We secure your competitive edge

Paper machine monitoring and optimization by online porosity and roll hardness analyzers

Heikki Mustalahti*, Jyrki Laari*, Vesa Kukkamo*, Pekka Komulainen**

* ACA Systems Oy
**Pele Oy

ACA Systems

삼보과학(주) SAM BO SCIENTIFIC

40 is the number of countries we have delivered our systems

30 years we have been in the business

20 % is the growth rate of our company

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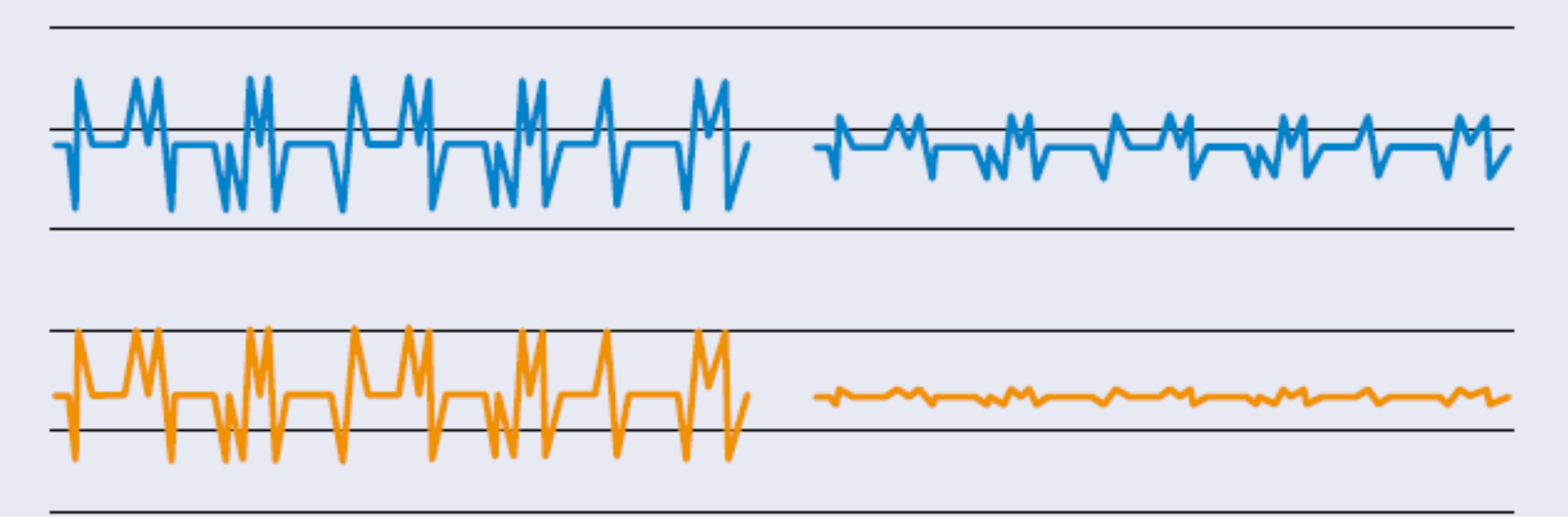
Some references

Stable process?

- What are the tools to stabilizing paper making process?



Tools for the papermaker

- Basis weight, Moisture, ash and caliper MD & CD controls
- Sheet break camera system
- Freeness control system
- Sheet inspection system
- Retention control system
- Gas (free and dissolved) content control system
- The list goes on ….

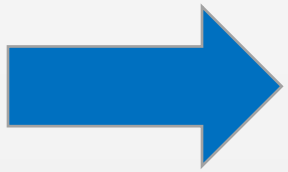
Any early warning system for the papermaker?

“Porosity is the best indicator for the balance of pulp quality and machine settings”

On-line porosity measurement?

Key benefits of Permi

- Continuous one calibration and fast online operation.
- Great correlation to laboratory results, 0.95 or higher.

