

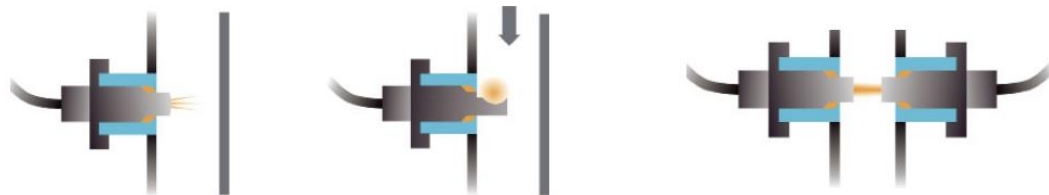
Steps to improve on-line analyzer implementation

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Development Manager

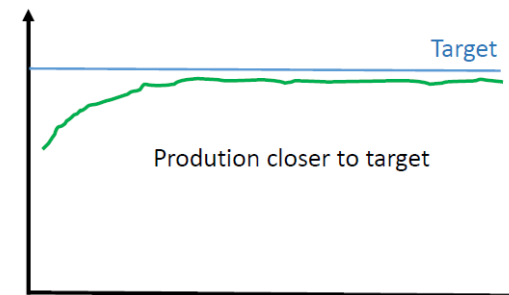
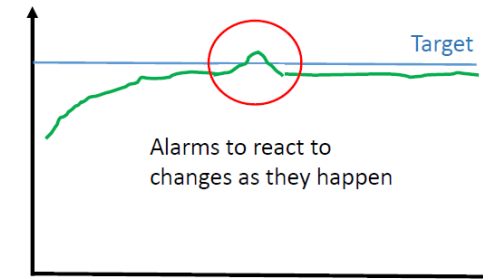
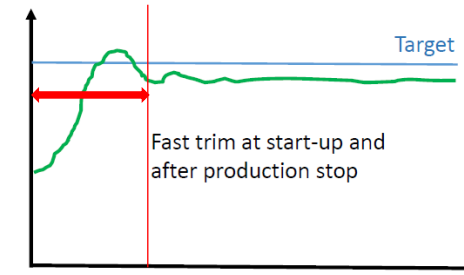
Q-Interline's on-line analyzer: InSight Pro

- Same FT-NIR spectrometer platform as at-line unit
 - No scheduled hardware maintenance
 - Re-use calibration data
- Air/water-cooled IP65 cabinet
- One or two measurement positions - mix
- Bundle optical fibres 5 - 30 m
- Food-grade probes and cells
- InSightView operator touch panel



Typical challenges in food production

- Fast trim at production start-up, stop or product change
 - Reduce waste
 - Less time consumption
- Fast reaction to changes in the process
 - Optimal raw material utilization
 - Optimal resource utilization
 - Less rework or waste
- Production close to target
 - Optimize raw material utilization
 - Avoid off-spec production, legislative fines, scrap and rework

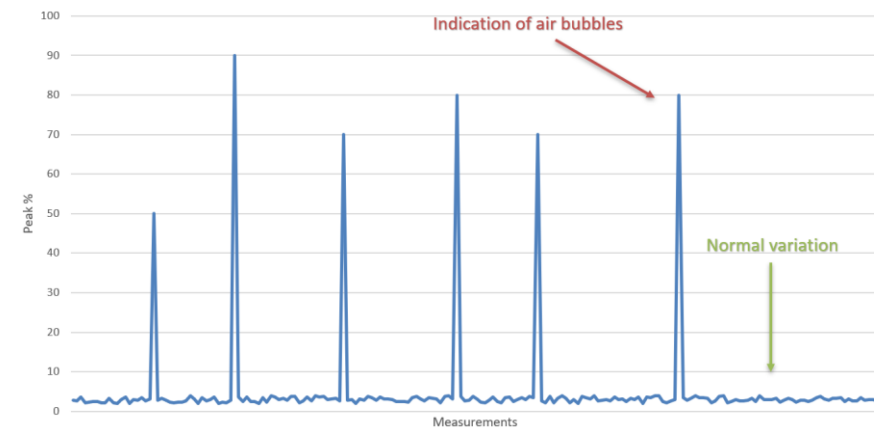


First decision: Measurement point

- Early decisions have the greatest impact
 - User Requirement Specification to identify best location

