MEASURE FIBER PROPERTIES IN “REAL-TIME” MODE

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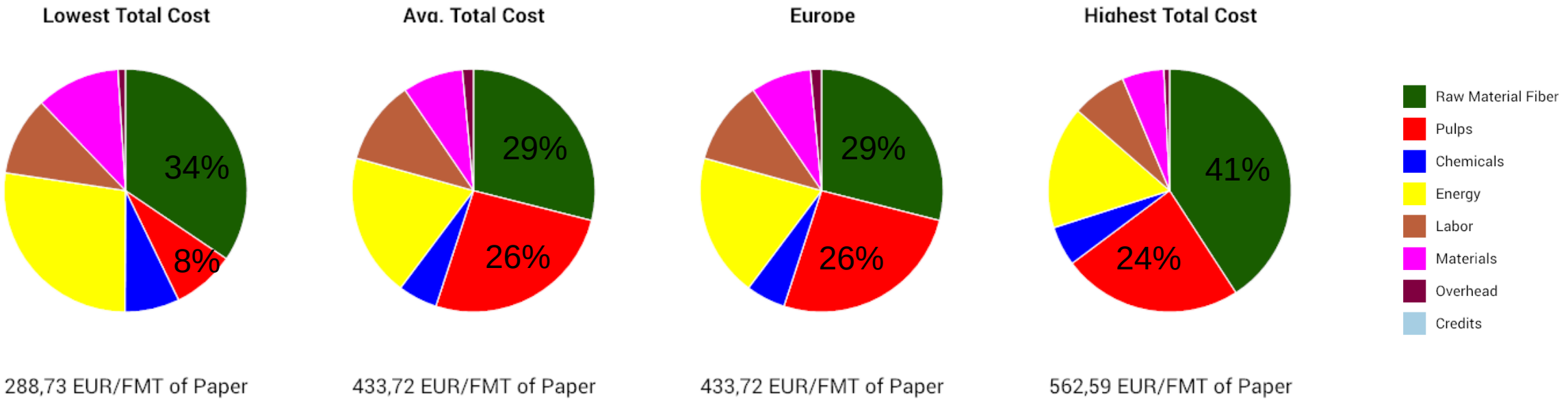
Content

- Impact of fiber cost to total production
- Measurement of fiber properties
- Application in pulping – shive content
- Application in refining – energy savings and quality stability

Cost Breakdown Comparison For Packaging Paper Compared Worldwide



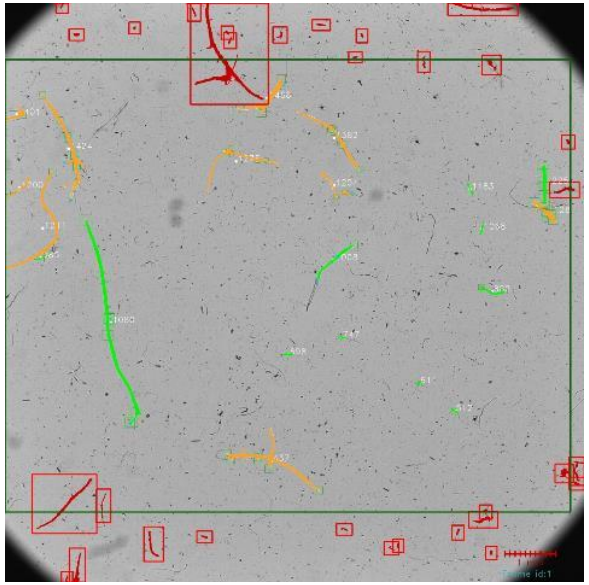
Cost of fiber between 40 and 65 % of the total production cost

Source: FisherSolve Next™ © 2019 Fisher International, Inc.

