

- Today are often powerful magnetic field strength of 10,000 to 12,000 Gauss requested.
- On the other hand, is optimum removal achieved if the magnetic bars are positioned right in the center of the product flow. In this way, the product always comes in close proximity to one or more magnets.

The combination of Gauss value (flow density) and field depth allows to achieve best results for food safety.

- For machine protection inside the process are normal magnets sufficient. For FP quality control are high quality neodymium (rare earth) magnets recommended.
- Any magnet is a CCP within the operation process.





Different control sifting solutions.

180 – 500µ

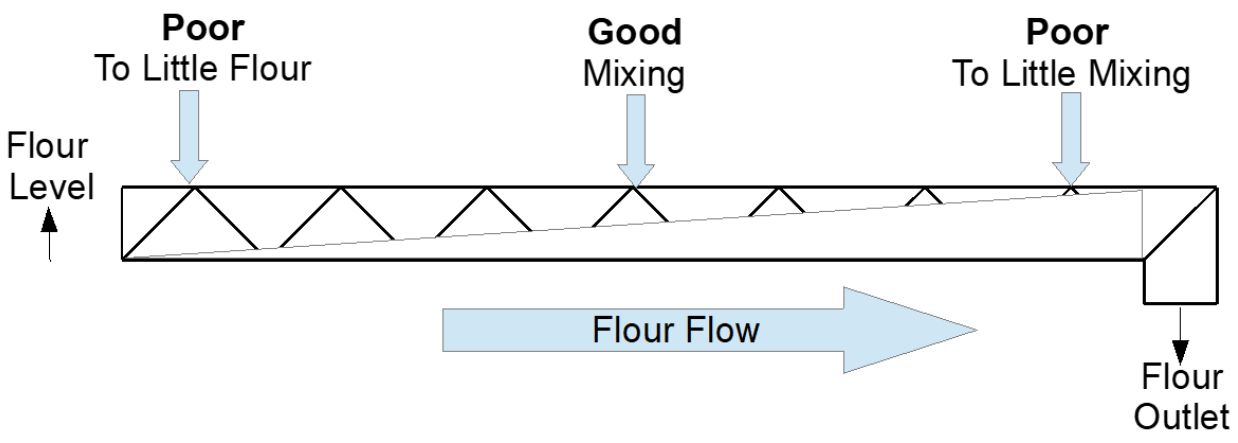
1.5 – 3.0mm

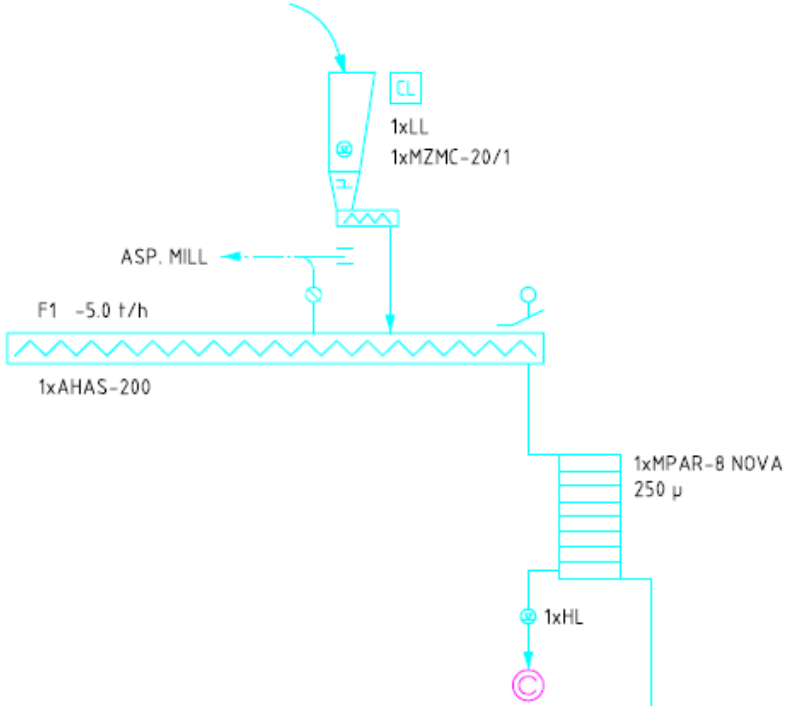
Microfeeder positioning.

