aurelia.

NIPMAN
PAPPERSTEKNOLOGI

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Understanding PSM-Q

2nd Generation on-line stiffness measurement

incorporating Paperform predictive software

NIPMAN™ PAPER TECHNOLOGY

Uswers to some questions

New

2ND GENERATION PSM-Q

- Measures paper strength-quality every second of every day
- Gives a complete picture of paper quality for optimization
- Automatic prediction of all-important strength properties in MD & CD
  - Tensile Strength, Elongation, TSI, RCT, CMT, CCT, SCT, BURST, Bending Stiffness, MD/CD TSI Ratio, J/W Ratio

History and background

Amcor Packaging was the company who developed the system and also patented its technology. They only used it for internal use, to optimize their PM's, never commercialized it.
Once the patent ran out, the technolgy is now available and delivered to customers around the world.
Russel Allan, MD Aurelia Group

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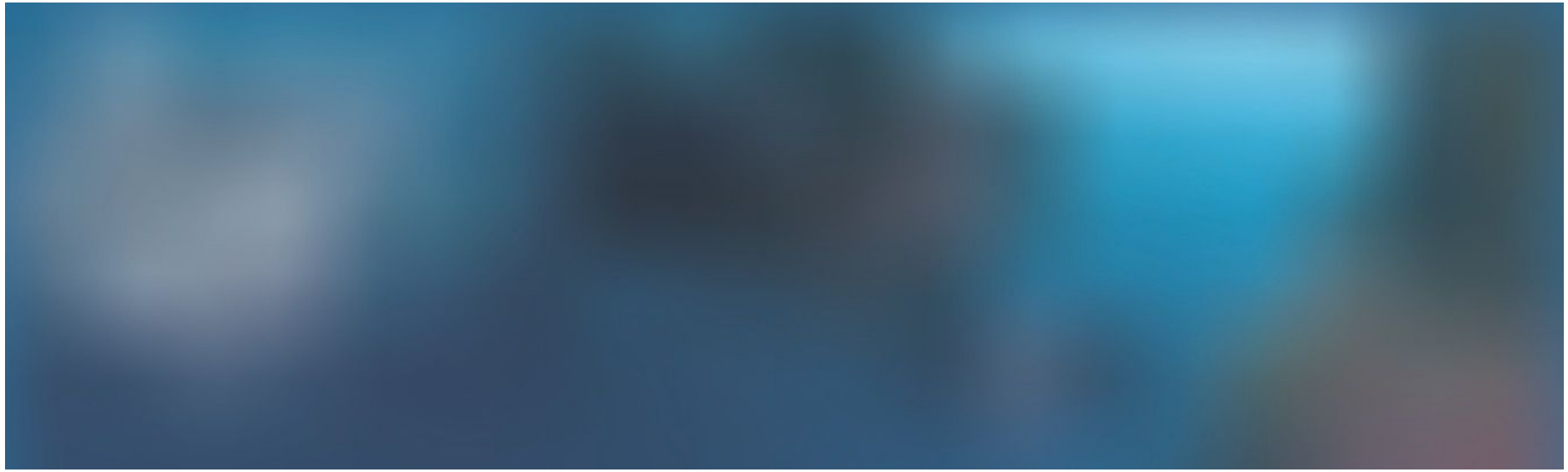
Lets you see into the paper reel

THE “PROBLEM”

TOP OF REEL MEASUREMENT



- Measures paper quality every hour or two
- Low test rates mean the picture is blurry and not representative

Lets you see into the paper reel

THE “SOLUTION”

PSM-Q MEASUREMENT

- Measures paper quality every second of every day
- Gives a complete picture of paper quality

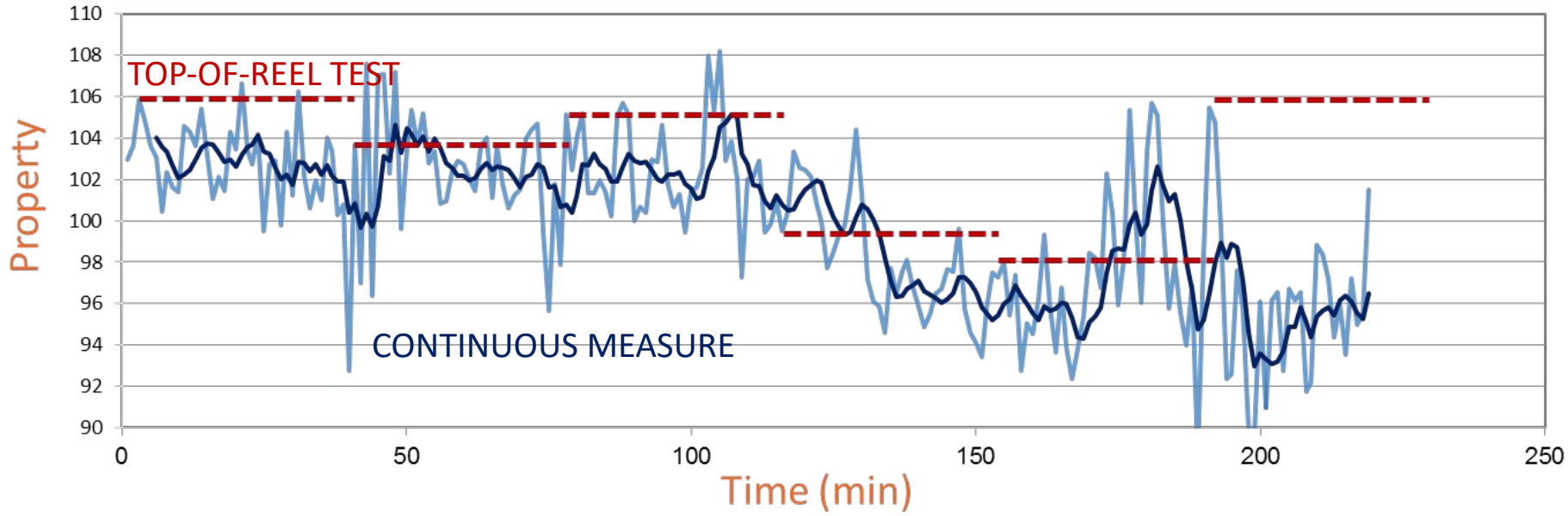
2ND Generation PSM-Q

THE “SOLUTION”

- Measures paper strength-quality every second of every day
- Gives a complete picture of paper quality for optimization
- Automatic prediction of all-important strength properties in MD & CD
  - Tensile Strength, Elongation, TSI, RCT, CMT, CCT, SCT, BURST, Bending Stiffness, MD/CD TSI Ratio, J/W Ratio

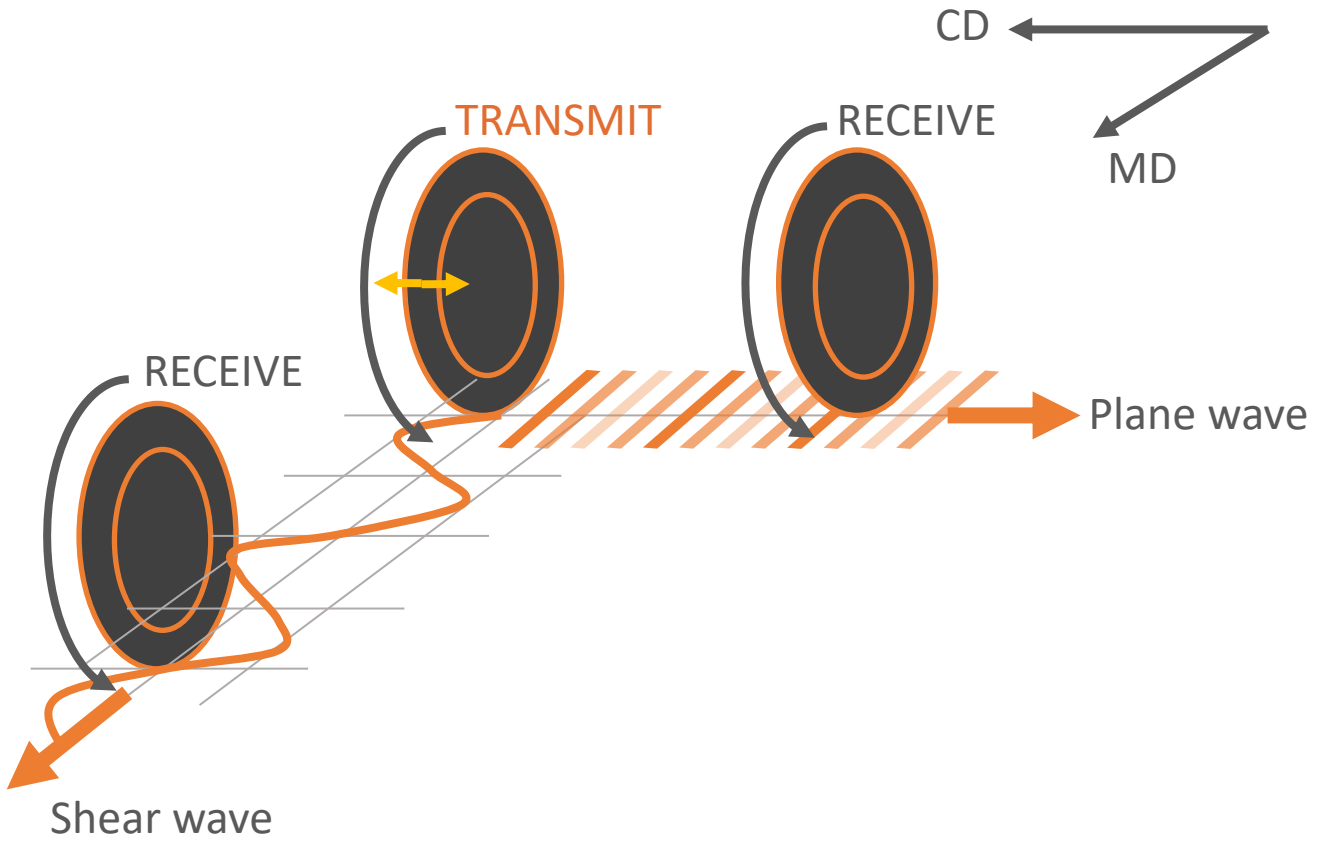
Lets you see into the paper reel

THE “HOW” OF THE PSM-Q



- Measures paper quality every second of every day
- Gives a detailed picture of paper quality

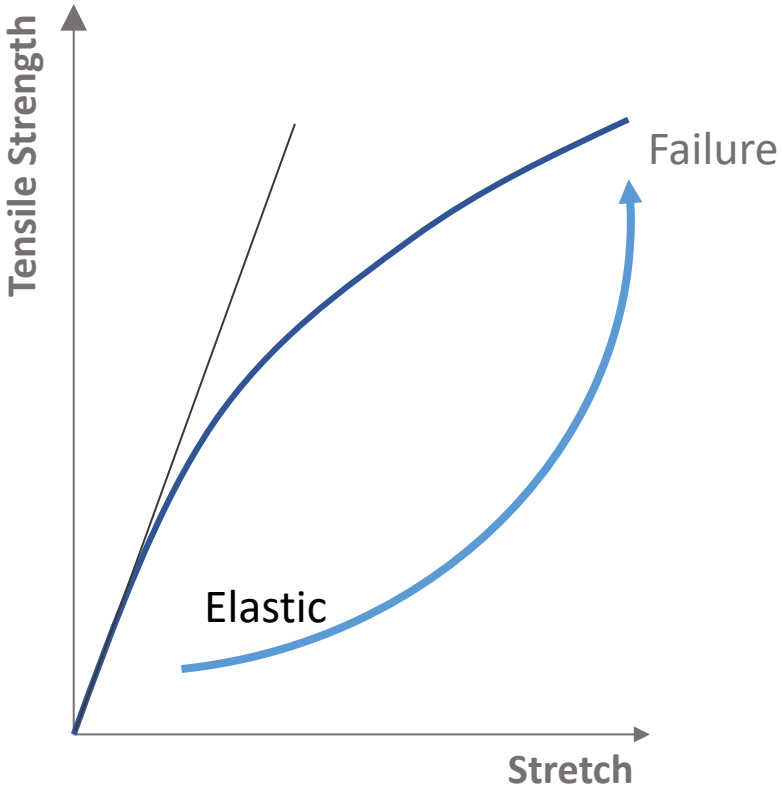
PSM-Q uses ultrasonic wave velocity to determine paper stiffness



The PSM-Q sensor consists of 3 contacting wheels: 1 transmitter and 2 receivers. The fundamental properties it reports are MD & CD Tensile Stiffness Index (TSI)

FUNCTIONAL PROPERTY DESCRIPTIONS

Predicting Useful Properties



1. PSM-Q relates the elastic properties to the failure properties
2. PSM-Q predictors represent physical descriptions of the paper test
3. The relationship between elastic properties (stiffness) and failure properties is maintained for many processes that occur on the paper machine.