Fiber properties measurement

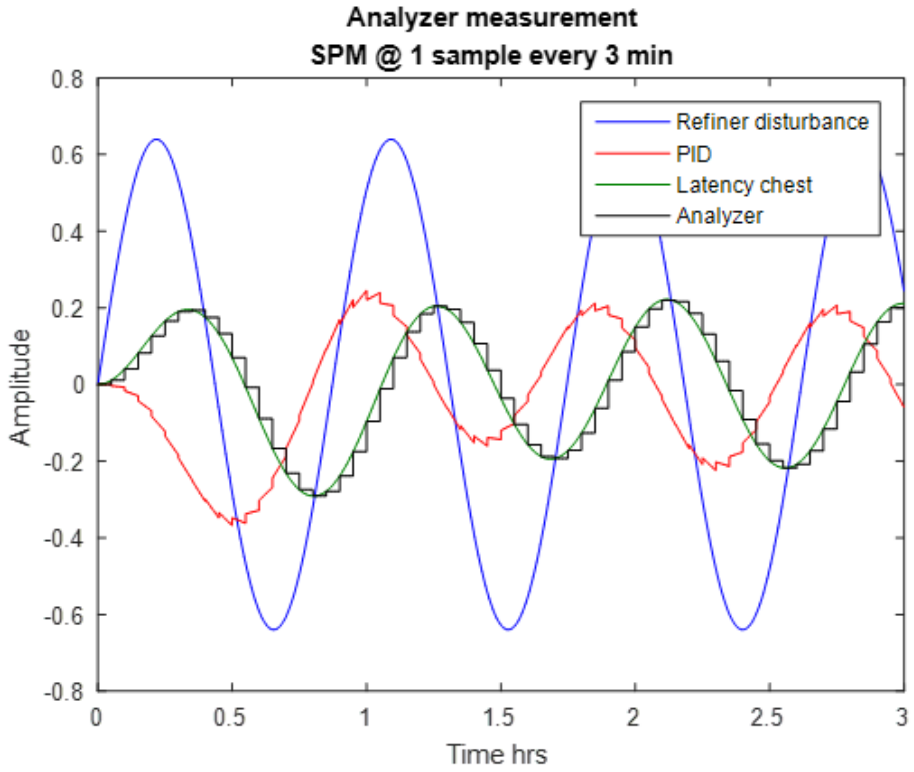
- Traditional measured by lab or multi point analyzers
  - Update rate does not meet control needs
  - For a given tensile index of 40 Nm/g the applied energy differs by as much as 750 kWh/ton or 8 KNm/kwh