- Example with adding fortificants on the flour collecting screw conveyor.

There is at least 3 meters of conveyor length needed to ensure adequate mixing.

- If two or more microfeeders are required is a separate mixing screw recommended.





Calculation dosing volume.

What is the PPM ?

- 1 ppm = One part over one million parts
  - 1/1’000’000
- 1 t = 1’000’000 g

1ppm in 1t = 1grams in t

Example:

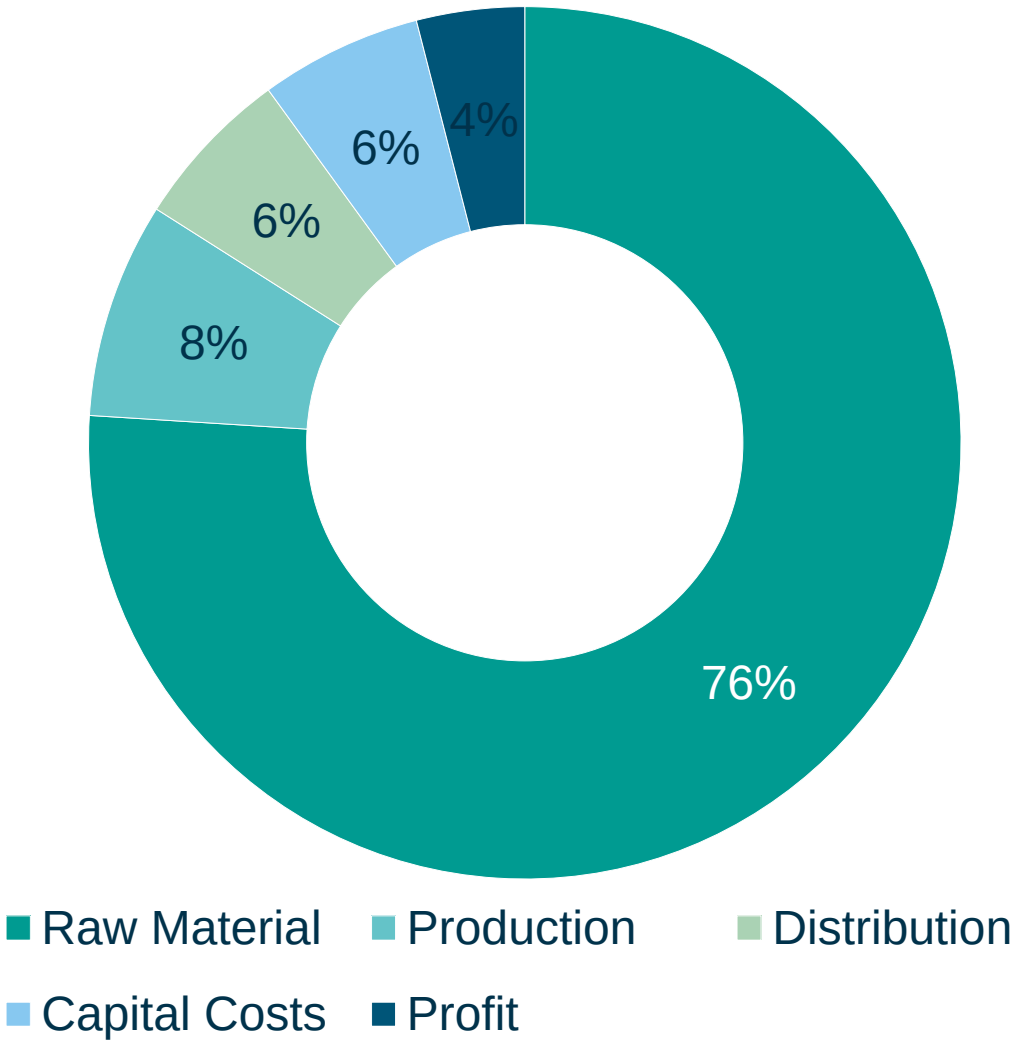
- You need to add 100 ppm of fortificants/premix to your flour stream of 5t/h.
  - 100g x 5 = 500g of fortificants/premix per h

Landscape of Milling Excellence.