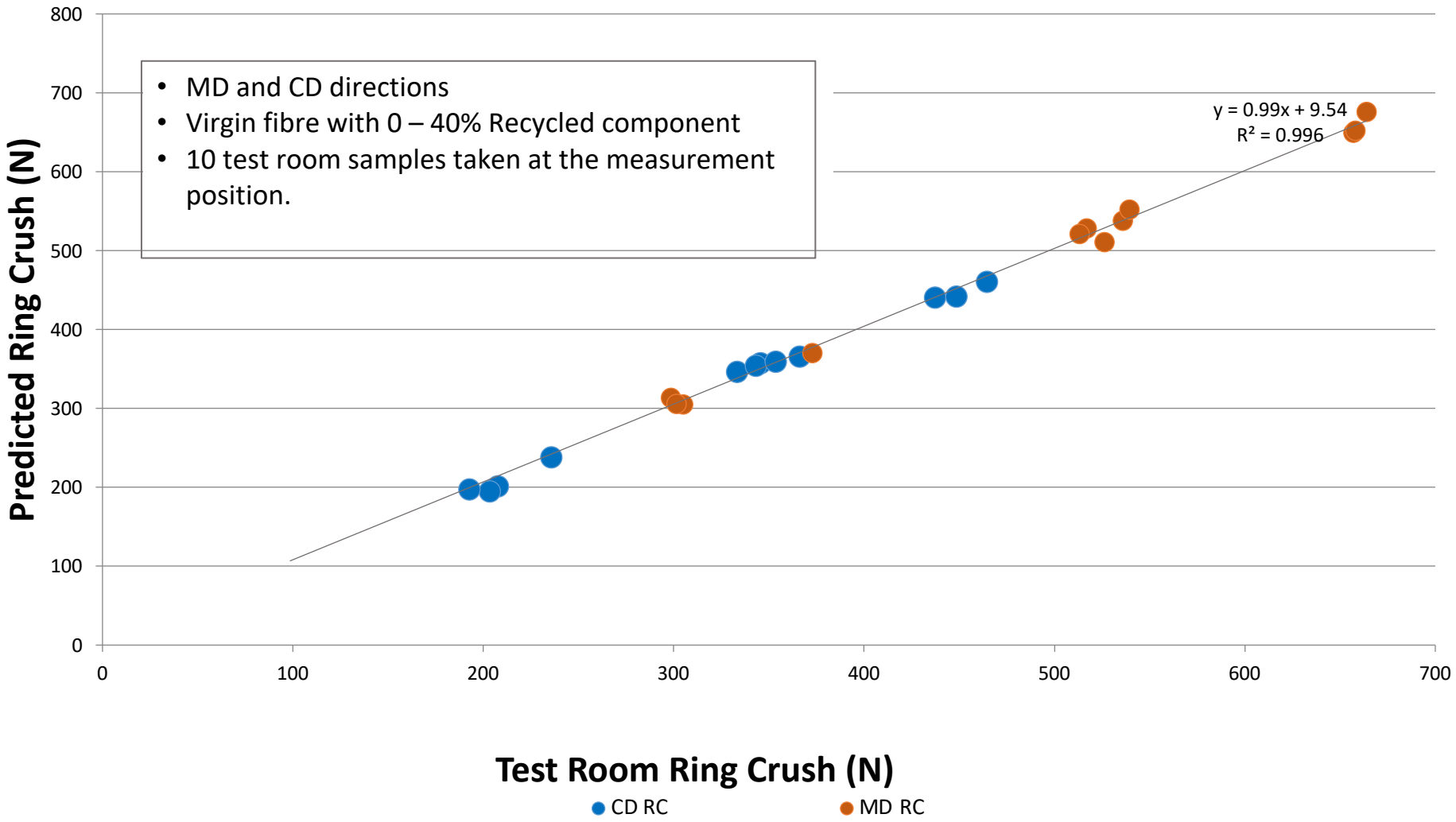
STRENGTH SENSOR POSITION

Measurement head

Pedestal floor mount

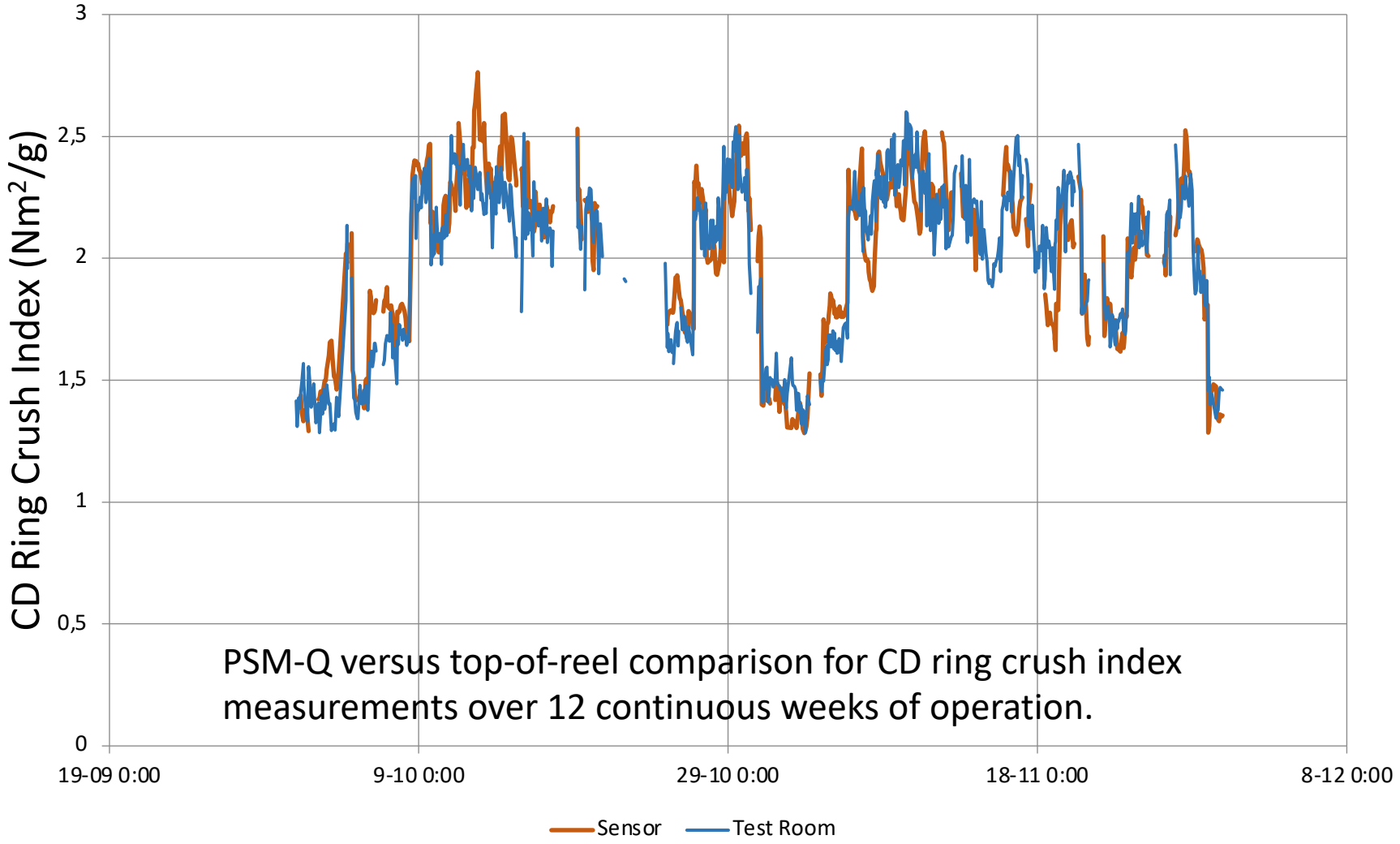
Cabling back to control box

PSM provides excellent prediction capability



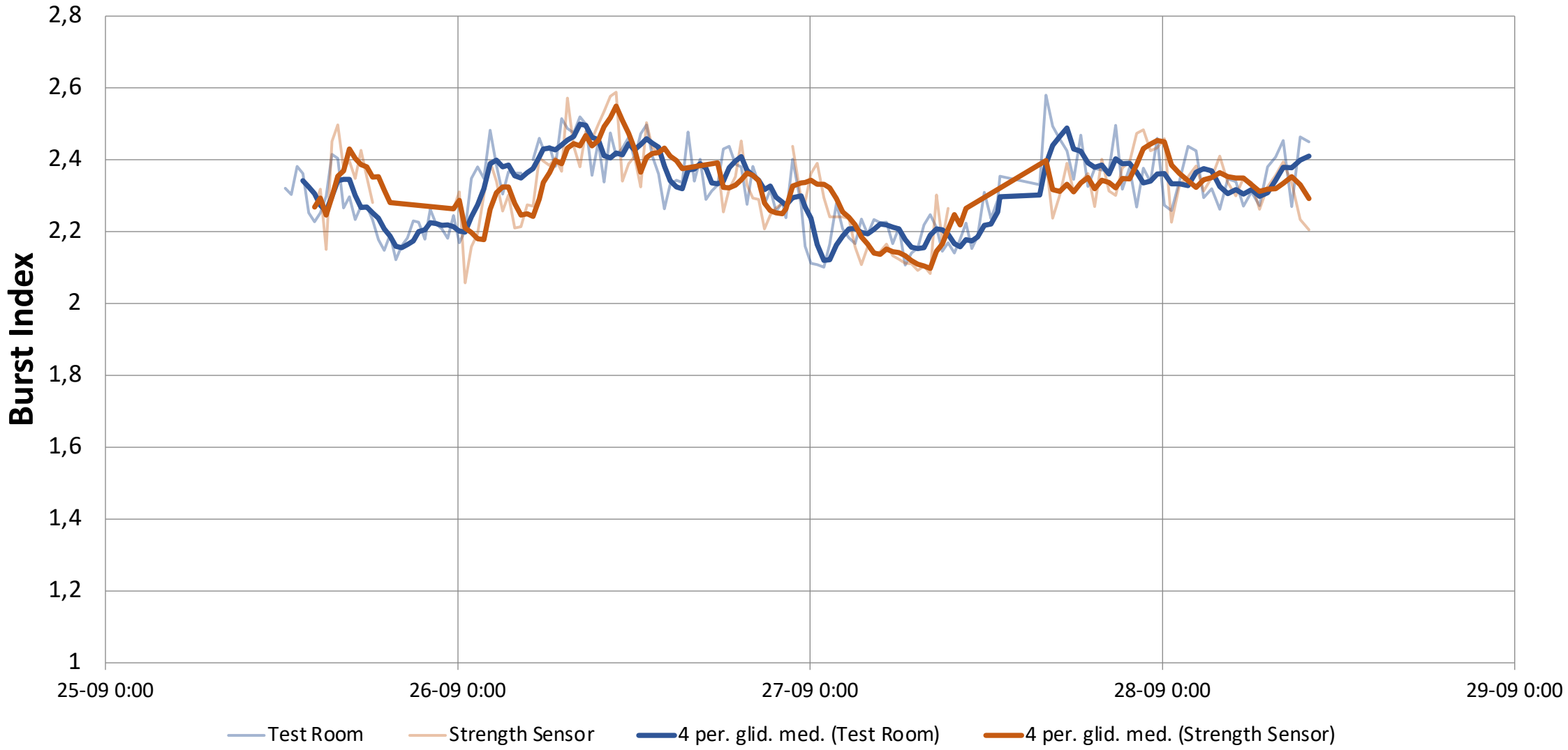
Comparison of test room and PSM measurements from a commercial linerboard machine

PSM delivers long term measurement stability, machine optimisation of important paper properties of CD Ring Crush Index.



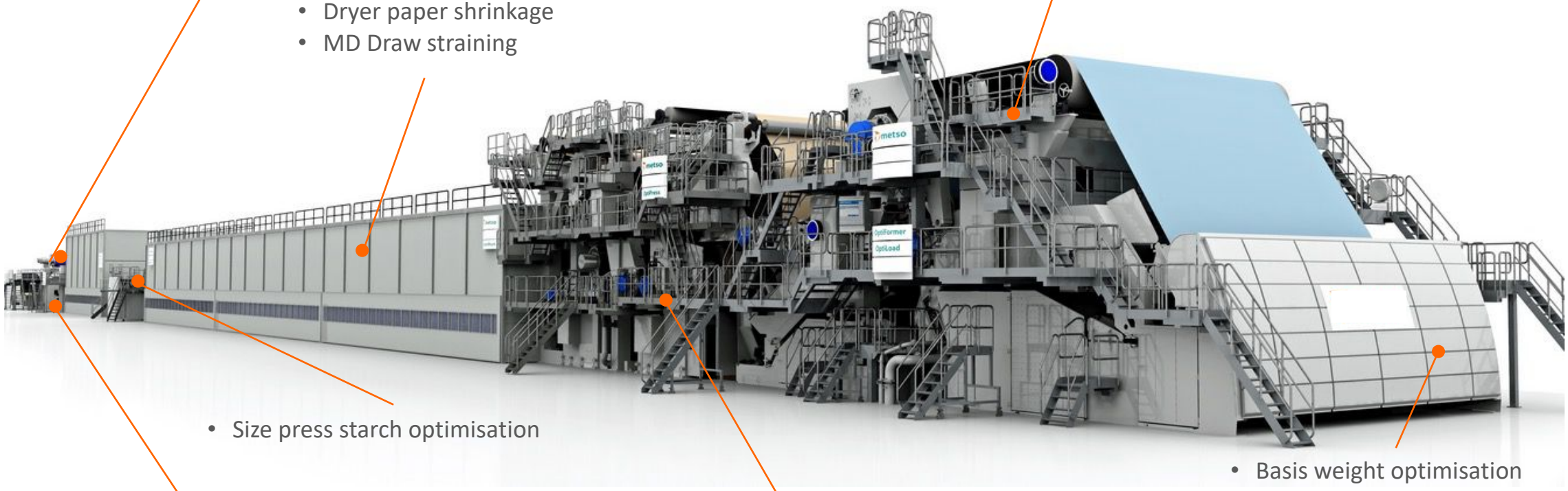
PSM-Q versus top-of-reel comparison for CD ring crush index measurements over 12 continuous weeks of operation.

PSM delivers long term measurement stability, machine optimisation of important paper properties of Burst Index.



PSM-Q measurements are sensitive to many process changes down the machine

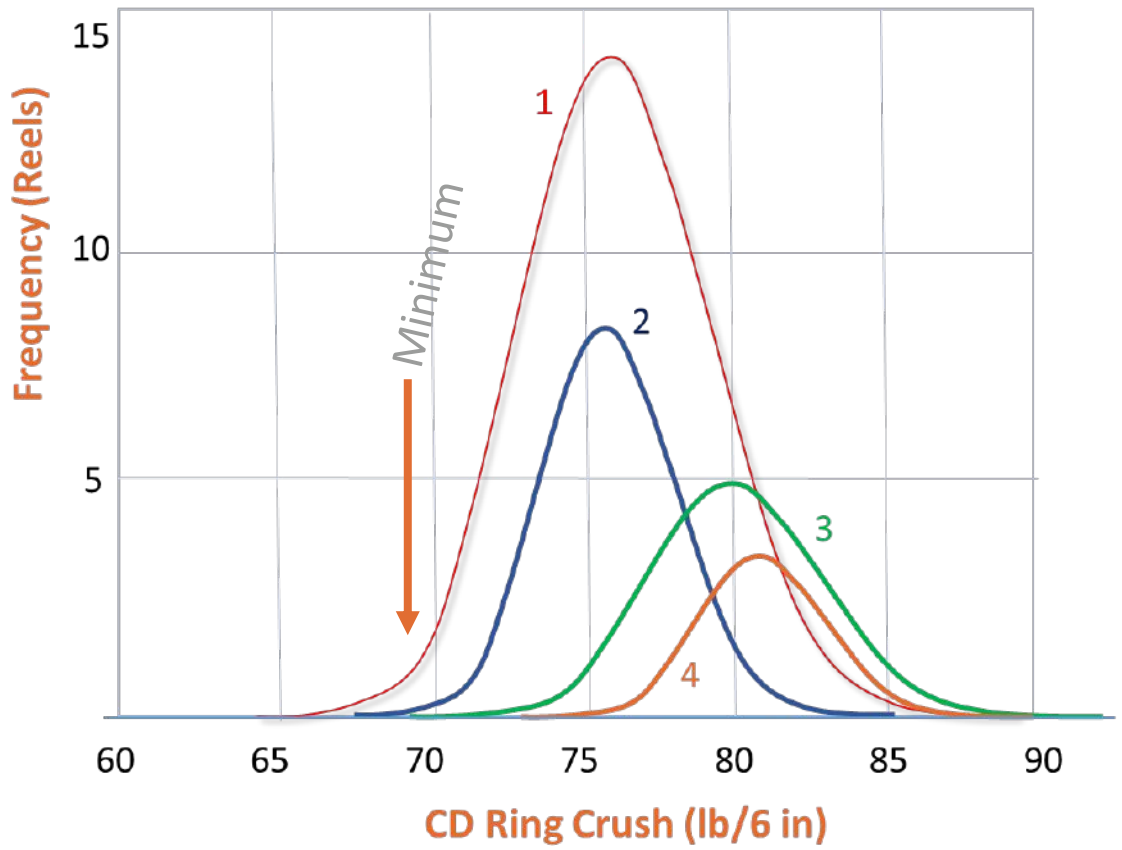
- Calender optimisation
- Dryer paper shrinkage
- MD Draw straining
- Forming optimisation
- Cross machine property profiles (wet end setup)
- Rush-drag setting



- Size press starch optimisation
- Property reporting (Bending stiffness, Ring Crush, Concora etc)
- Reduced reject material
- Faster recovery from breaks
- Press performance
- Basis weight optimisation
- Fibre Quality
- Optimised Recycled Addition
- Pulp Yield optimisation
- Refiner Control/ Energy minimisation
- Wet end starch addition
- Broke monitoring

Lower variability

THE “PROBLEM”