- High frequency camera based analysis
- 20 results / hour
- Single point

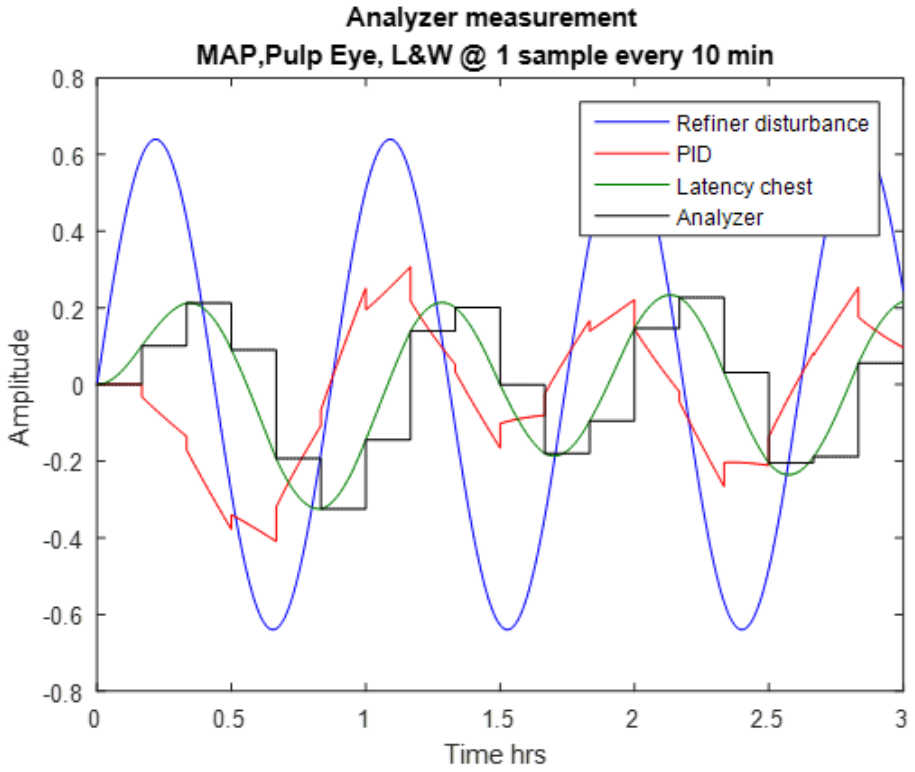


Detecting high frequent process changes

SPM-5550
20 results/hr.



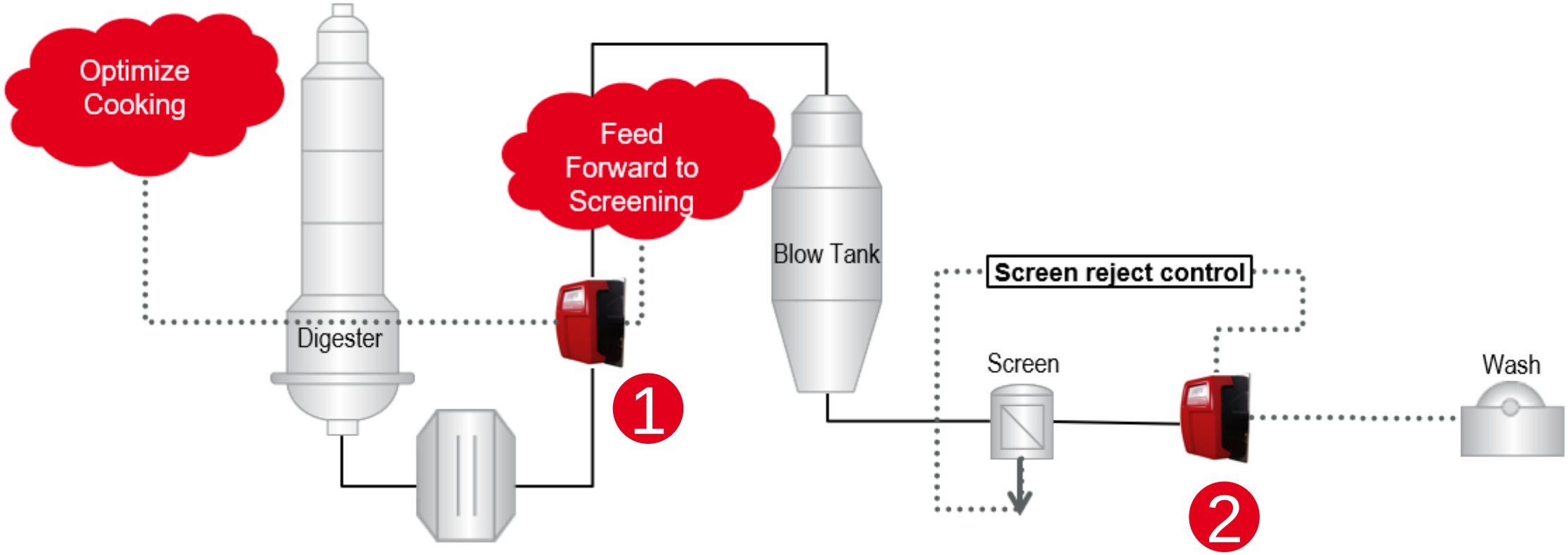
Conventional Systems
5 results/hr.