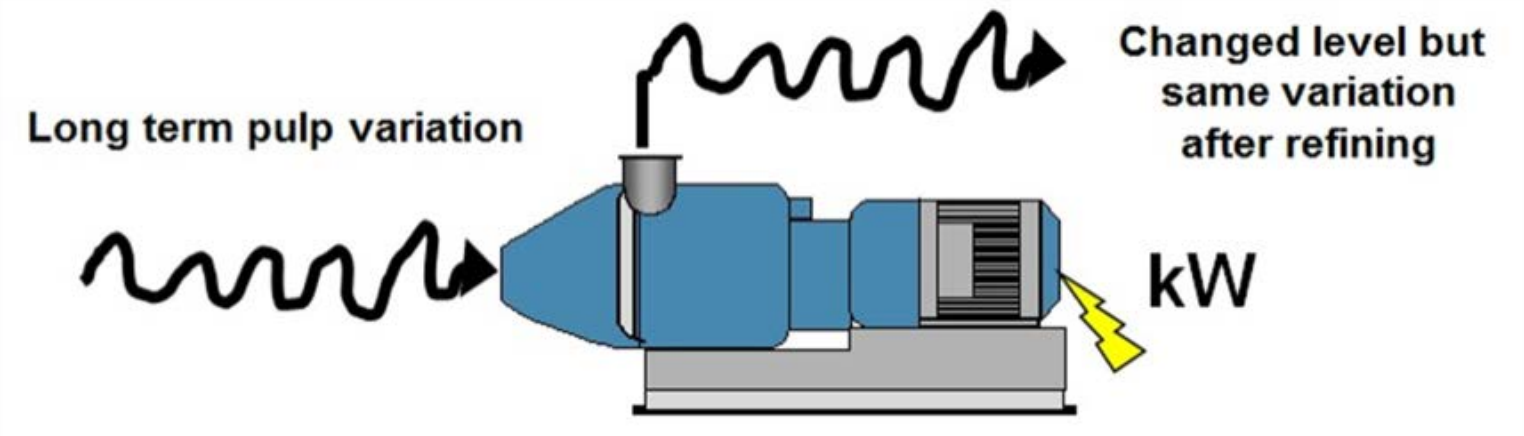


Makes process optimization easy!

Stable MD porosity means stable web structure, which leads to unbelievable good runnability of paper machine.

Refining by stable loads

- Conventional Control of Refining
  - SRE control of refiners cannot decrease pulp quality variations
- With on-line porosity measurement this can be corrected!

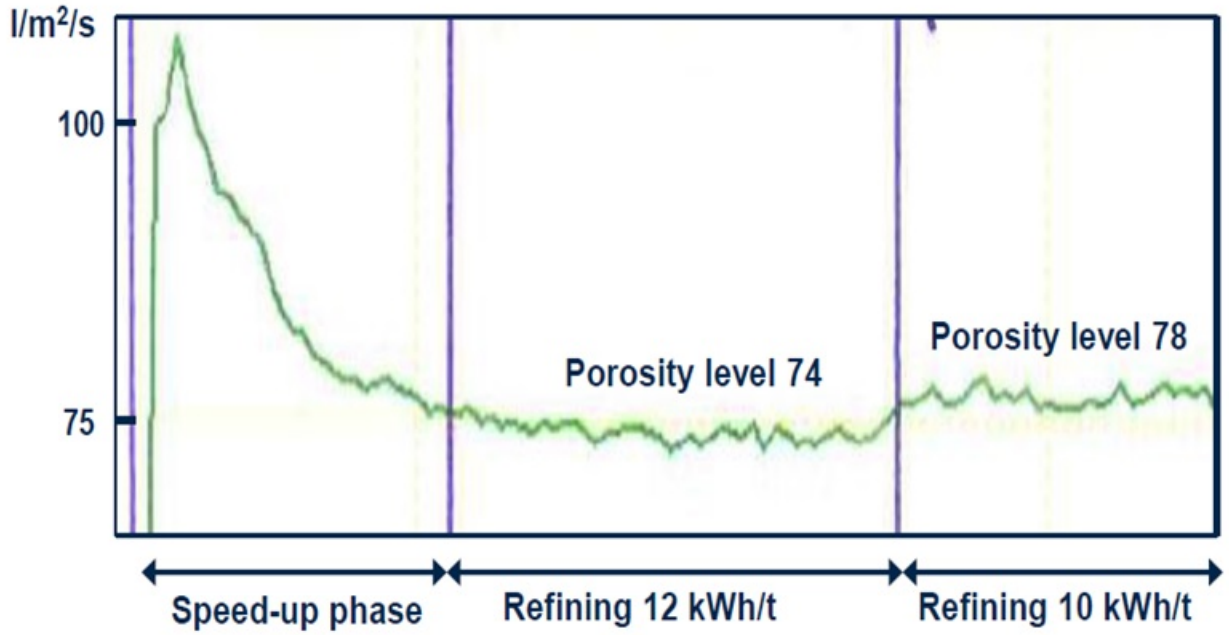


$$SRE\ (kWh/t) = \frac{P_e\ (kW) = P_t\ (kW) - P_o\ (kW)}{m\ (t/h)}$$

SRE = Specific Refining Energy
Pe = Effective Power, Pt = Total Power, Po = Idle Power
m = Fibre flow (Bone Dry)