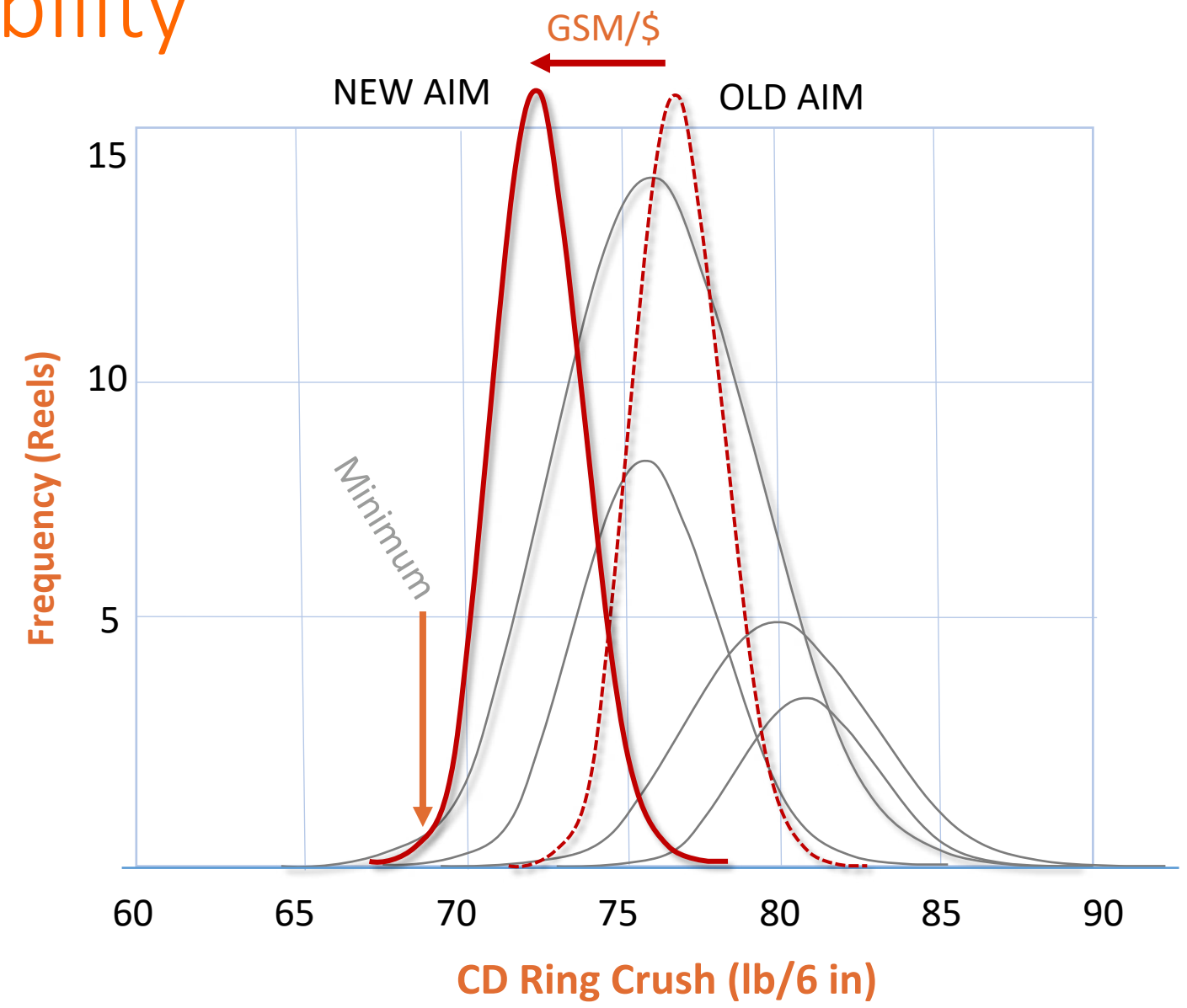
FOR THE SAME GRADE

Pk-pk property variation within a run ~ 15%

Pk-pk property variation across runs ~ 25%

Lower variability

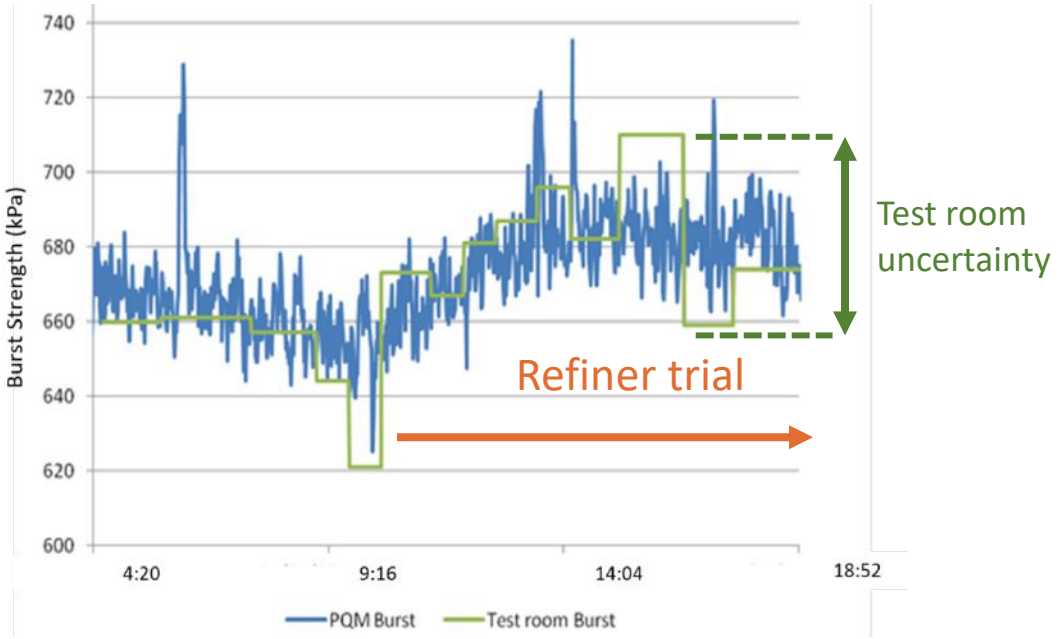
THE “PROBLEM”



Shorten Trial Times

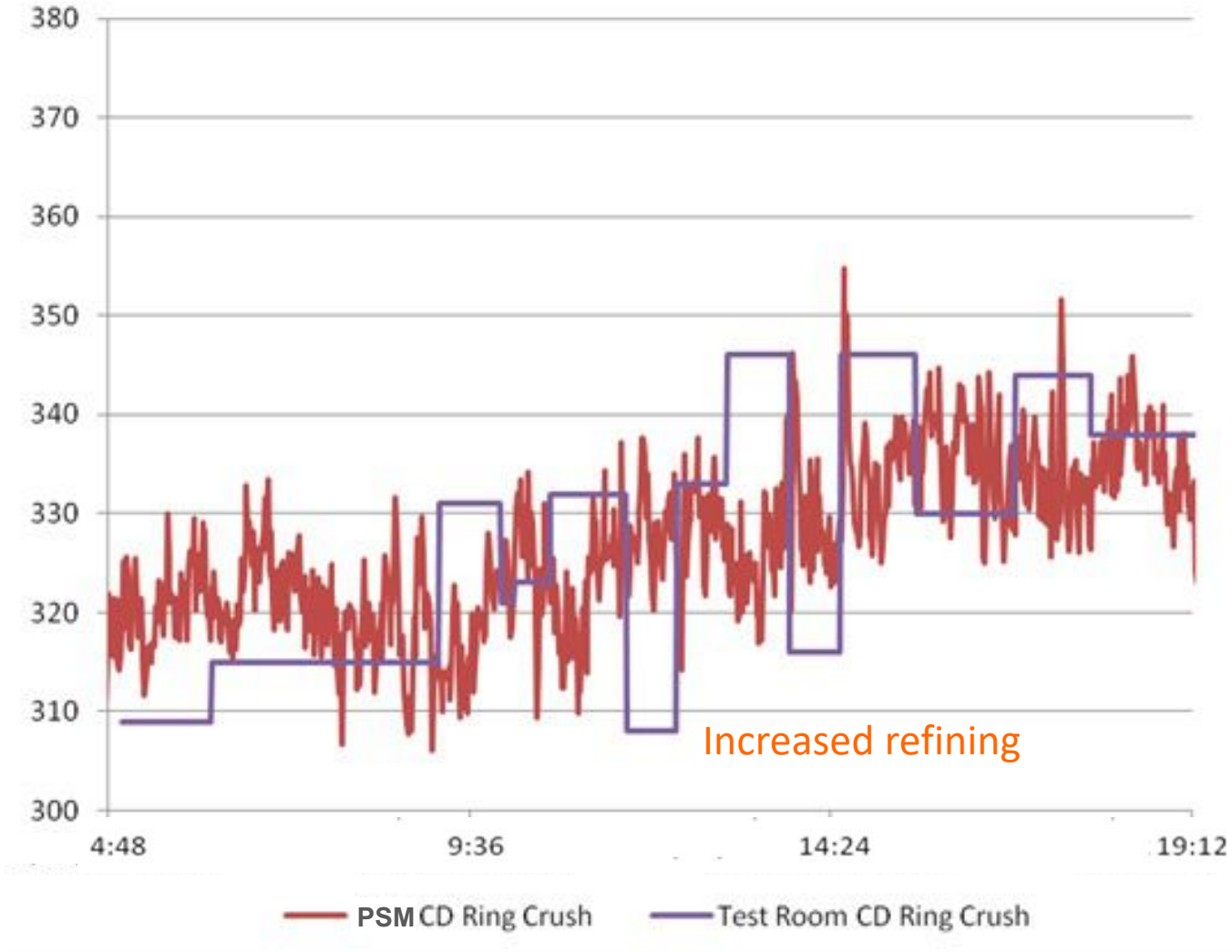
RESULTS

- Shorten trial times, maximise confidence in trial conclusions and lower the risk of losses during trials.
- Lower the cost of trials by substantially decreasing the trial time and subsequent need for paper testing.



2 Improve Trial Confidence

PSM measures fine resolution changes on the paper machine



3 Develop Informed Optimisation Strategies

RESULTS

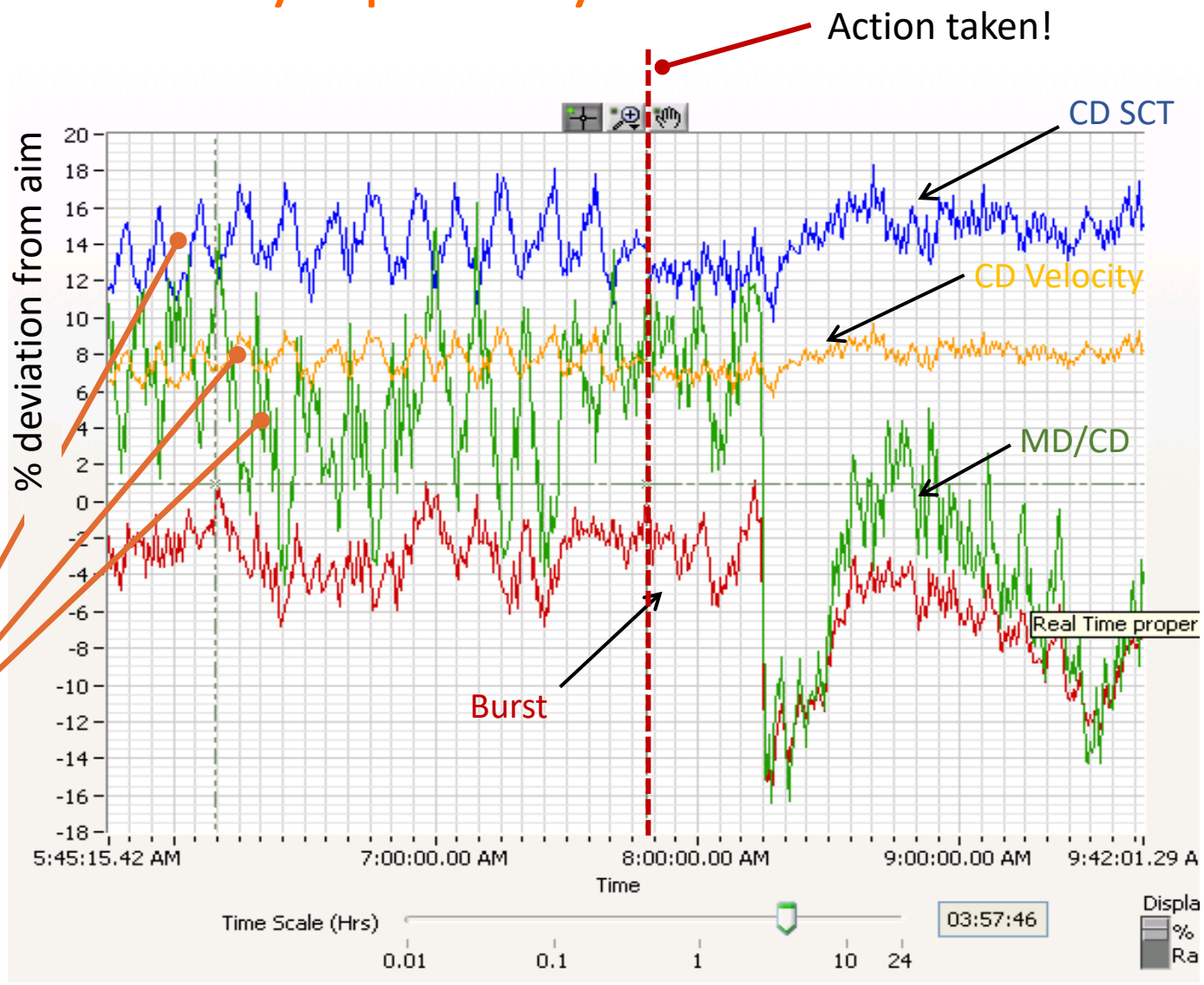
- Immediately shows process changes and setting changes as they affect the paper.
- Lets you know what's happening to paper quality as the reel is built.
- Facilitates the development of informed optimisation strategies to lower cost while maintaining or improving performance.
- Lowers paper property variation.