Advantages summarized

- Opens the fiber morphology dimensions for the pulp- and papermaker providing statistical data on particles from fines & fibrils to shives
- Correlations of fiber morphology with process and quality parameters
- Higher update rate allows for accurate measurement also of scarce objects e.g. shives and spots
- Simple device: a single point measurement, not dependent on any central unit
- Step by step approach by setting up each refiner line separately
- Used to predict quality parameter as part of a modelling solution

Application example in pulping



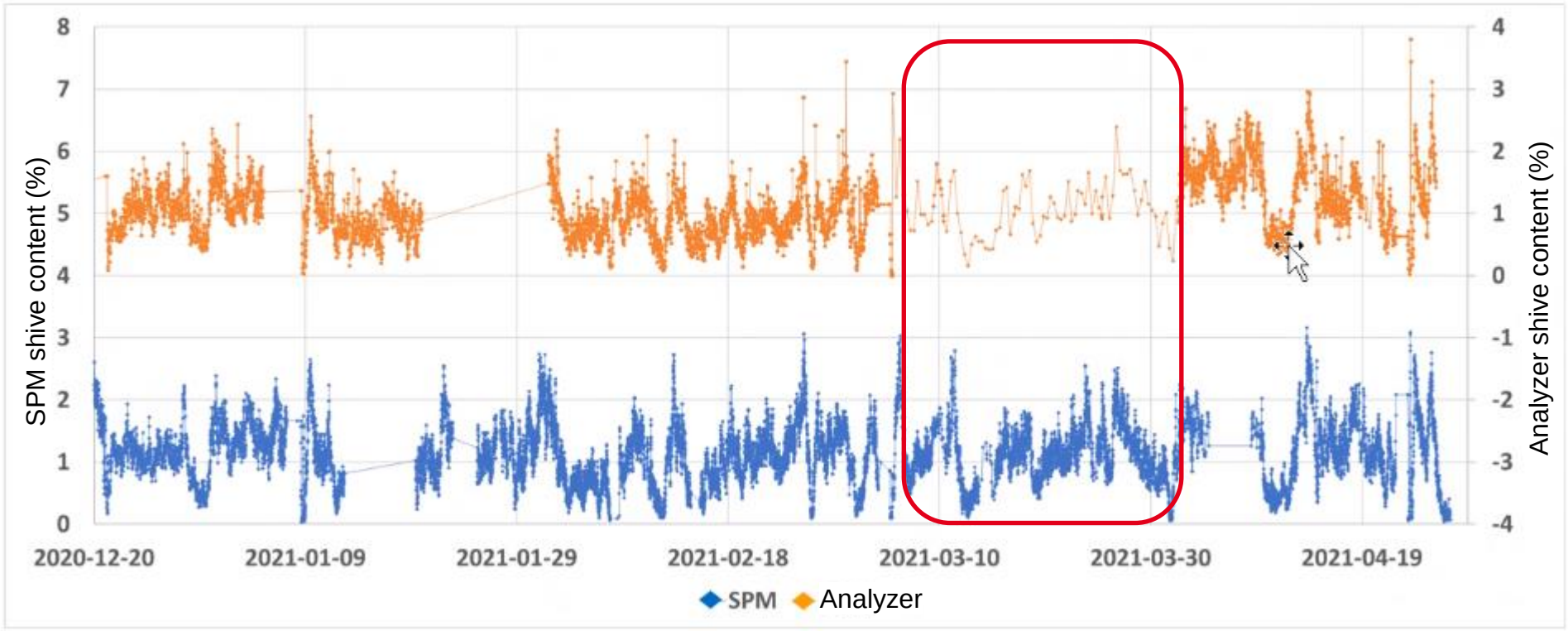
Problem description

- Reduced production rate due to pulp quality constraints
- High consumption of ClO_2
- High shive content impacting bleaching and paper quality
- Energy cost reduction in the reject handling