Refining control by porosity

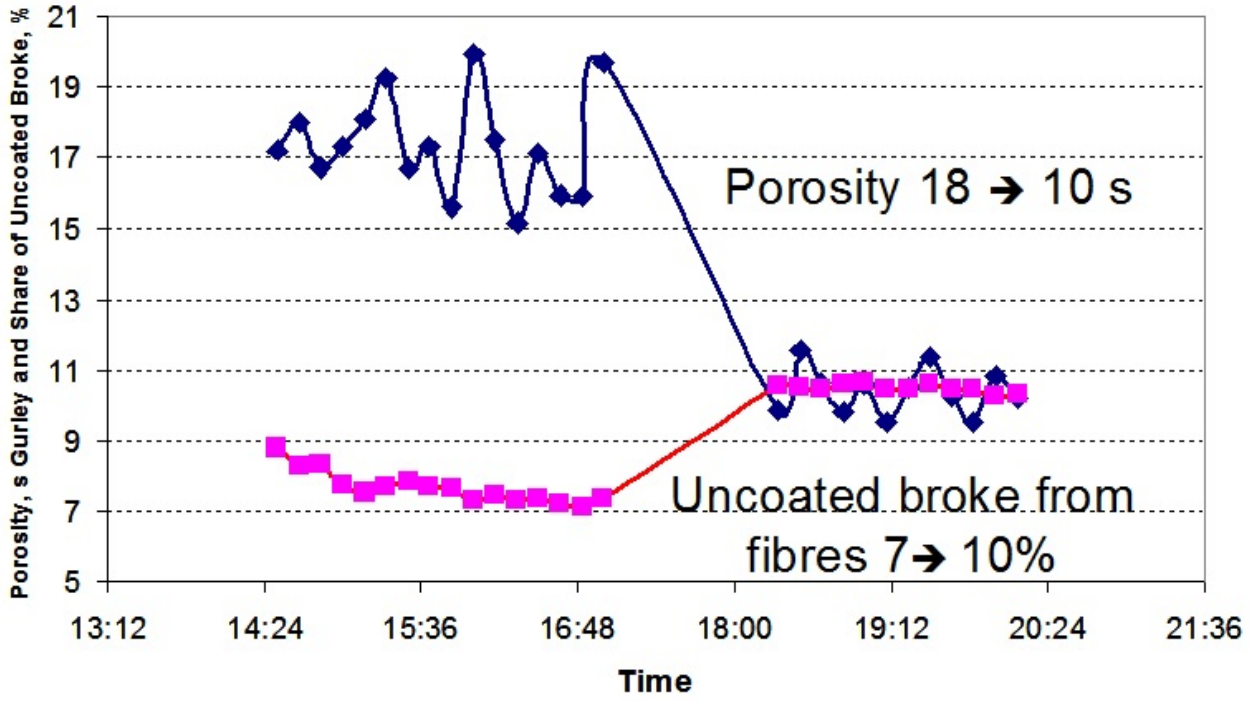
- Example of filter paper machine



A very small change in refining control can be clearly seen in the porosity measurement. The units of porosity numbers are l/m2/s.

Porosity and broke adding optimization

- Increased porosity (decrease in Gurley seconds) due to a small addition of uncoated broke