4 Quickly identify quality issues

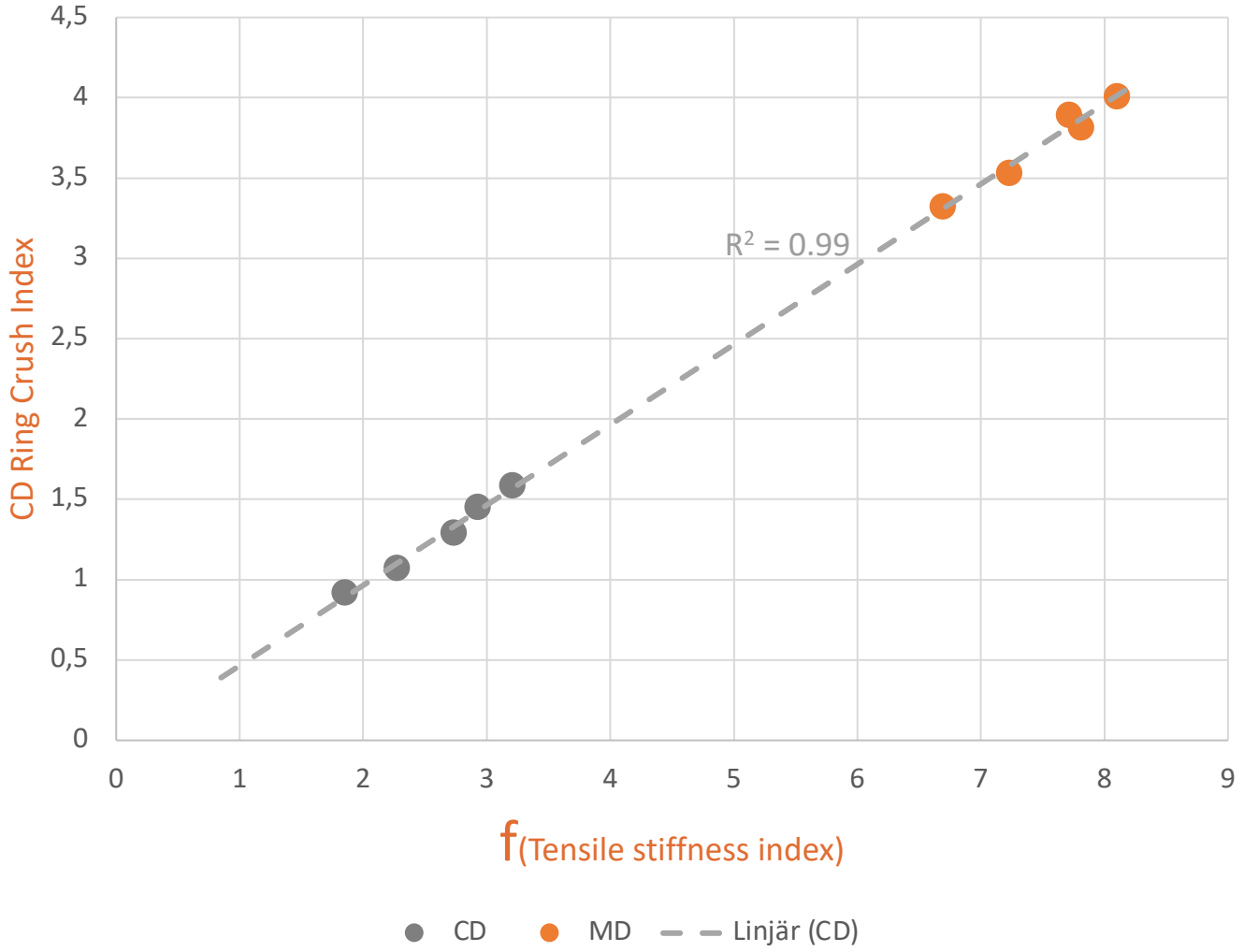
RESULTS

EUROPEAN RECYCLED PAPER MACHINE

12 minute cycle time

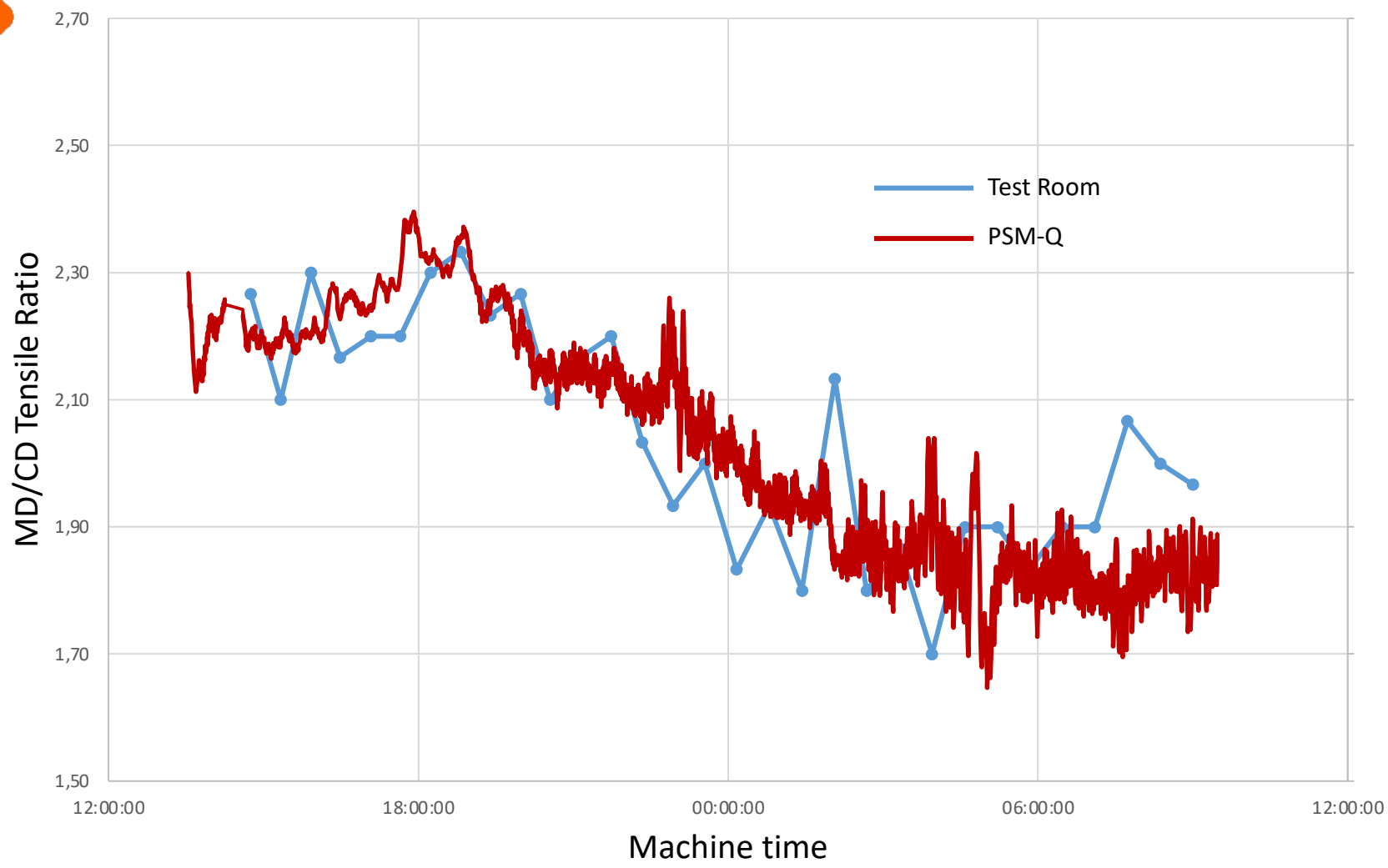


Save money on starch



PSM measures the impact of changing starch addition

6 Control paper machine settings



Comparison of PSM-Q versus top-of-reel measurement for linerboard machine MD/CD tensile ratio

IMPORTANCE

POOR CONTROL OF MD/CD RATIO HAS THE POTENTIAL TO:

1. Increase fibre orientation problems
2. Increase any forming instability on the paper machine
3. Ensure that any paper made must be over specified and more expensive than necessary
4. Make strategic product development and control nearly impossible to achieve.

For example optimising both Burst and CD SCT.

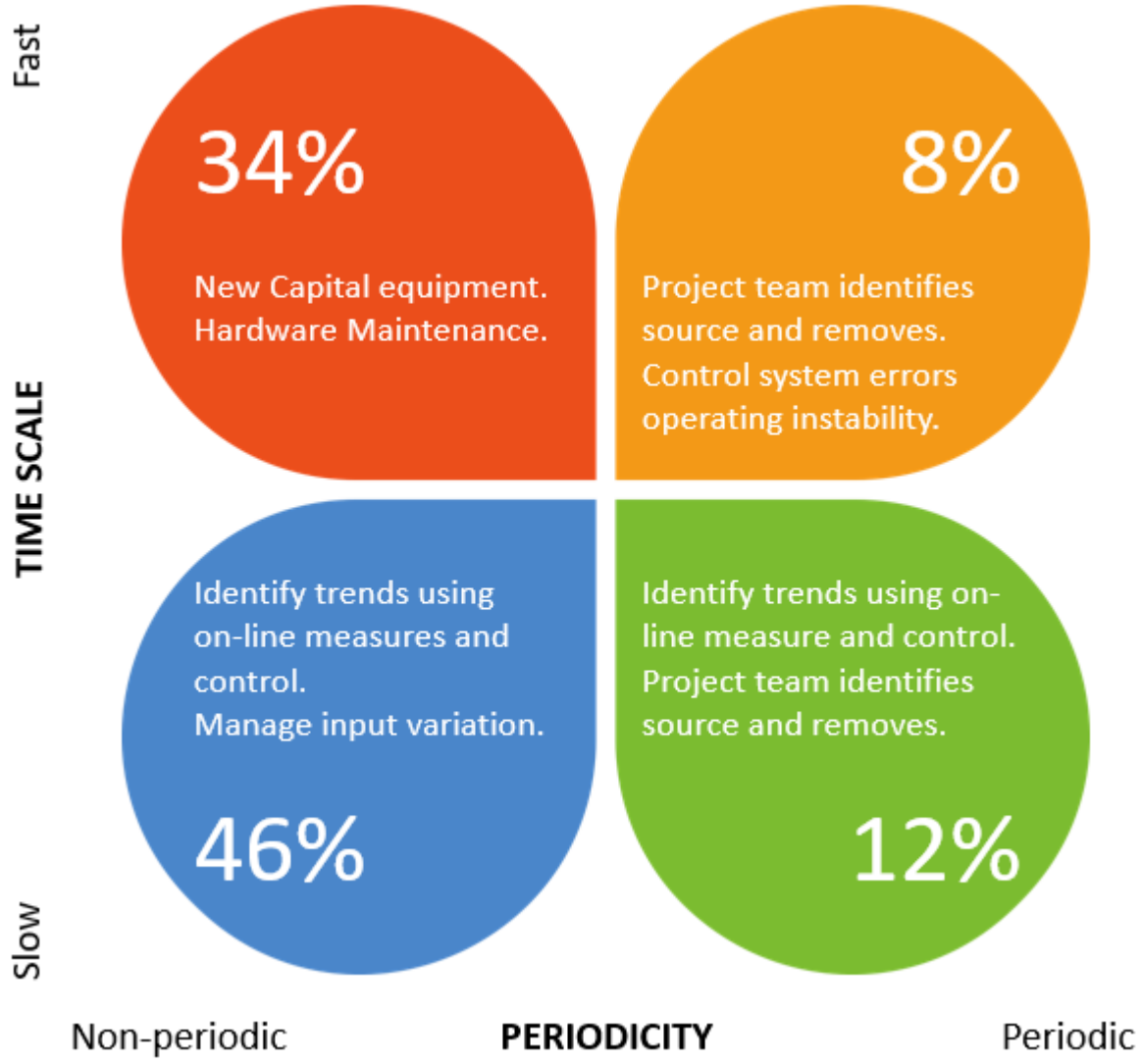
Over 55% of variations in the PM can be eliminated by monitoring and controlling proper MD/CD Ratio!

7 Minimise Losses

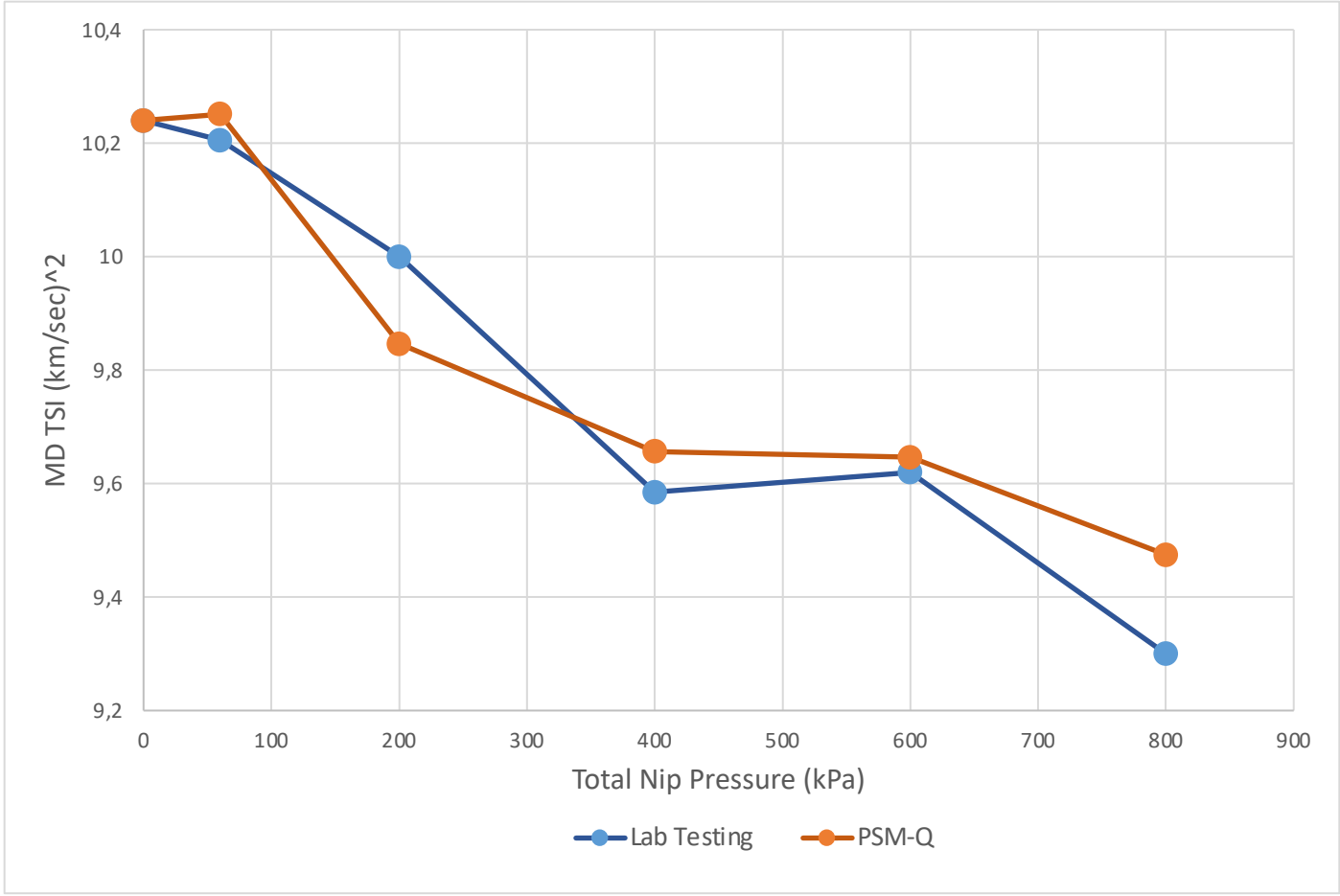
RESULTS

- Clearly shows whether paper quality has changed or is out of specification.
- Lowers the frequency of reject paper.
- Allows streaming of customer reels.
- Allows faster recovery from grade changes, breaks and start ups.

Remove quality variation



Avoid unnecessary property loss

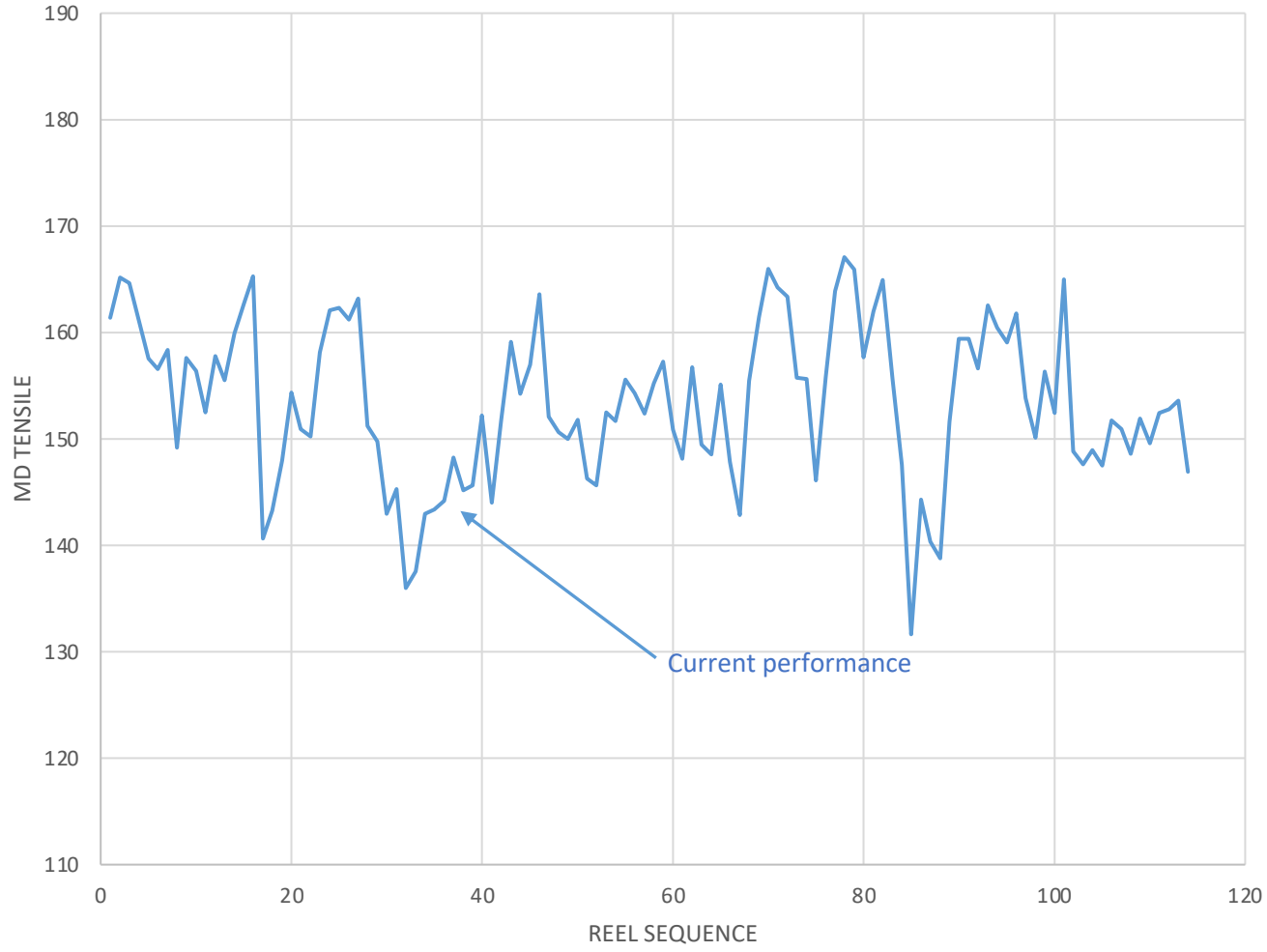


Finnish Calender trials

Operator Action

A. MD/CD TENSILE RATIO

Improvement in PMxx MD tensile strength variation by adjusting MD Tensile strength ratio.