1. Approach

- Monitor shive content from digester
- Combine fiber morphology with single point kappa and advanced process control
- Feed forward signal to screening room
- Adjust cooking and impregnation parameters

1. Shives after blow line refiners

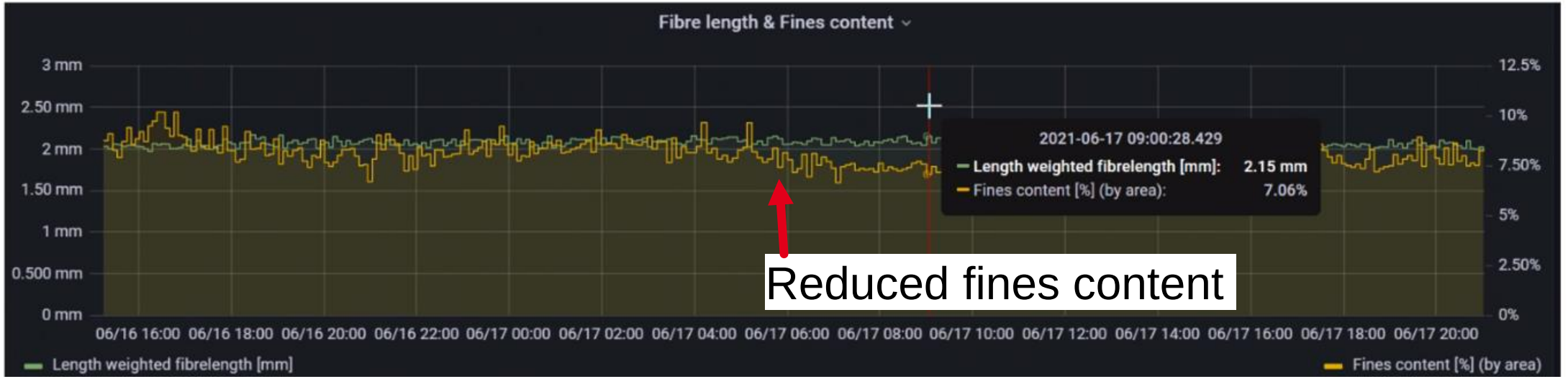


2. Approach

- Increase screening capacity by increasing inlet consistency

- Sceens have limitations in feed consistency. Higher consistency means more shives in accept.
  Shives and fiber measurement helps to increase output rate by increasing feed consistency within tolerance limit of shives measurement.
- Shive content monitoring in accept line and control of reject valve
- Reduce shive content to bleach plant