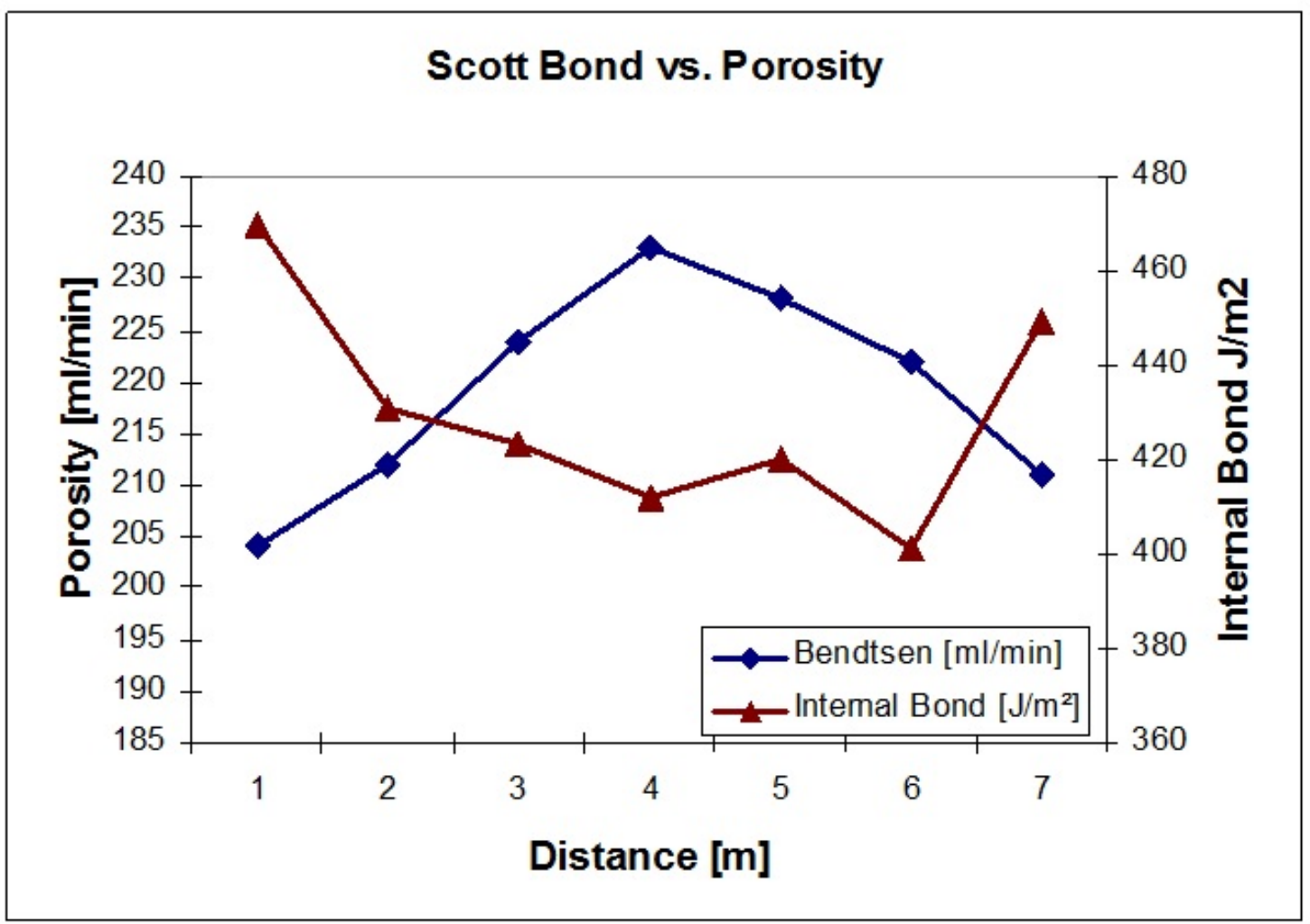


Very small changes in the broke levels can have a big effect on paper porosity (increasing or decreasing). In this case addition of uncoated broke has increased porosity.