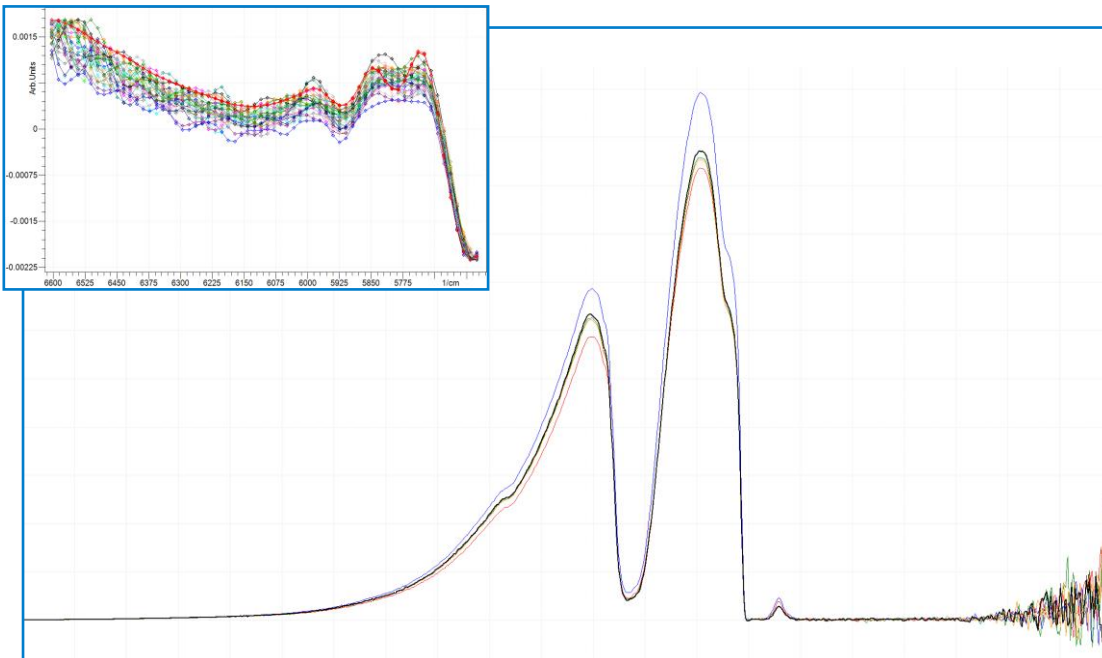
- Awareness to
 - Location of pumps
 - Addition of raw materials
 - Representative sampling
 - Sample presence and flow
 - Absence of artifacts

The image shows three overlapping screenshots of the 'interline' Project Questionnaire form. The form is titled 'URS On-line project' and includes fields for Date (13-01-2017), Filled in by (AL), and Doc. No. (F-1085 Rev. 2.00). The 'Project Questionnaire: On-line Instruments' section includes a purpose statement and a table for 'COMPANY AND PROJECT ID' with fields for Company name, City, Country, and Contact person. The 'ANALYTICAL SPECIFICATIONS' section includes fields for Reference laboratory, Known reference method performance, Prior experience with NIR, How many products in total, and Please add products sheet pr product. The 'INSTRUMENT CABINET ENVIRONMENT' section includes fields for Zone where the system will be installed, Room temperature range, Temperature scale, and Voltage. The 'CONTROL SAMPLING' section includes fields for Suitable extraction port available, How is sample ID managed?, If other please specify, and How much sample is extracted. The 'INSTALLATION AND DOCUMENTATION' section includes fields for Calibration software needed, Training, Documentation, and Installation. The 'APPLICATION DETAILS' section includes fields for Reuse of calibration models and Source of calibration model. The 'CALIBRATION AND COMMISSIONING' section includes fields for Initial calibration development, Long term application maintenance, and Apply AnalyticTrust.