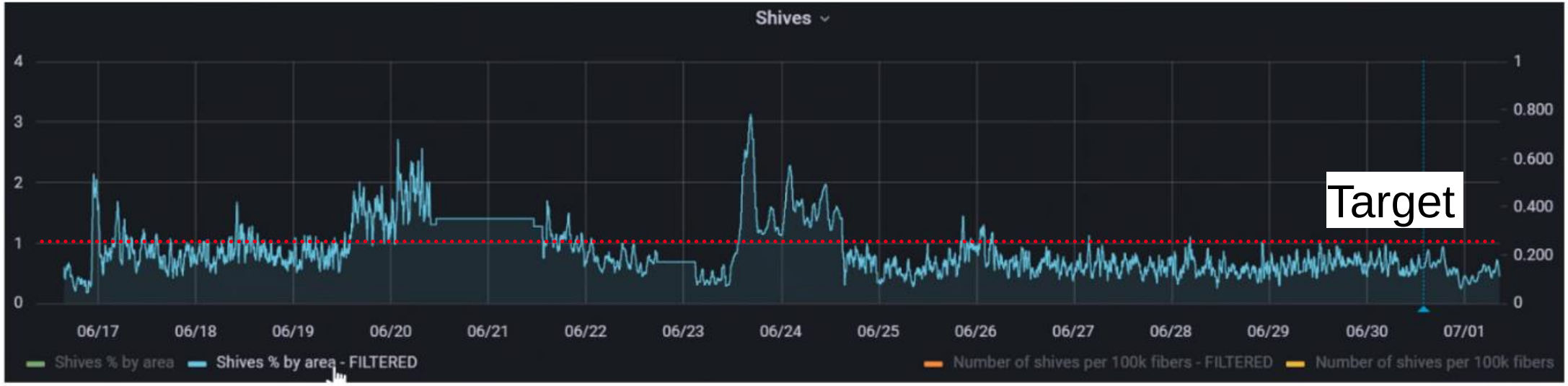
2. Shives after screening room



1 day trend

- Reduced fines content at stable fiber length

2. Shives after screening room



2 weeks trend

- Optimized shive content to PM
- Target is to be below 1 % by area

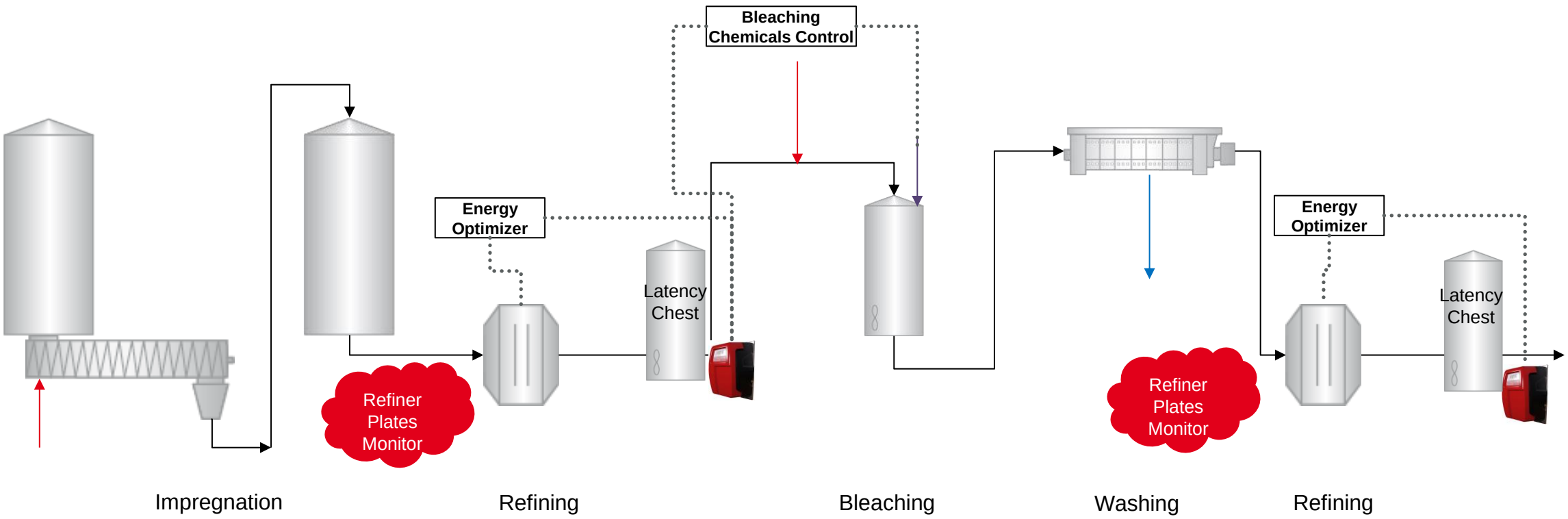
Achievements in pulping

1. Optimized cooking
- Maximized kappa to a shive limit
- Improving yield and quality stability
- Reduced ClO_2 by 10 % due to reduced overbleaching

2. Shives reduction in screening room
- 0,1% higher feed consistency gains 1.200.000 € annual profit
- Reduced ClO_2 consumption by 5 % due to reduced over bleaching ~ € 225,000 p/a