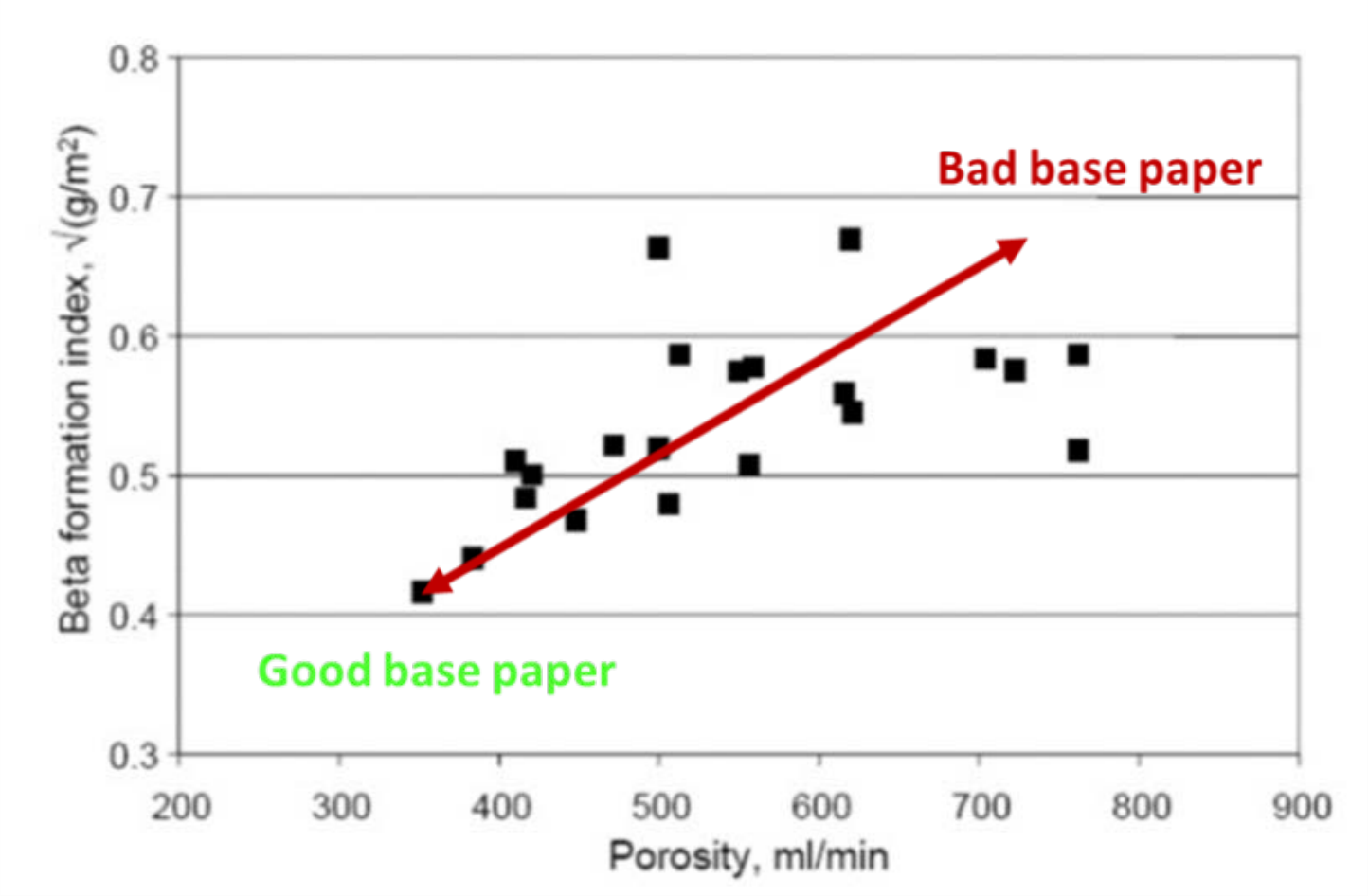
If we would add coated broke the porosity would decrease (higher Gurley values).

By online porosity measurement it's easy to optimize adding of broke.