Cost structure of a European flour mill.

Energy ~4%

Staff ~2%



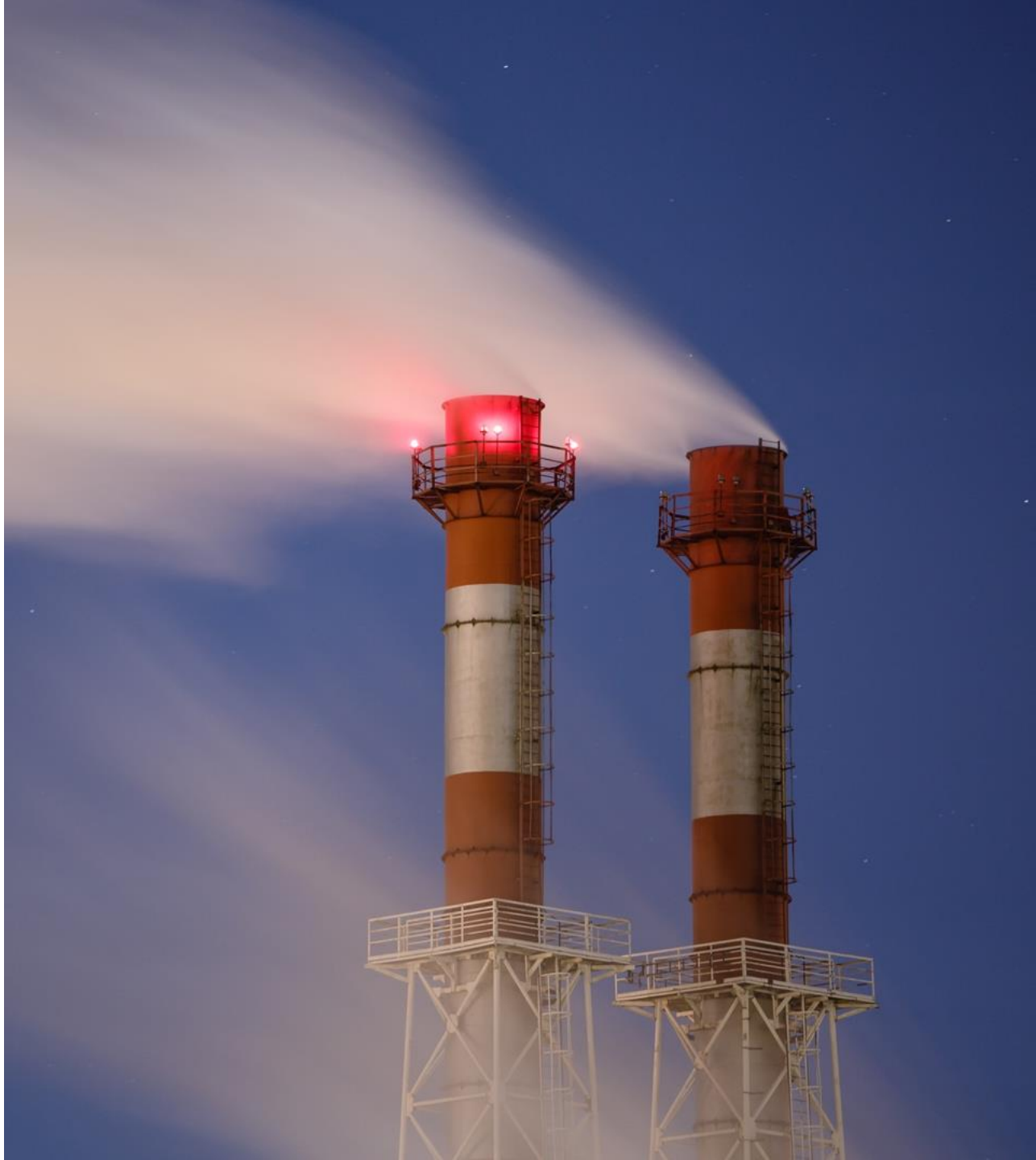
Energy management
Less consumption, more profit