Application example in mechanical pulping

Energy and Quality Optimization



Case description

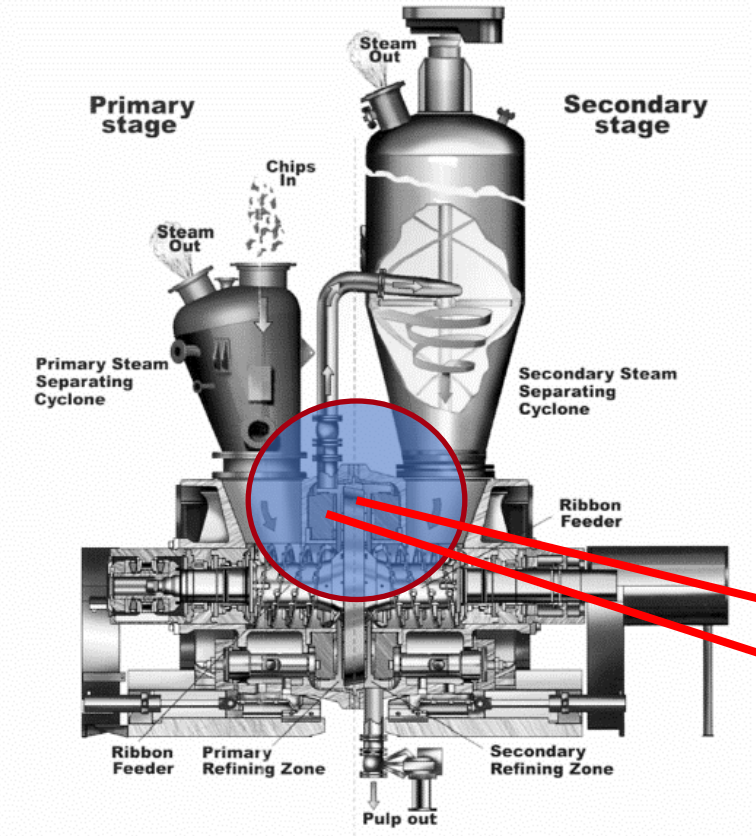
Problem description

- High energy consumption and pulp quality variation
- Low fiber length = strength loss

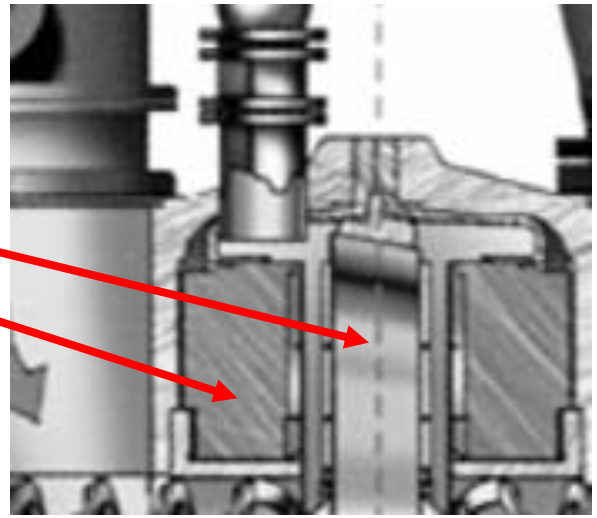
Approach

- Morphology based refiner control and strength and CSF prediction
- Morphology based screening control