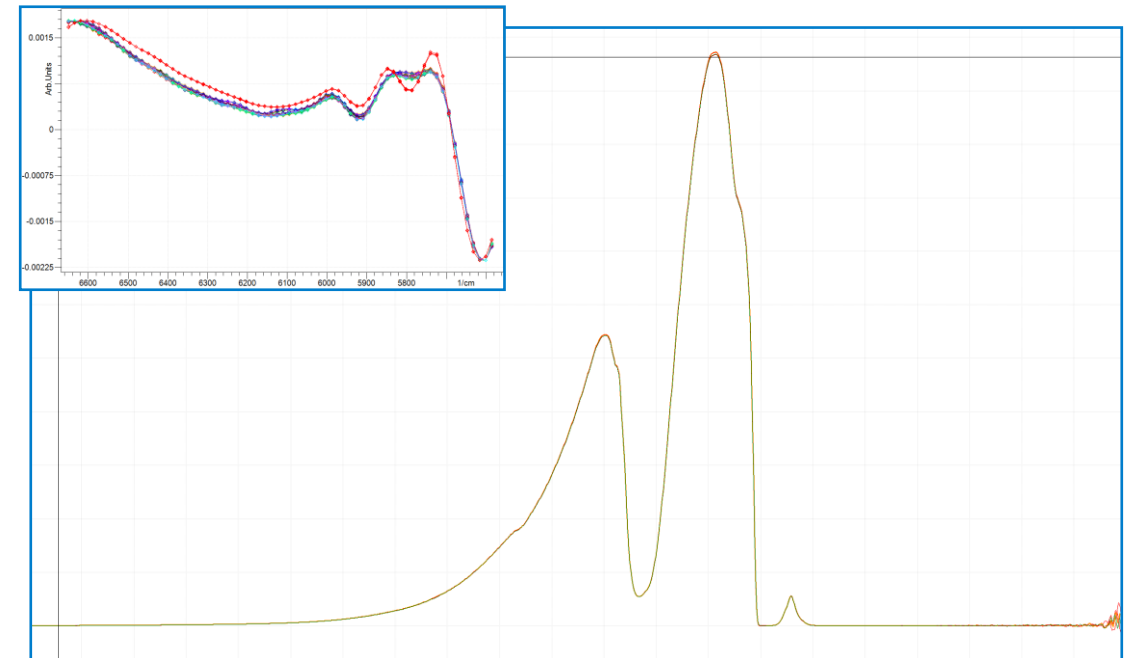


Challenge with in-line: Flow noise

High noise level

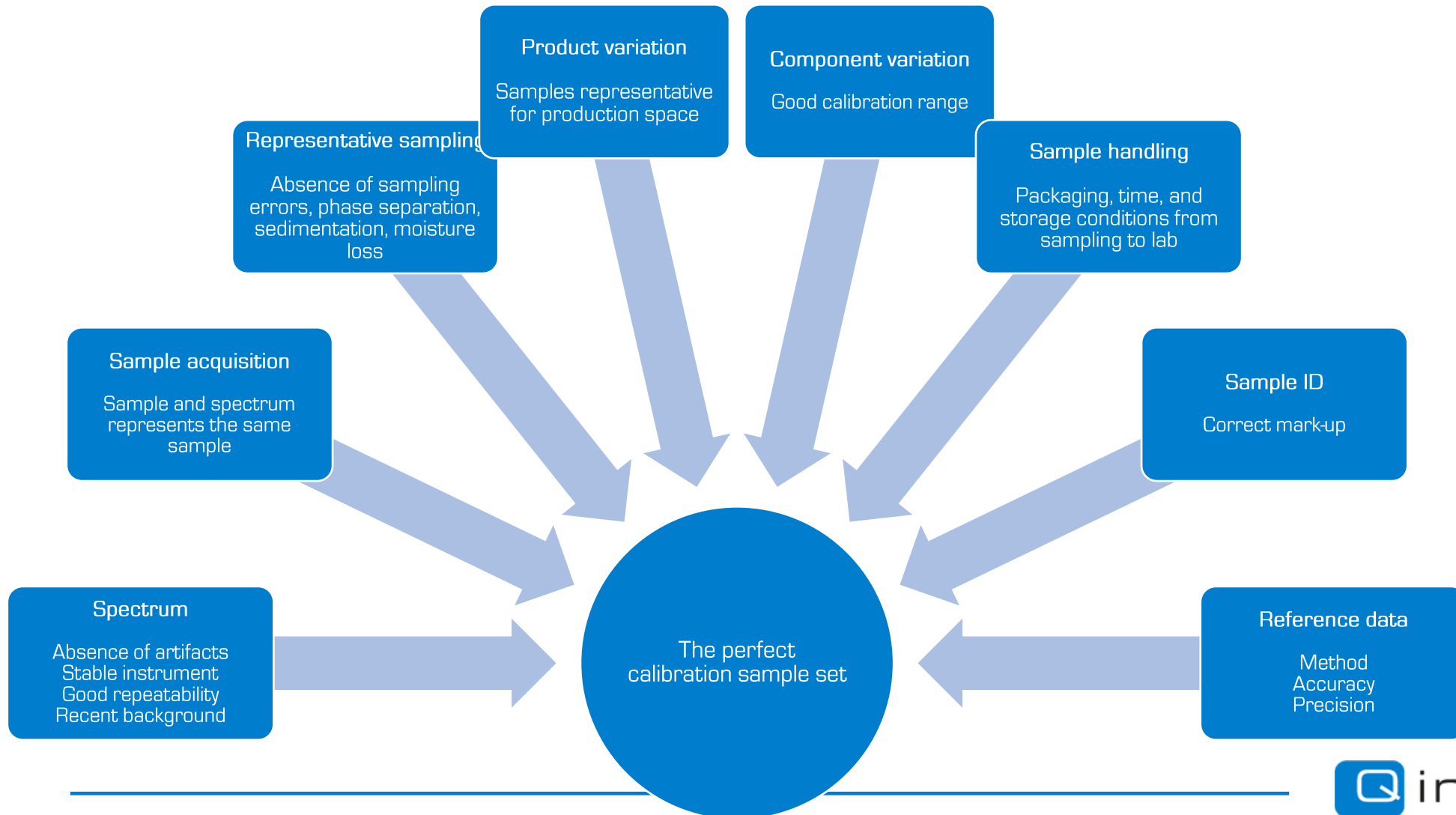