Z-strengths and porosity



Formation and porosity

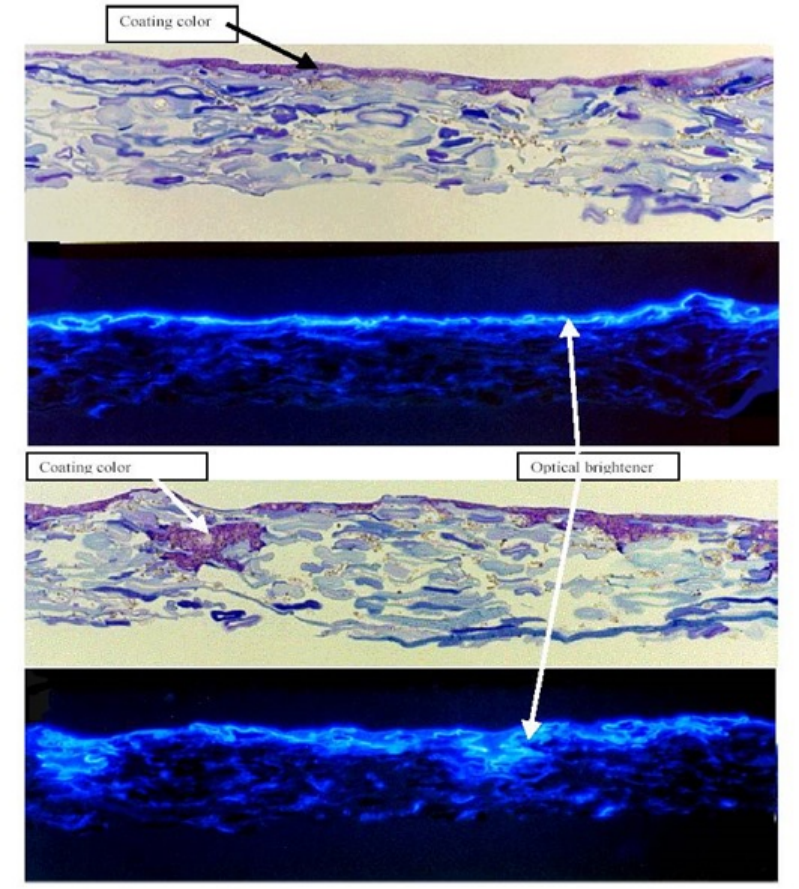


Generally the porosity is low when the formation is good.

Ari Puurtinen:MULTILAYERING OF FINE PAPER WITH 3-LAYER HEADBOX AND ROLL AND BLADE GAP FORMER, Espoo 2004

Coating and paper porosity

- Porosity and Coating Coverage

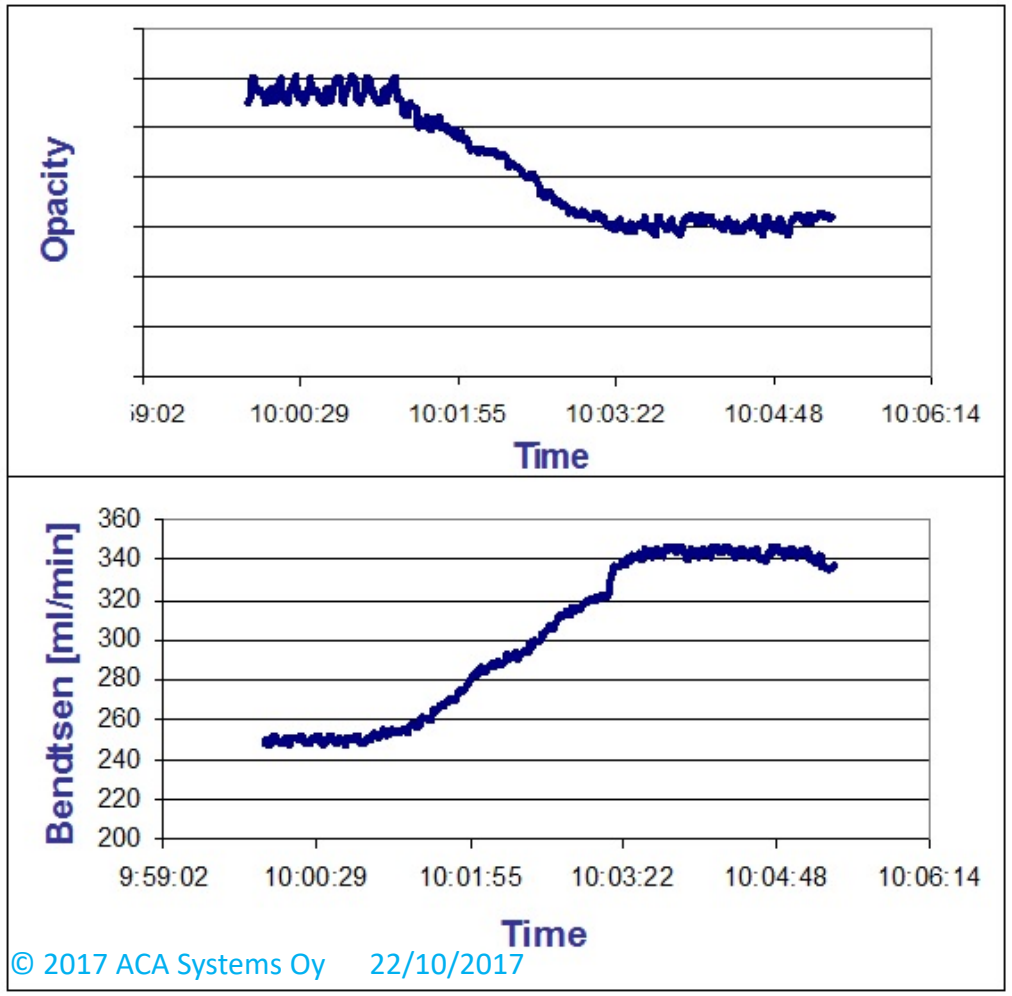


Forsström et al. TAPPI Coating Conference, 2002
http://www.kcl.fi/news/link12004/link12004s4.html

- Dense sheet – small penetration of coating color and good coating coverage and gloss.
- Porous sheet – deep penetration of coating color and poor coating coverage and gloss. Misting problems in film coating.