TMP refiner



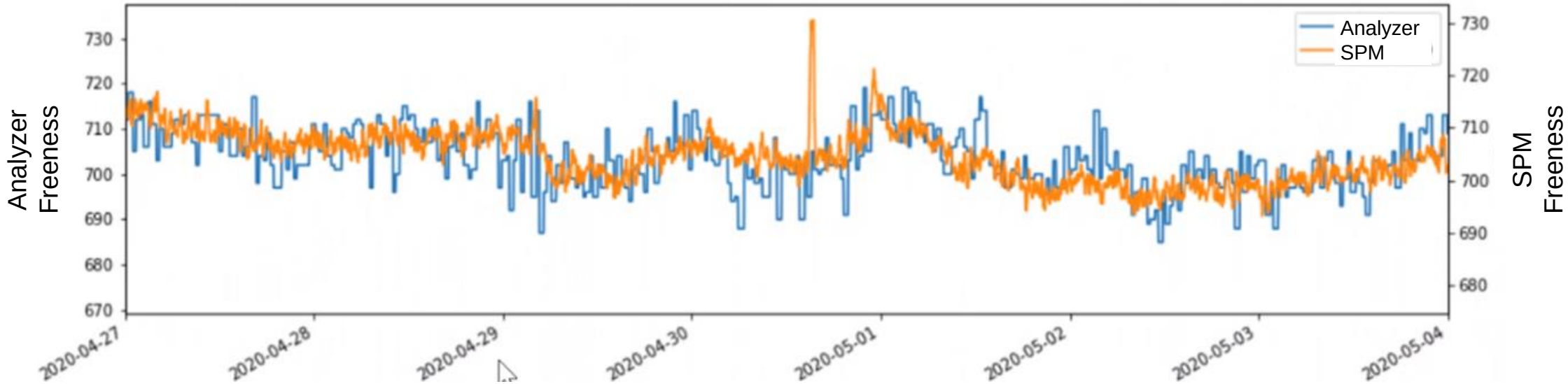
Hymac Andritz HXD 64 refiner (Papermaking science and technology)



Step change, **plate gap** will affect

- Energy applied
- Fiber length
- Shives content
- Pulp Tensile and Tear indices
- Paper properties

After high consistency refining

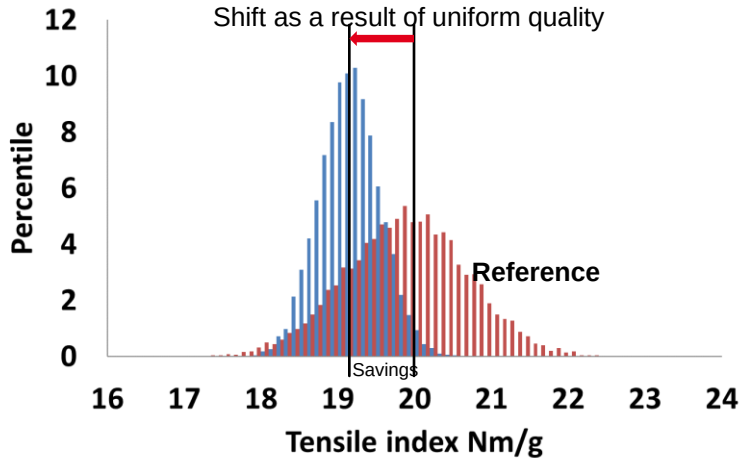


8 days trend

- SPM shows good tracking of freeness variation

Achievements in high consistency refining

- Tensile variation reduced by 15% which leads to energy savings of 150.000€ per line.
- Refiner plate condition can be monitored indicating the proper time to change plates.
- Most valuable long fiber content increased by 5 %



Summary REAL-TIME morphology

- **Fiber costs reduction**
  - Increase low-cost fiber type by optimizing the potential of the overall fiber mix (e.g. HW vs. SW or recycled vs. virgin)
  - Increase yield in chemical pulping ~1.000 k€/year
- **Chemicals**
  - in chemical pulping~400 k€/year
  - Reduce chemical costs (dry strength agent)
- **Reduce laboratory resources**
- **Energy**
  - Refining in mechanical pulping ~2.000 k€/year
  - Drying
- **Uniform Pulp Quality**
  - Grade changes
    - quickly get back on target pulp
  - Improved controls
- **Reduced service needs for the analyzer**
  - No physical test i.e. no screens, valves etc.

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