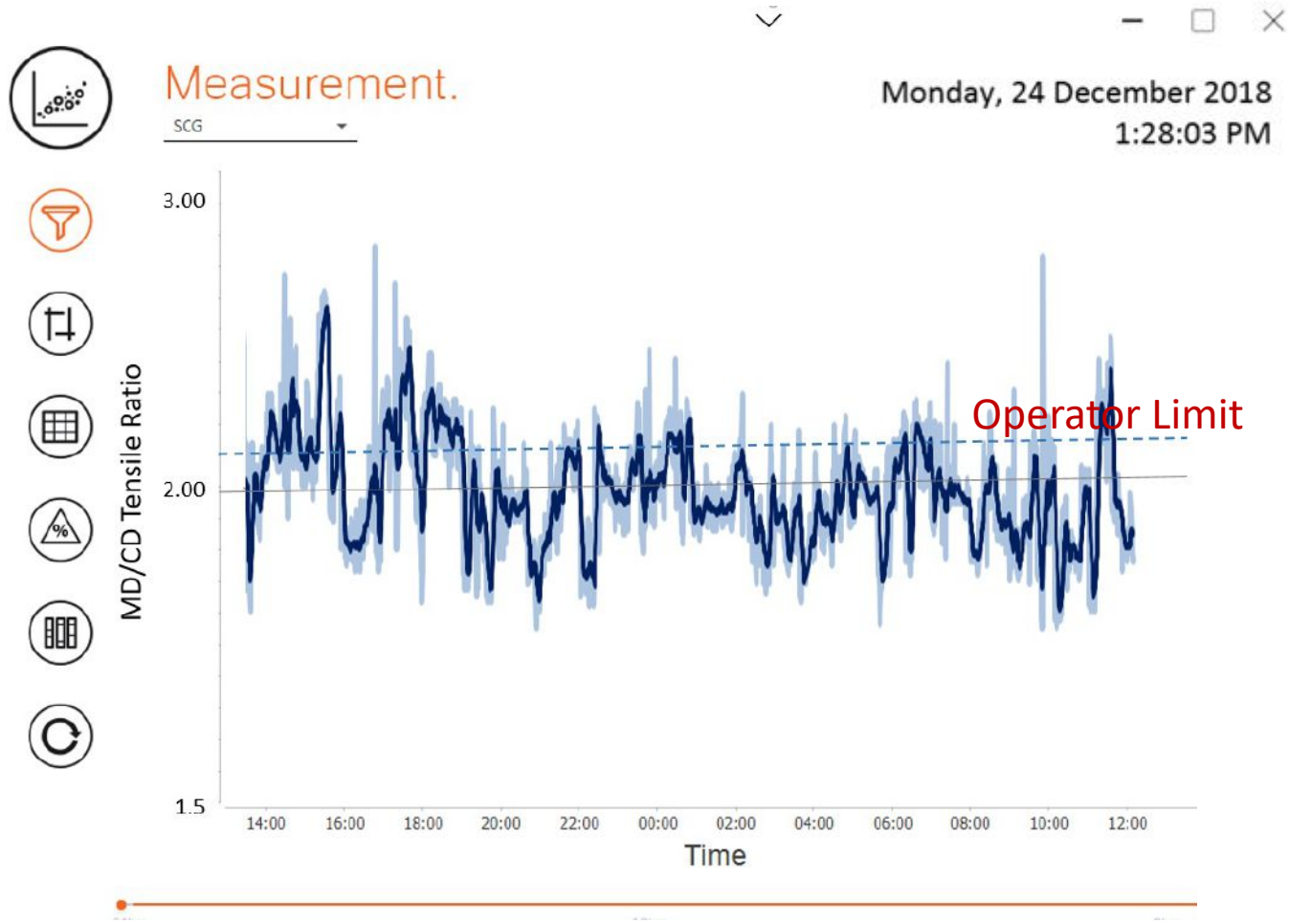


Operator Action

A. MD/CD TENSILE RATIO

1. Monitor MD/CD Tensile ratio using the PSM-Q.
2. Aim for MD/CD Tensile Ratio < 2.1
3. If MD/CD Tensile Ratio > 2.1 then adjust rush-drag speed **difference** over allowable range.

4. Always monitor MD/CD tensile ratio when changing machine speed.
5. Over time, generate an ‘action table’ that calculates the jet-wire speed difference to give MD/CD = 2 for different machine speeds (grades).



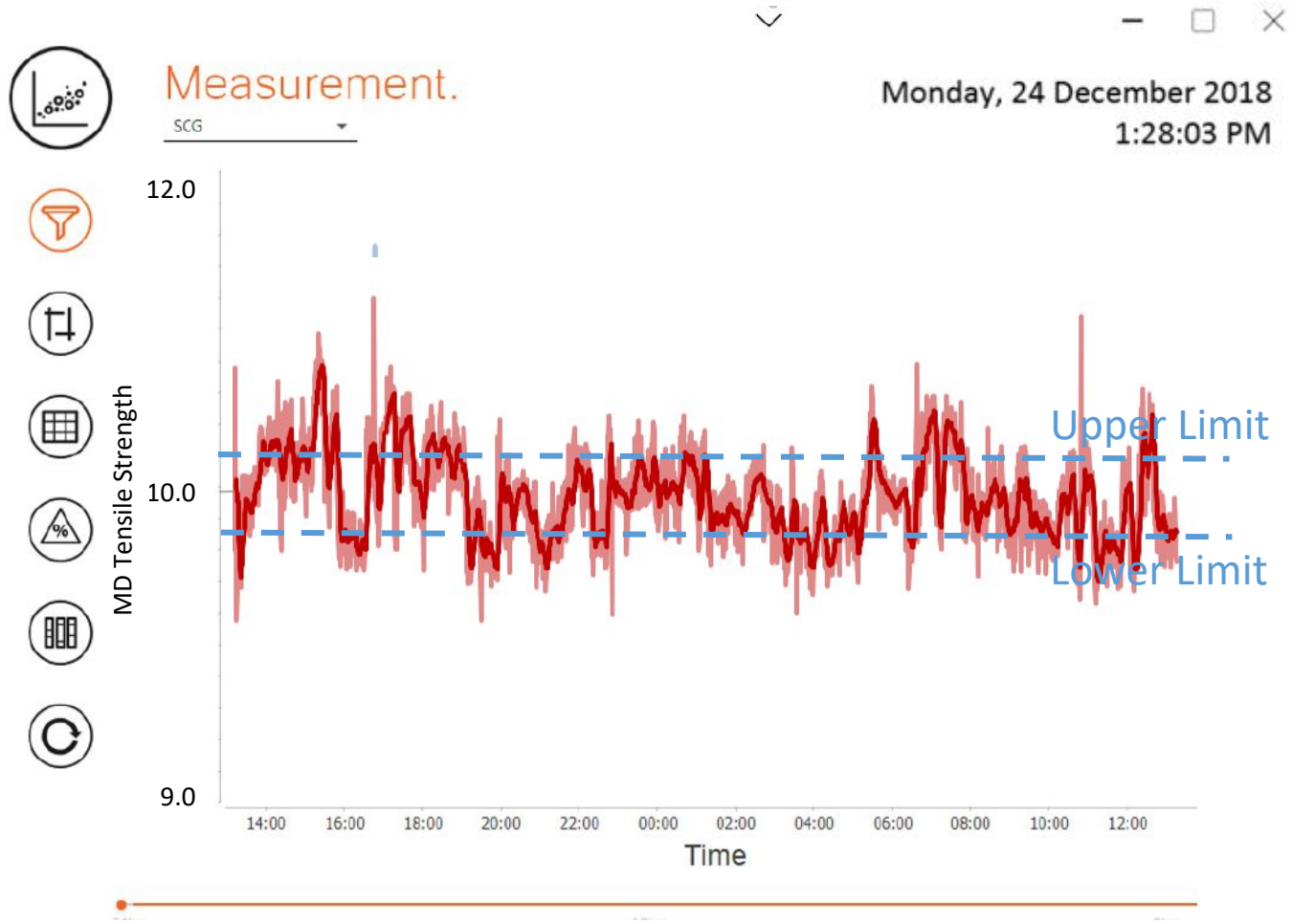
Jet-wire speed difference = (1- jet/wire speed ratio) x machine speed

Operator Action

B. FIBRE/STARCH QUALITY

1. Monitor the chosen properties (like MD Tensile).
2. If property is above desired limits then check MD/CD ratio and lower starch addition, basis weight and increase lower cost fibre or broke back to the machine.
3. If property is below desired limits then check MD/CD ratio, minimise lower cost fibre and broke and increase starch addition.

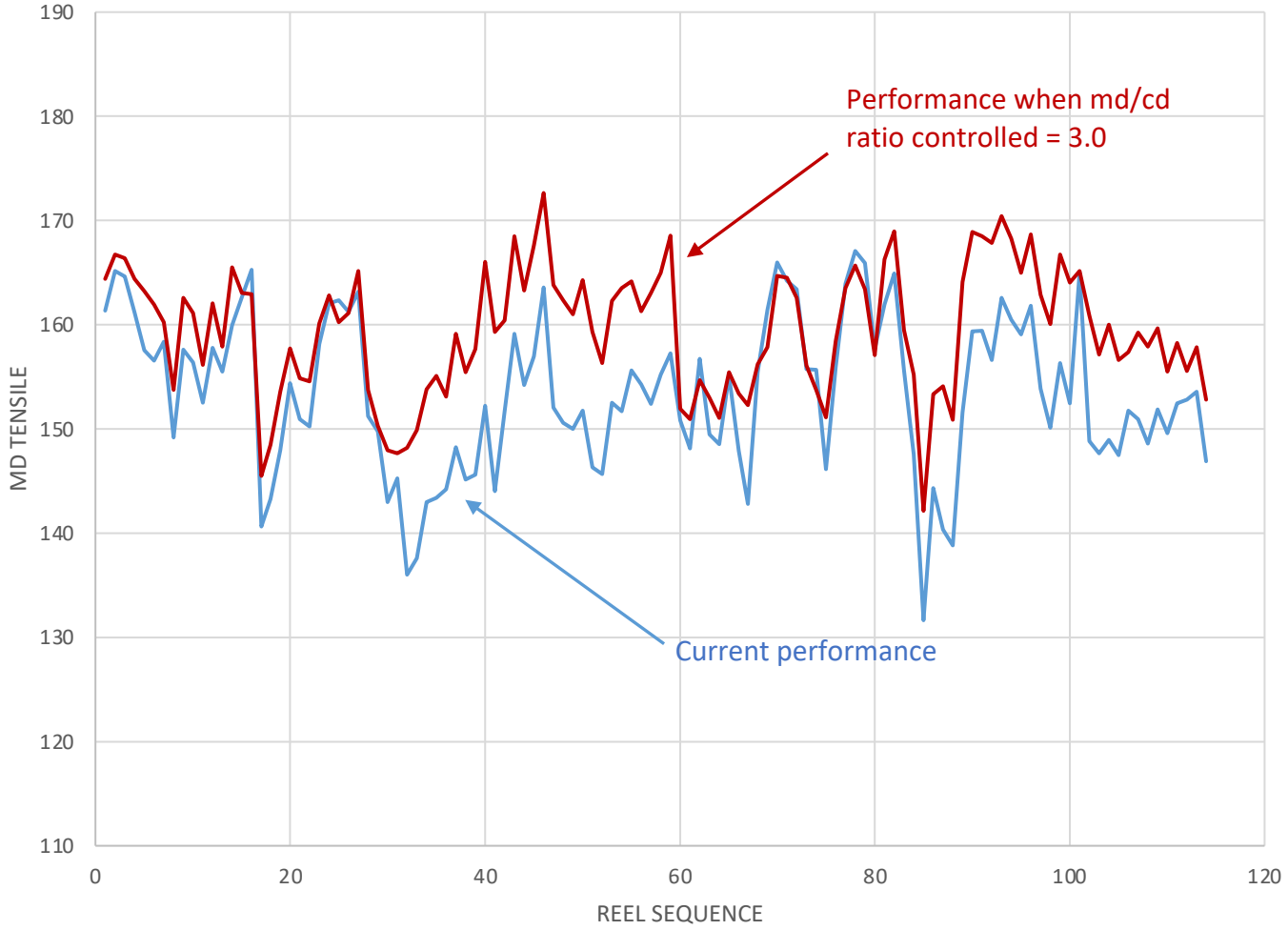
4. Always monitor machine moistures.
5. Over time, generate an ‘action table’ that calculates the improvement in property with the addition of starch.



Operator Action

A. MD/CD TENSILE RATIO

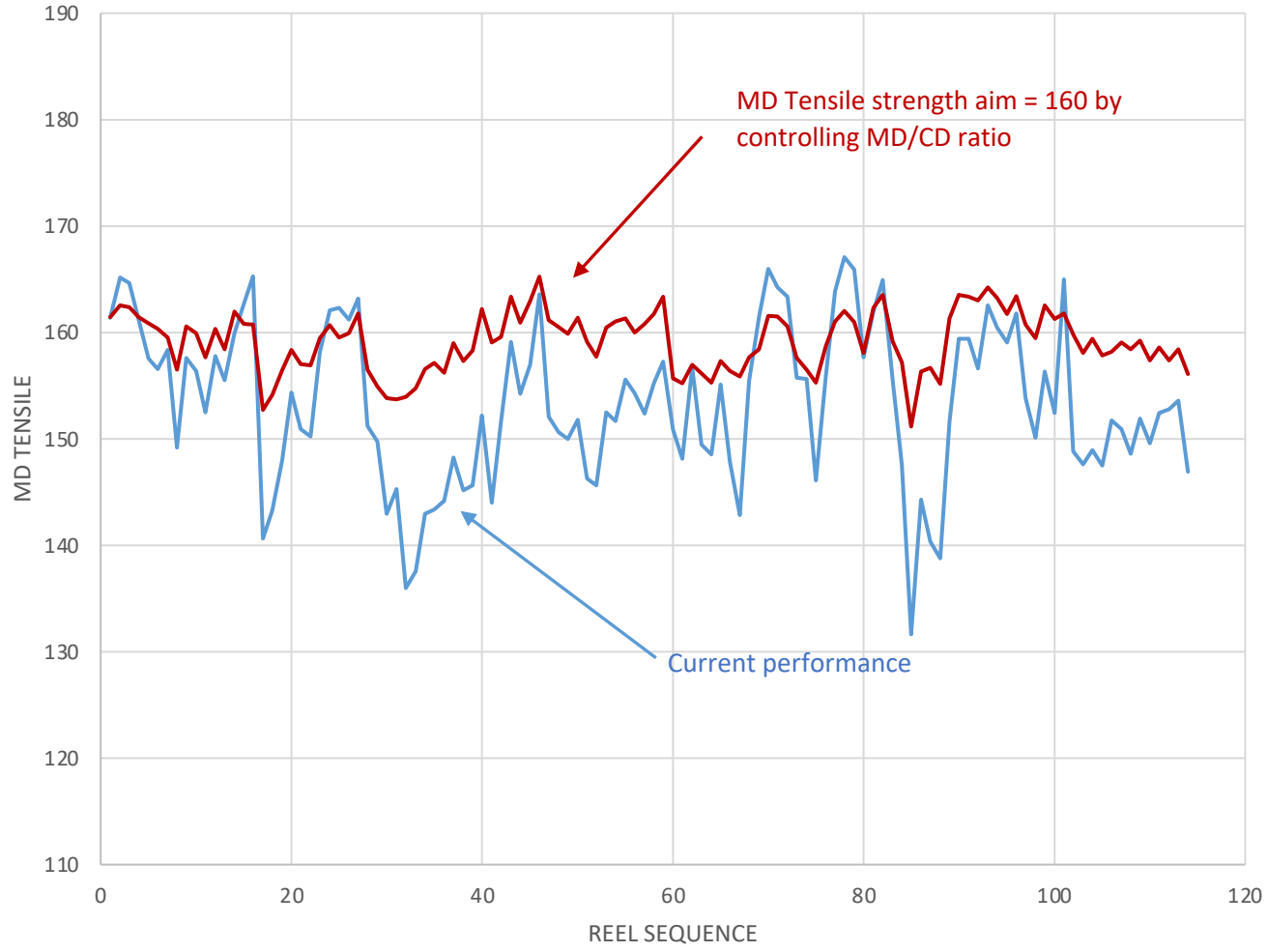
Improvement in PMxx MD tensile strength by maintaining the md/cd tensile ratio at 3.0