Coating and paper porosity

- Porosity versus Opacity



- Opacity of Coated Paper (on-line coater)
- Porosity of Base Paper

Users' experiences

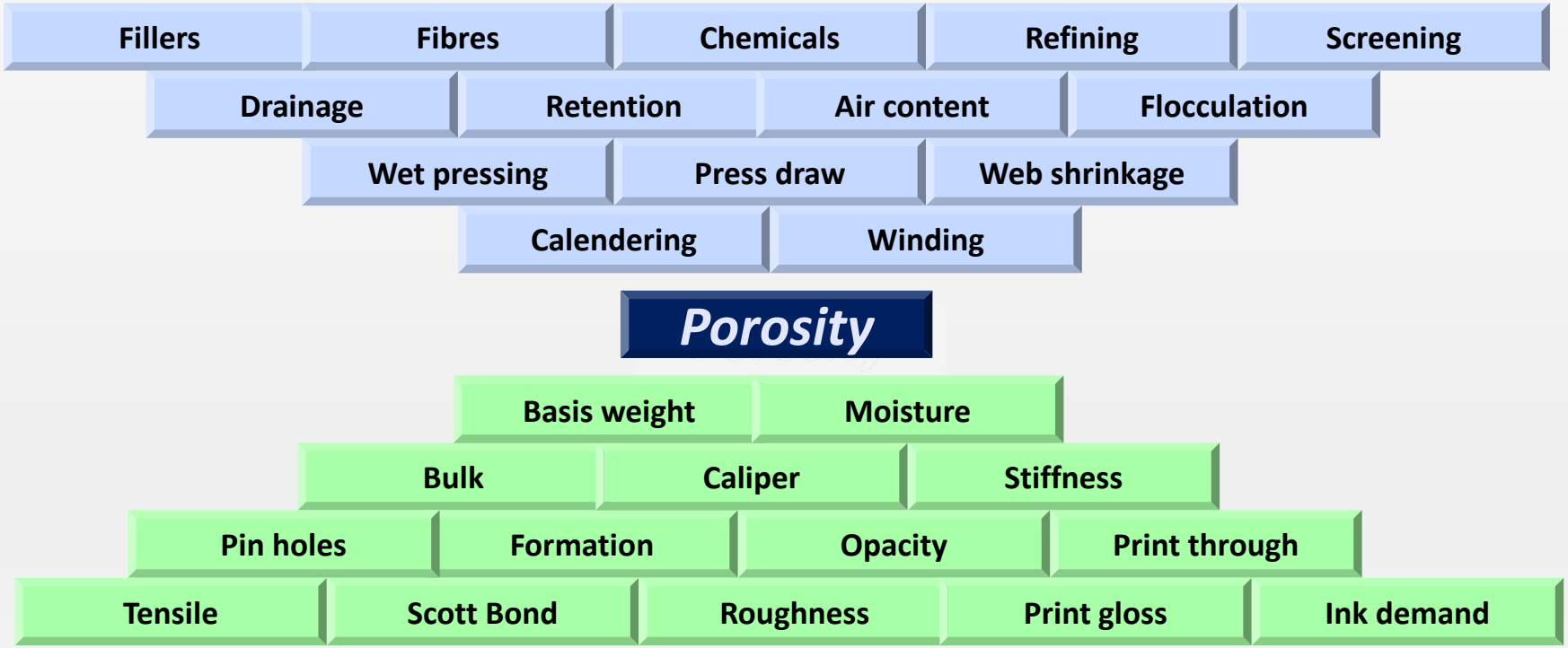
- We noticed, that we have sometimes very unstable porosity level. Things, which can swing the porosity, are **the amount of fines, the refining, the unstable pH-level, the levels of tanks** and very many others. But we can't solve this kind problems, if we haven't an equipment like the Permi.

- Grammage and moisture measurements are important ones, but with the fast porosity measurement one is able to make profit!

- Production Manager Seppo Karine, Stora Enso Imatra PM 1

Total process control by porosity

- Process Optimization and Paper Quality
  - Fast porosity measurement is the best link between process performance and total paper quality.
  - Stable porosity is a good guarantee of well working process and consistent paper quality.