Feature & Function

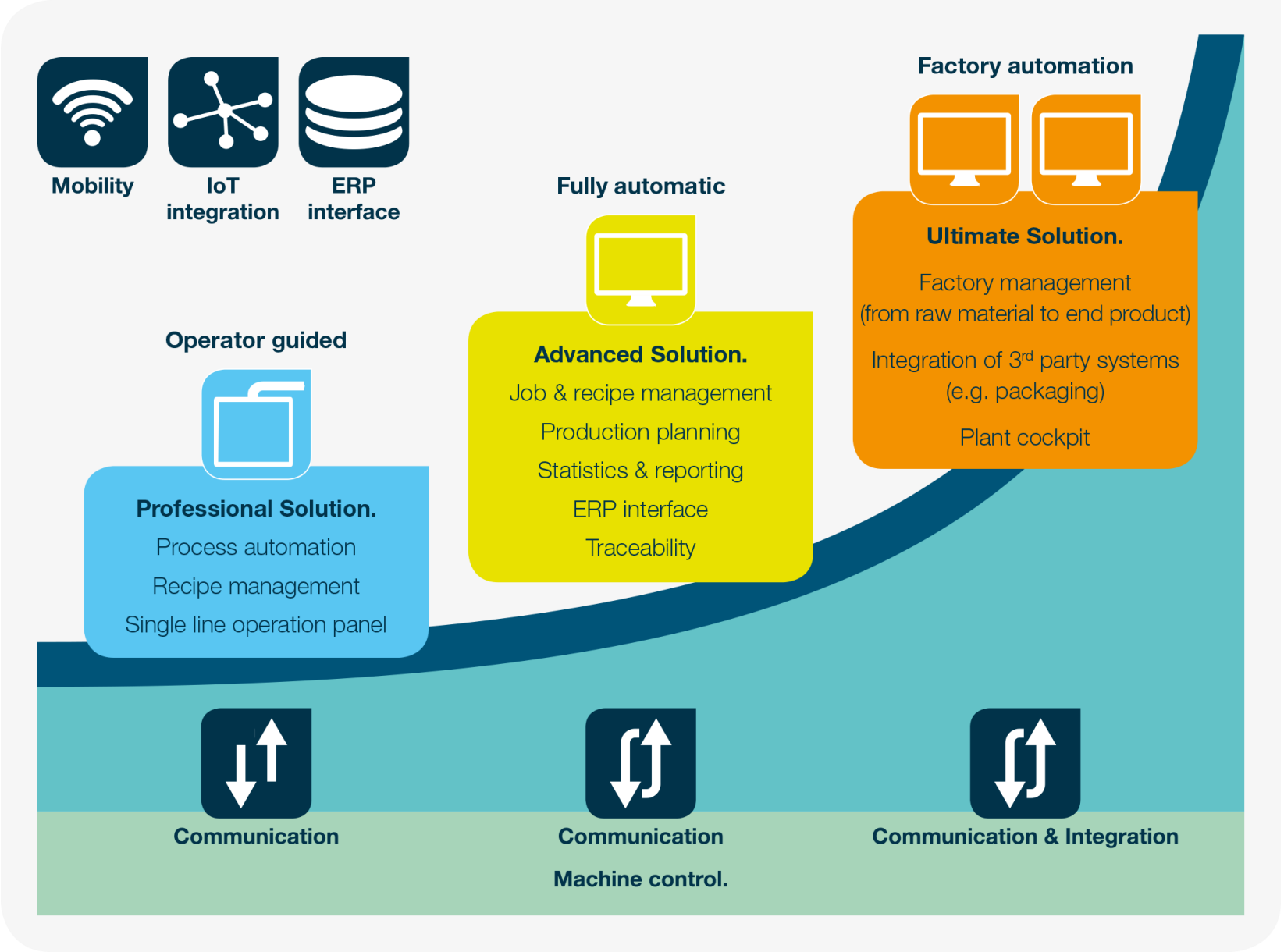
- Overview of energy, gas & water consumption and its biggest consumers
- Intelligent management of energy consumers adjusted to the current needs
- History and Trend analysis of energy consumption

Value / Benefit

- Optimized energy cost
- Reduced CO_2-Footprint
- Sustainable production



The right automation solution.



Legend

ERP	Enterprise resource planning
*	Possible options

Operational milling excellence means the step from good to excellent.

Martin Schlauri

Innovations for a better world.

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