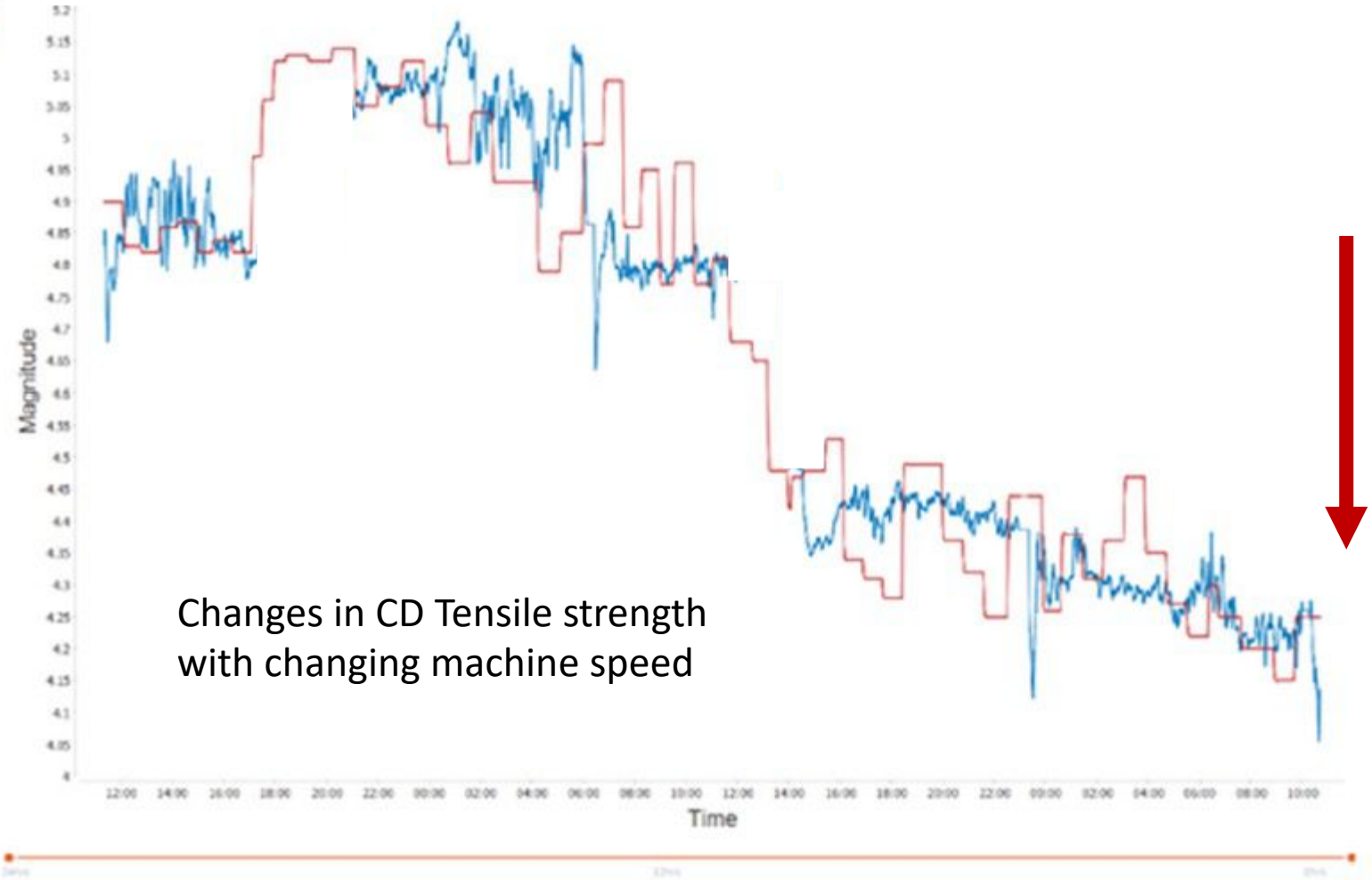
Operator Action

A. MD/CD TENSILE RATIO

Improvement in PMxx MD tensile strength variation by adjusting MD Tensile strength ratio.



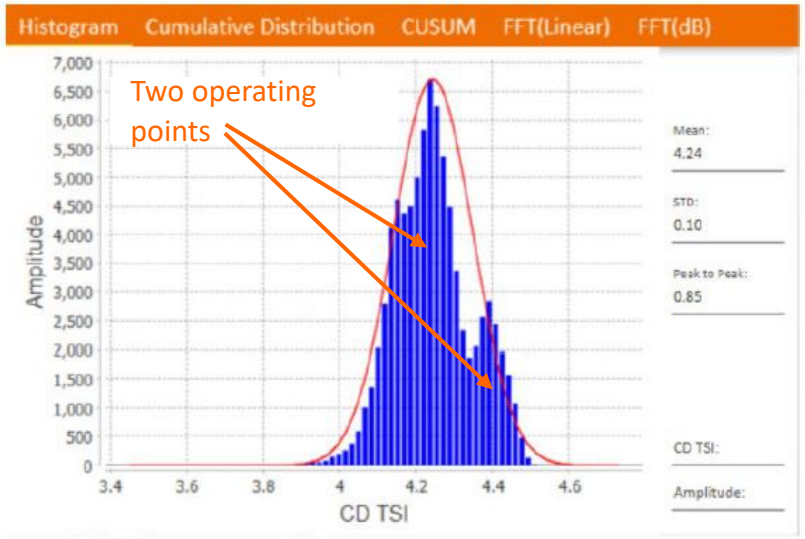
Case Study 1: Installed 2017
Gypsum board machine

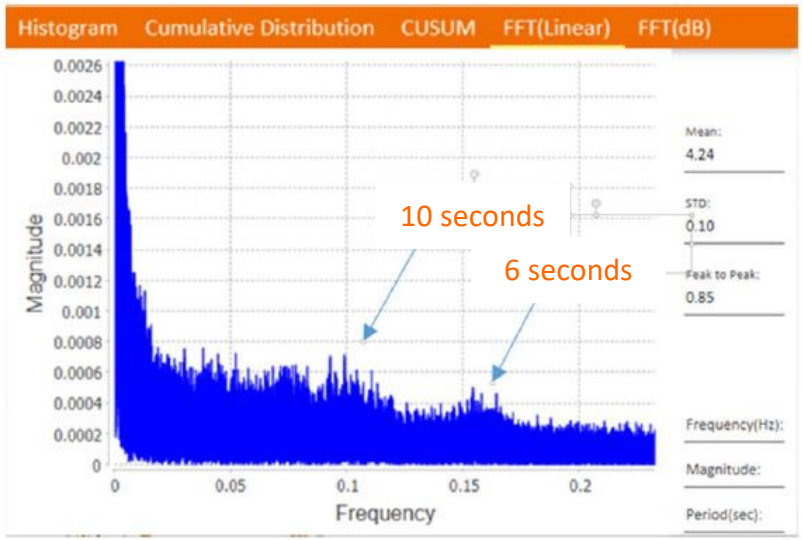


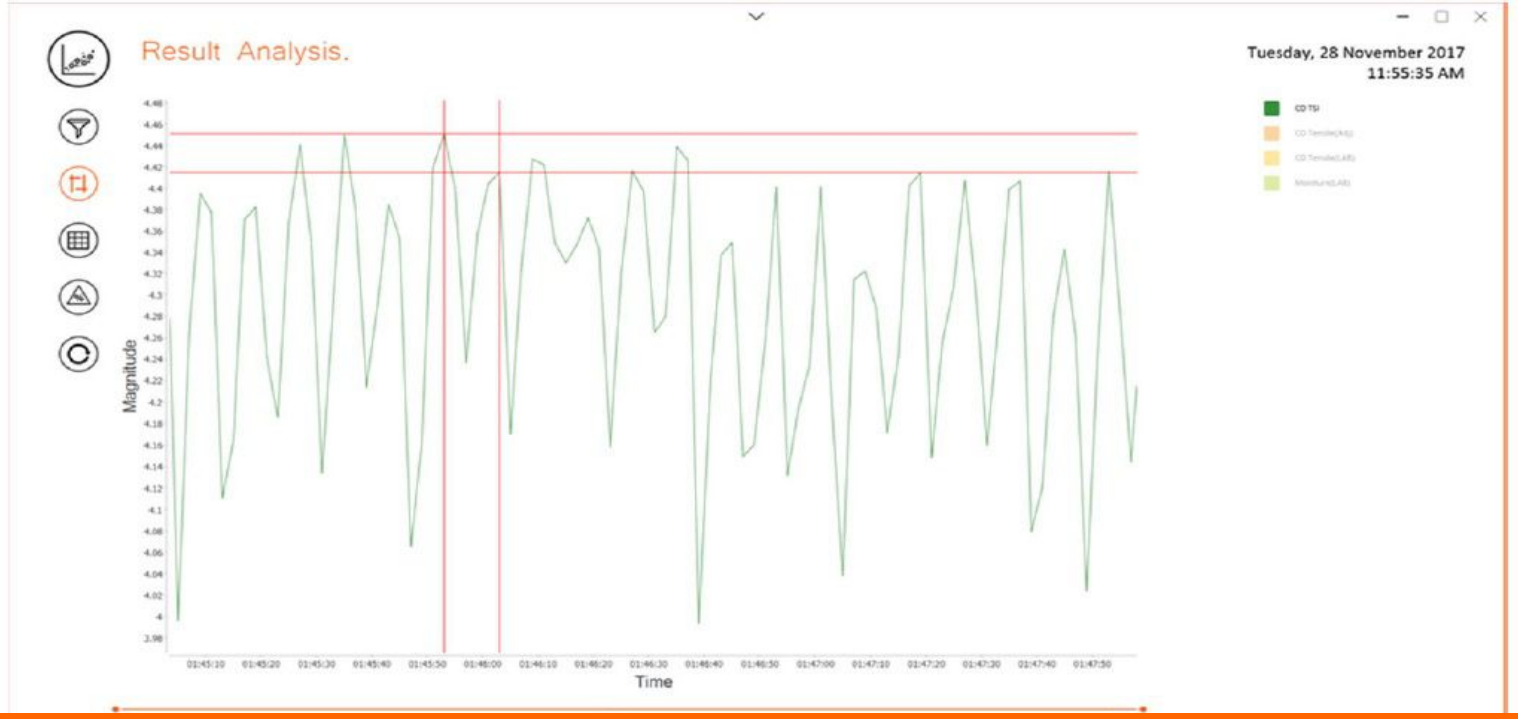
Case Study 1: Installed 2017 Gypsum board machine

This machine operated in two modes. Removing the higher operating performance by monitoring using PSM-Q and minimising starch usage and maintaining md/cd tensile ratio saved 5% starch costs.

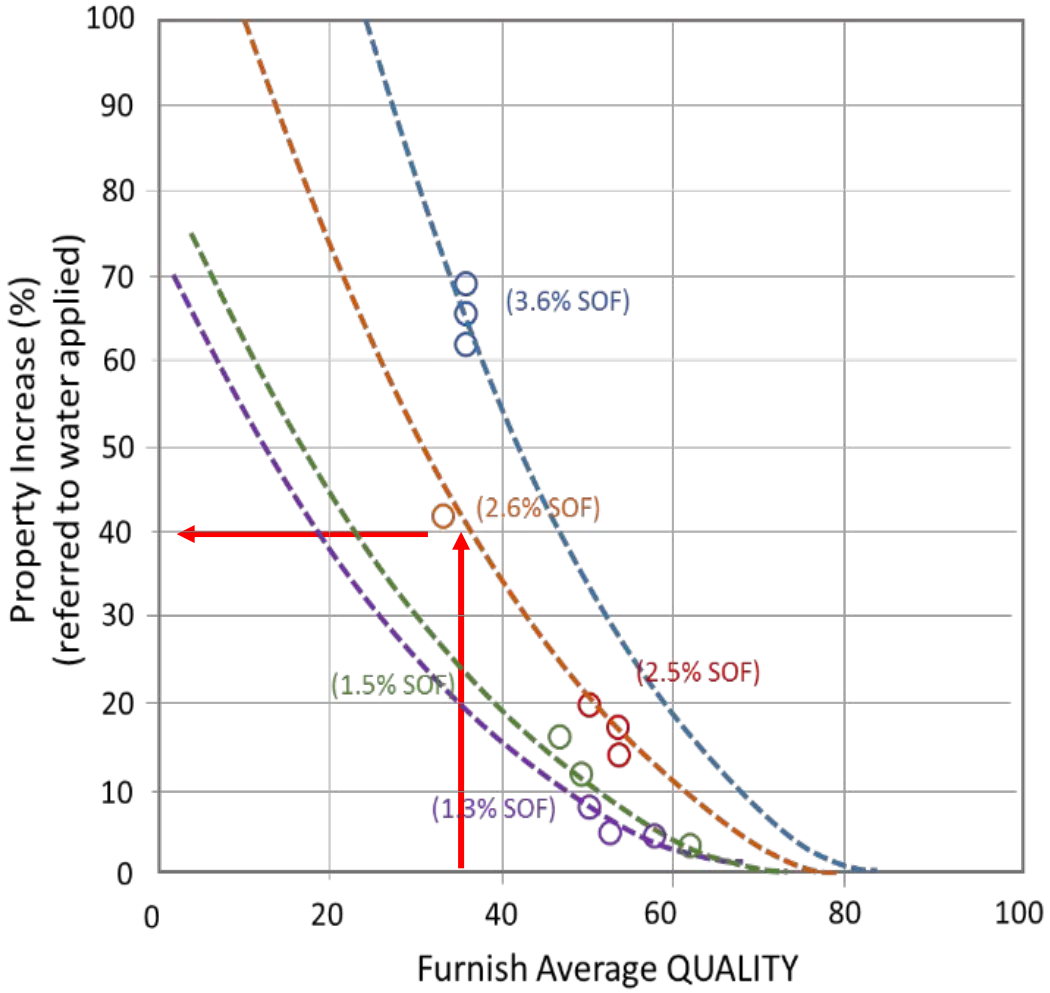
Controlling md/cd tensile ratio lowered out of specification claims by $500,000 per year.