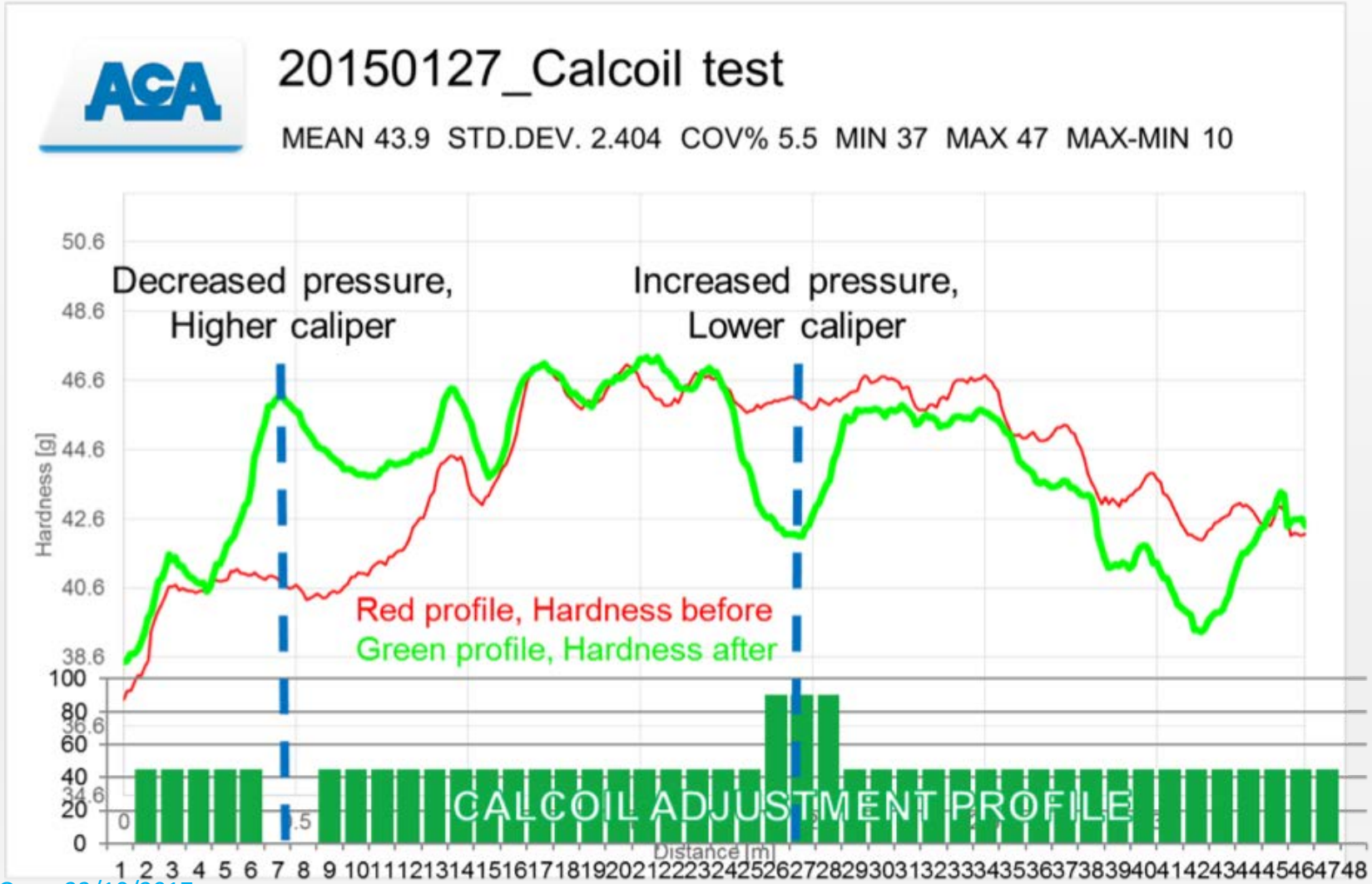
Calendering and CD control by roll hardness measurement

Calendering control

- The required accuracy of online caliper measurement is very demanding.
- In cross direction profile less than 0.5 micrometer caliper variations can cause problems especially with thin and dense paper grades like SC and LWC.

Roll hardness measurement, example video

Bump test with calcoil profiling system



Key benefits of calendaring control by ACA RoQ hardness measurement

- Less breaks and reeling problems on a winder.
- Better customer rolls quality and less customer complaints.
- Improved runnability.

- "Know structure of your paper in order to better run your machine!"

감사합니다 Thank You for Your Attention!