Starch considerations



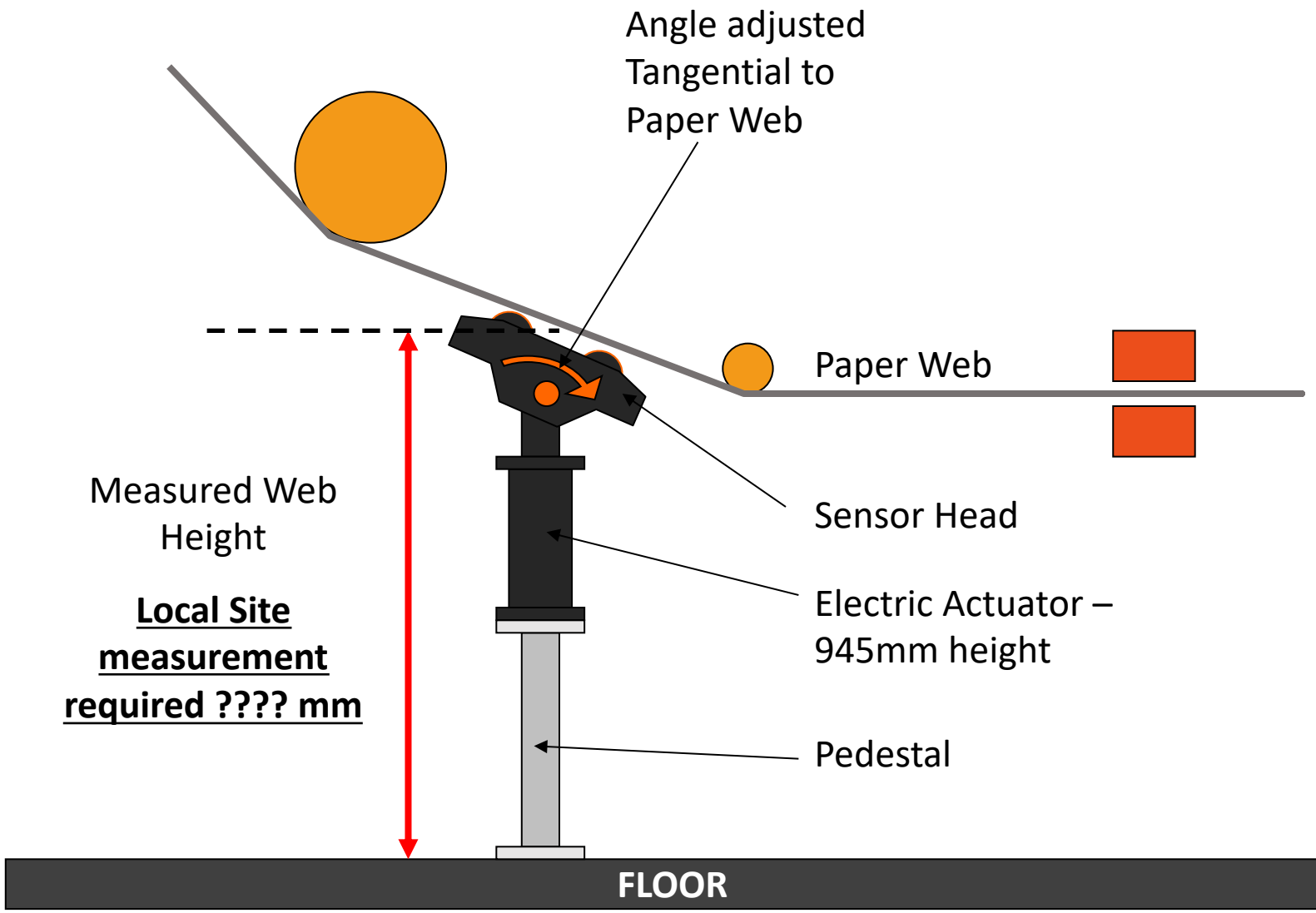
40% improvement is expected for typical recycled fibre sheet with the addition of 2.5% starch (15-20% for every 1% SOF).

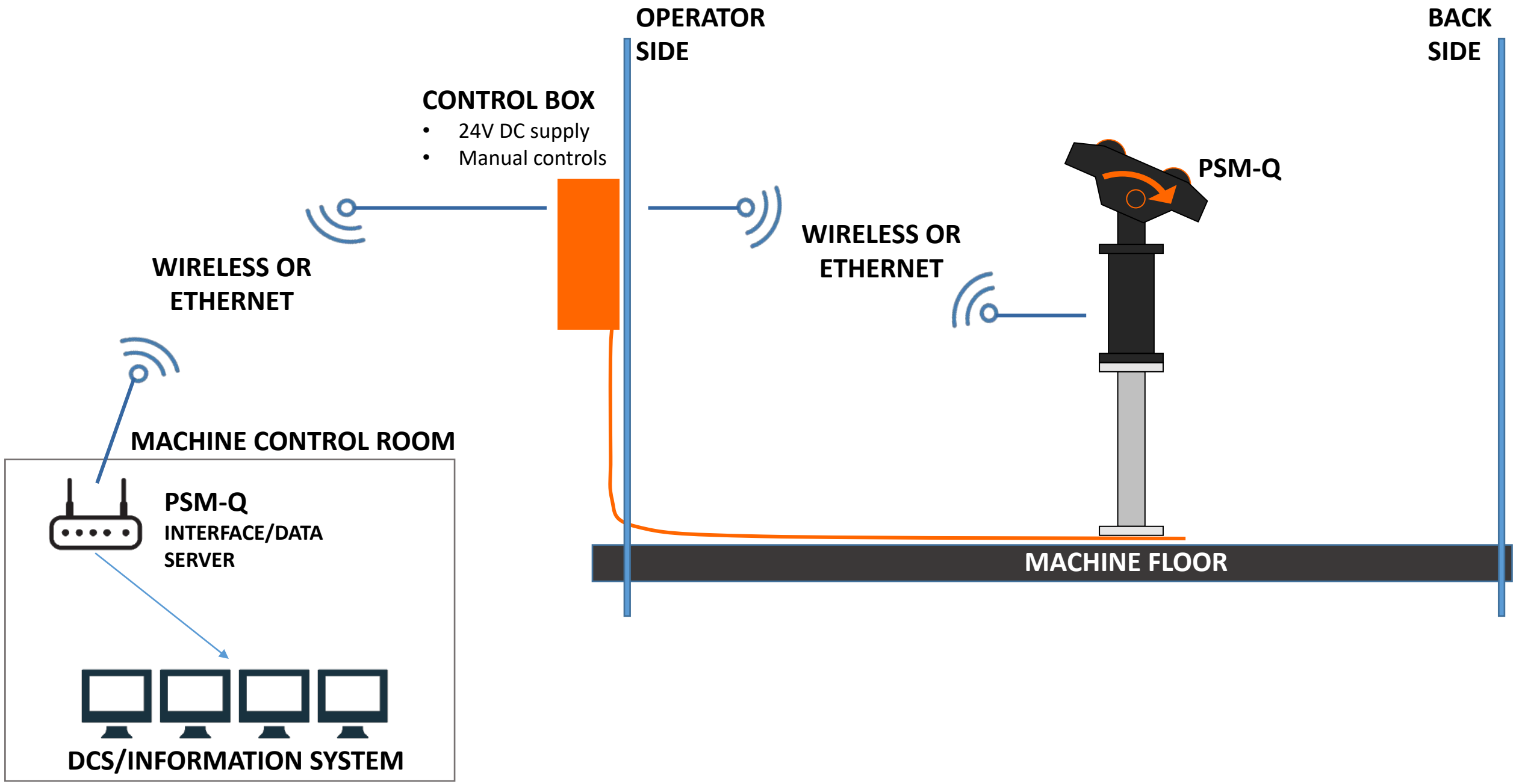
This will depend upon:

- Starch quality/preparation
- Raw fibre quality
- Sheet conditions on entry to the size press
- Profile of starch effect through the thickness of the sheet.

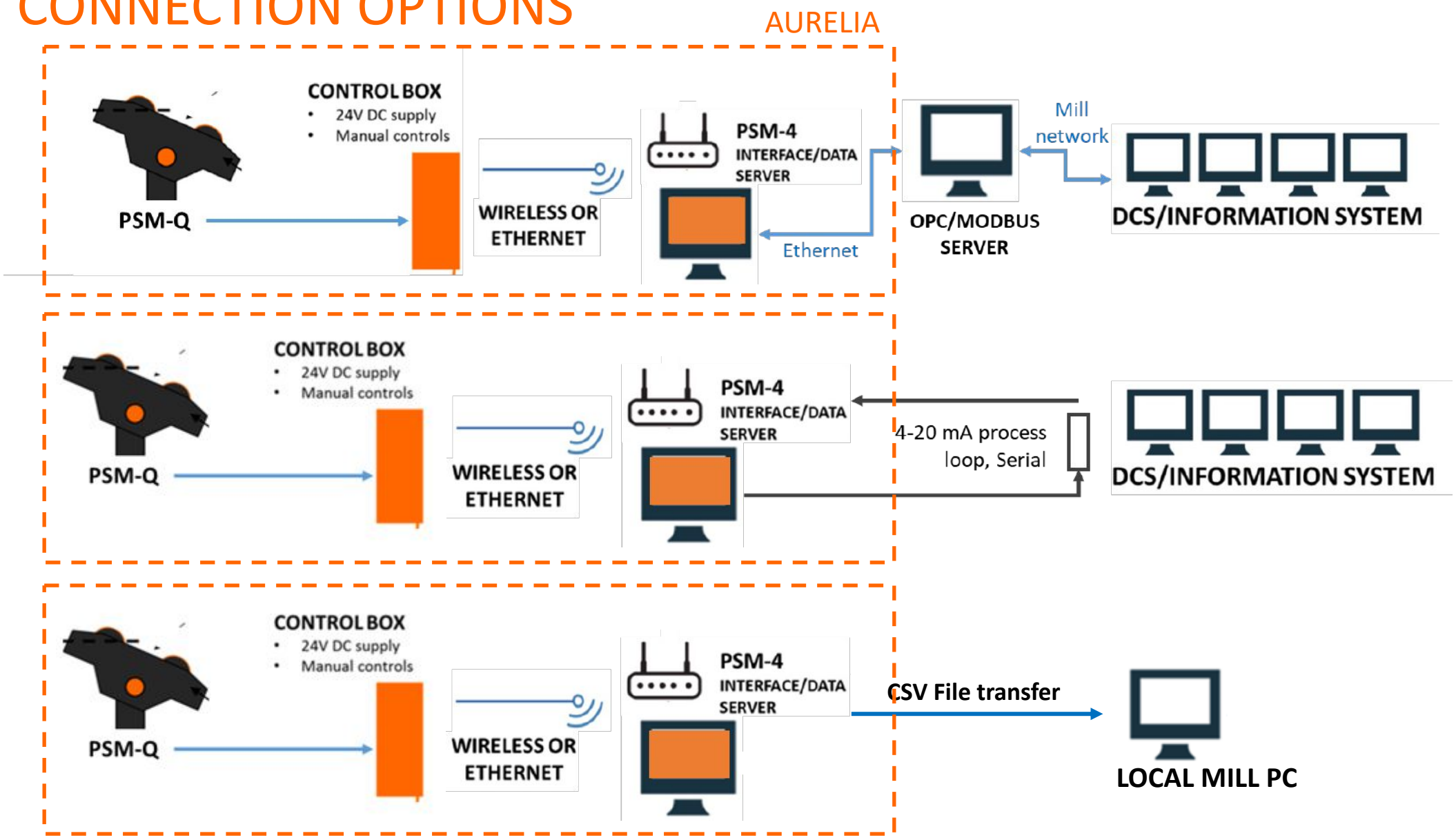
Maximise by:

- Using PSM-Q on-line measurement
- Evaluate the current starch effect profile
- Ensure that the starch quality is delivering the expected improvement
- Ensuring that the sheet has optimal moisture, fibre quality,


Angle adjusted
Tangential to
Paper Web
Paper Web
Sensor Head
Electric Actuator –
945mm height
Pedestal
Measured Web
Height
Local Site
measurement
required ???? mm
FLOOR


OPERATOR SIDE
BACK SIDE
CONTROL BOX
• 24V DC supply
• Manual controls
WIRELESS OR ETHERNET
WIRELESS OR ETHERNET
PSM-Q
MACHINE CONTROL ROOM
PSM-Q
INTERFACE/DATA SERVER
DCS/INFORMATION SYSTEM
MACHINE FLOOR

CONNECTION OPTIONS



OUR EXPERIENCE

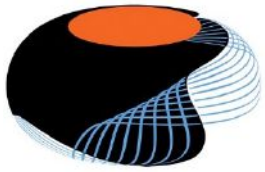
WITH THE PSM-Q

- No sheet marking
- Caused no runnability issues
- No cleaning required
- No maintenance for 13 months

US KRAFT LINER BOARD MACHINE

The PSM-Q installation process
(for project or permanent installation)

Prior to arriving at mill	Mill fabricates simple support for PSM-Q/installs 24V dc power supply Mill test data evaluated showing opportunities Mill test data used to setup initial grade files/select properties	Time: 2 weeks
Installation at mill	Mill engineers bolt PSM-Q to support Aurelia engineers test communications with server in control room Link to DCS if required	Time: 4 hours
Commissioning	Initialise PSM-Q and test operation. After sheet is on machine, self test mode commenced Place PSM-Q to auto load and report Install paperForm prediction software	Time: 2 hours
Validation	Compare test room results with PSM-Q estimates Training session for operating and technical staff	Time: 1 day
Machine characterisation	Evaluation report/engineering report/machine report	Time: 5 days
Identification of benefits	Discussions/ presentations at the mill Mill handover	Time: 1 day



PSM-Q

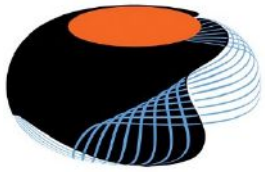
Product & Support Delivery at PURCHASE

1 Set **Aurelia PSM-Q On-Line TSI Measurement**, incl.:

Pre-Commissioning, Start-Up & Setup, PaperForm Software, WiFi Connections, DCS connections, incl. TSI MD, TSI CD, TSI MD/CD Ratio, 1 x Strength Property Prediction Algorithm (Tensile, Burst, SCT, CMT, Bending Stiffness all for CD & MD), additional Strength Prediction Algorithm optional

12 M Platinum Support package

- Extensive Training after installation, various levels (Operator, IT, Maintenance, Production Mgmt.) via video-conferencing
- Remote Monitoring & Support via email & phone
- free Wheel-Assy
- free PaperForm upgrades of software and prediction algorithms
- free hardware replacement (non-consumables)
- ongoing project support to ensure all benefits of PSM-Q will be used
- free Opportunity Assessment Support
- two (2) weeks Remote Project Support via video-conferencing



PSM-Q

Product & Support Delivery at RENTAL

Minimum Rental Period 3 month, can be extended monthly, to max. 12 month. Paid Rental will be deducted from future purchase!

1 Set **Aurelia PSM-Q On-Line TSI Measurement**, incl.:

Pre-Commissioning, Start-Up & Setup, PaperForm Software, WiFi Connections, DCS connections, incl. TSI MD, TSI CD, TSI MD/CD Ratio, 1 x Strength Property Prediction Algorithm (Tensile, Burst, SCT, CMT, Bending Stiffness all for CD & MD), additional Strength Prediction Algorithm optional

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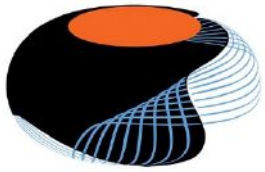
Paperform.

2nd Generation Software

Integrated Prediction Platform

PSM-Q ON-LINE, NON-DESTRUCTIVE, STIFFNESS TESTER



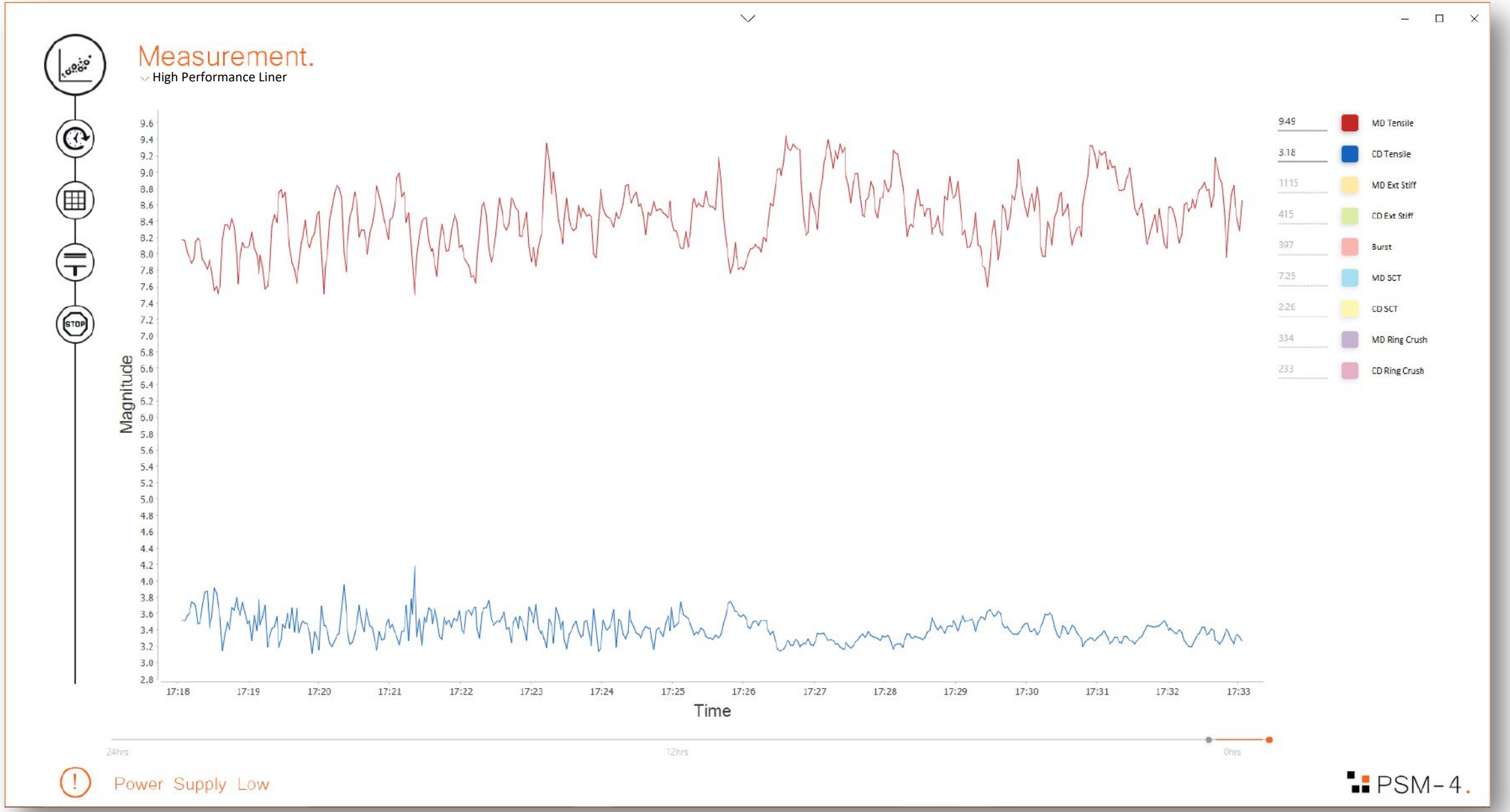
Paperform

AURELIA'S INTEGRATED PREDICTION PLATFORM

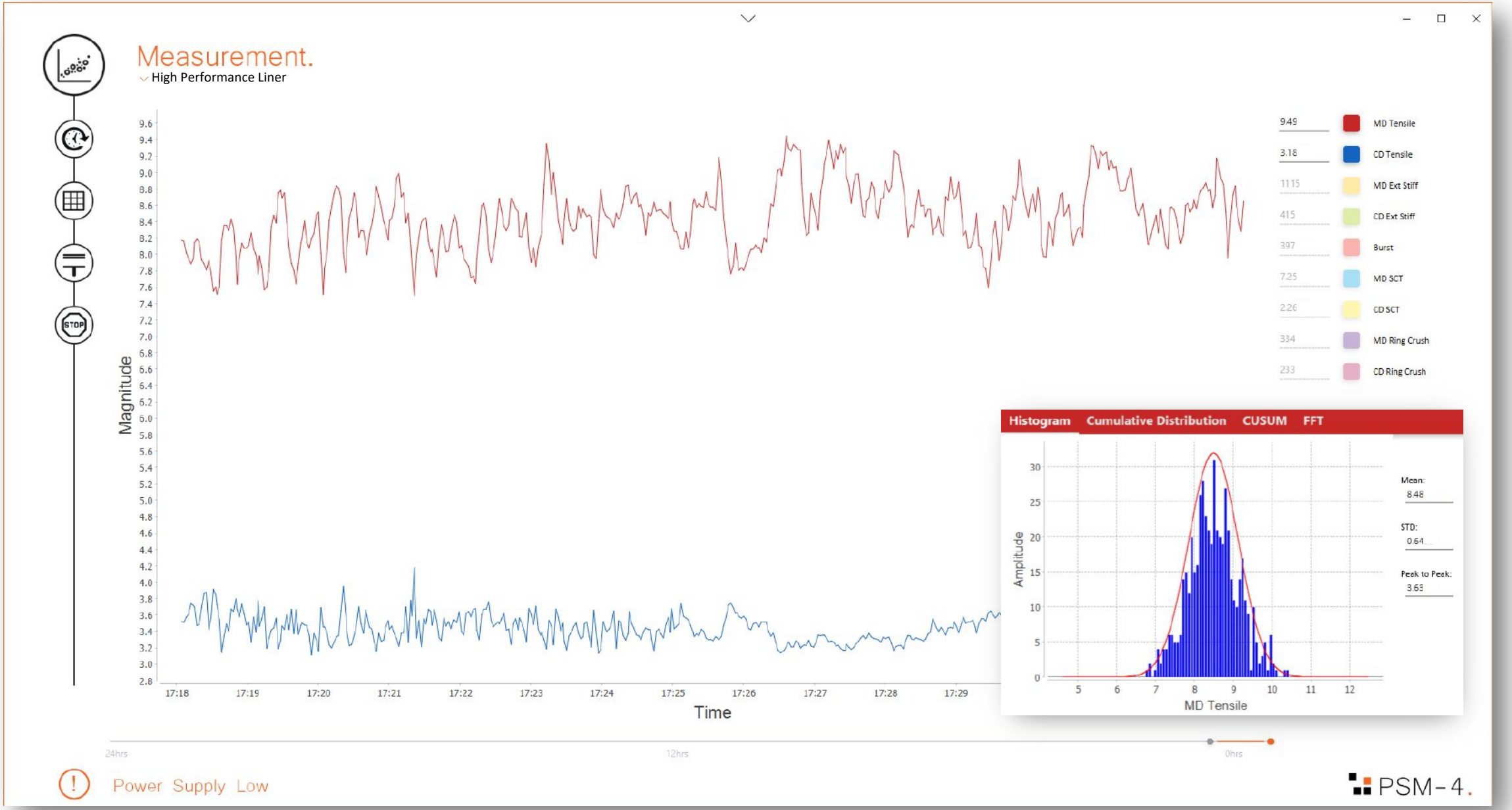
Aurelia's newest software package gives you the power of property prediction – either stand alone or fully integrated into your PSM-Q operating system. The package offers:

- Full integration into the PSM-Q operating system
- Stand alone operation app
- Data downloading to and from common spreadsheet applications
- Correlation and property development
- Easy to use icon based user interface control

Correlate your data with Aurelia's TSI predictor relationships, remove outliers and test outcomes in a user friendly interface.



PSM-Q ON-LINE, NON-DESTRUCTIVE, STIFFNESS TESTER



PSM-Q ON-LINE, NON-DESTRUCTIVE, STIFFNESS TESTER

Graphing

Grade

MD Tensile

Name:
Grade

Code:
Code

Description:
Description

Reload | Delete

Edit Mode

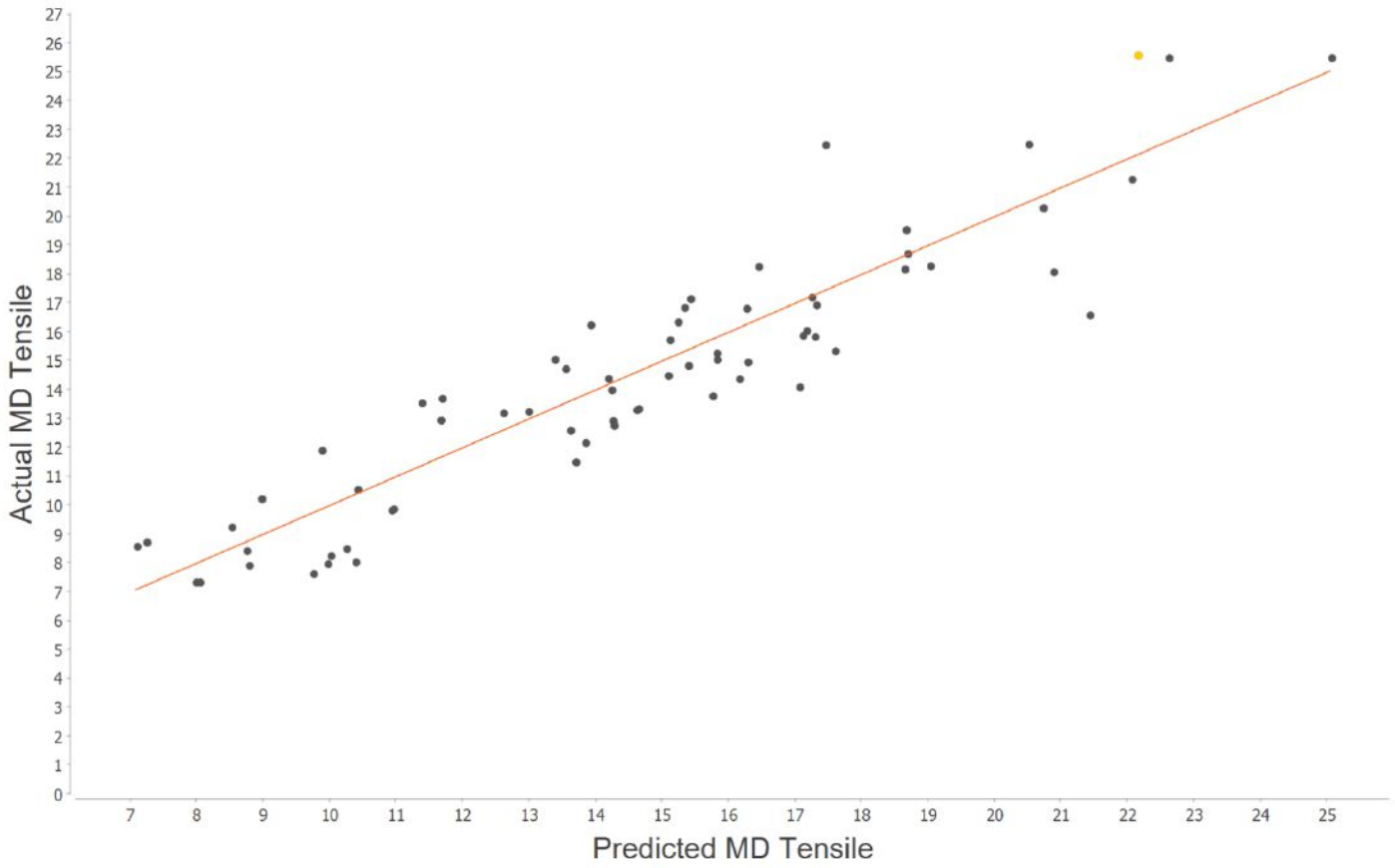
Save Changes

MD Tensile

Some details about the calculation

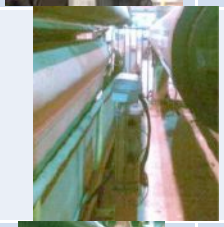
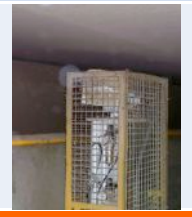
(22.13,25.74)

▶ Details



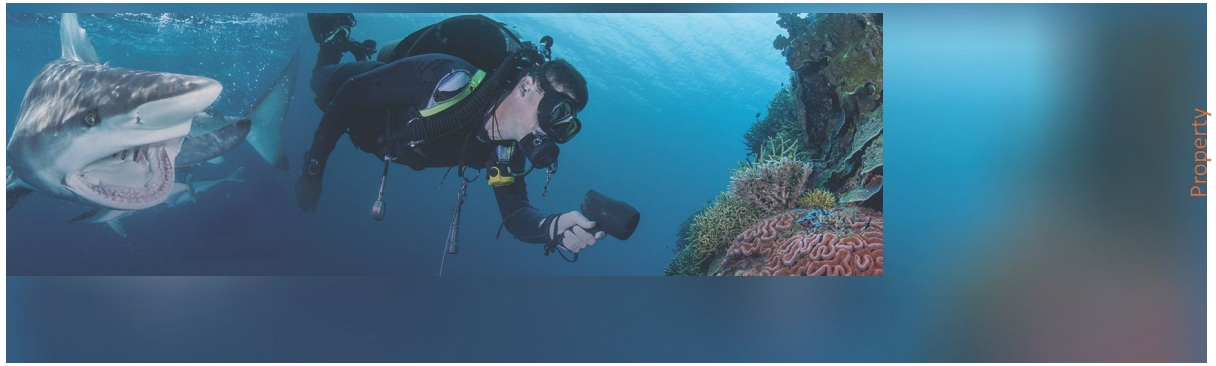
Paperform.

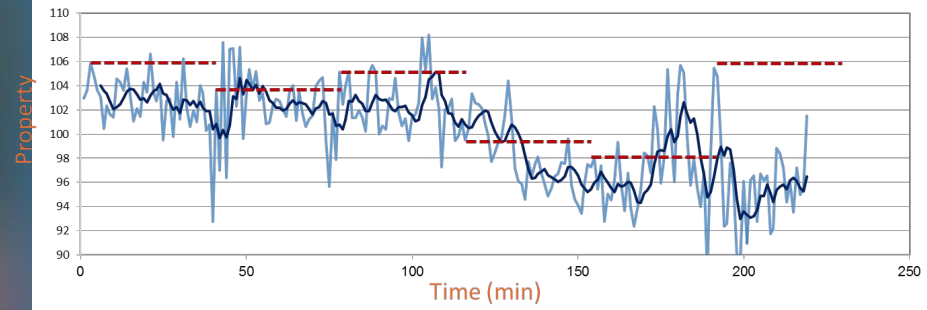
PSM-Q ON-LINE, NON-DESTRUCTIVE, STIFFNESS TESTER

	Install Year	Install. Type	Product	Speed (m/min)	Region	Weight (gsm)	Purpose/Result
	2011	10 month project rental	Kraft liner board	760	North America	120 - 250	Minimising variation, optimising performance process control. **Removal of 5% persistent strength variation.**
	2012	5 month project rental	100% Recycled liners and flutings. Size press	1400	Europe	105 -150	Size press starch addition optimisation. **New board grades based on selection of recycled fibre quality.**
	2013	fix installed	100% Recycled liners and flutings. Size press	800	Australia	105 - 150	Starch optimisation, process optimisation, optimising and characterising fibre streams. **5% reduction in starch use.**
	2009	fix installed, replaced in 2019	Flat Sack Kraft	790	Australia	70 - 110	Optimisation of new process machinery, trials related to refiner optimisation and property development. **5% strength improvement.**
	2014	fix installed	Kraft/Recycled liners	800	Australasia	120 - 280	Optimisation of furnish components, refining trials, forming trials, additive trials. **50% drop in reject material.**
	2011	fix installed	100% Recycled liner and medium board	650	Asia	105-170	Starch optimisation, process optimisation, optimising and characterising fibre streams **4% increase in paper strength.**

	Install Year	Install. Type	Product	Speed (m/min)	Region	Weight (gsm)	Purpose/Result
	2018	fix installed	Recycled Gypsum board	760	Australia	150 -190	Starch and furnish optimisation. **Removal of long fibre addition. 8% cost reduction.**
	2017	3 month demo, order placed in 2019Q4	100% Recycled liners and Fluting	1400	Europe	90 – 150	Starch optimisation. Cost optimisation. **12% drop in strength variation.**
	2019	fix installed, order for 7 more units received	Recycled Gypsum board	800	Asia	150 -190	50% variability removal, increase of Tensile by 15%, 3% reductioon in starch usage
	2018	fix installed	100% Recycled liners and Fluting	1400	Asia	90 – 150	Starch optimisation. Cost optimisation. **15% drop in strength variation.**

Get the full picture





- Measures paper strength quality every second of every day
- Gives a complete picture of paper quality – optimization possibilities

TAKE CONTROL OF YOUR PRODUCTION AND ACT NOW!