Low noise level

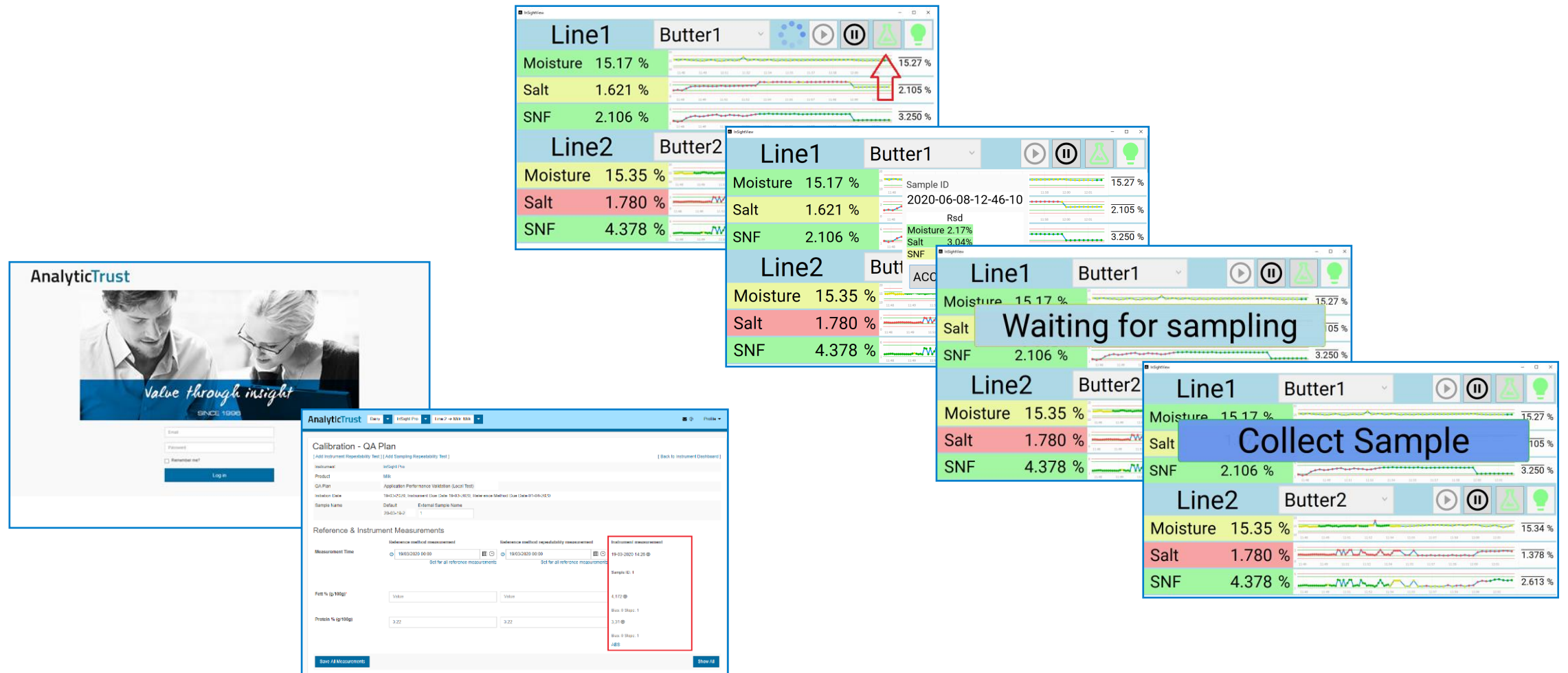


Decrease the noise until fit for purpose

Calibration samples – not trivial

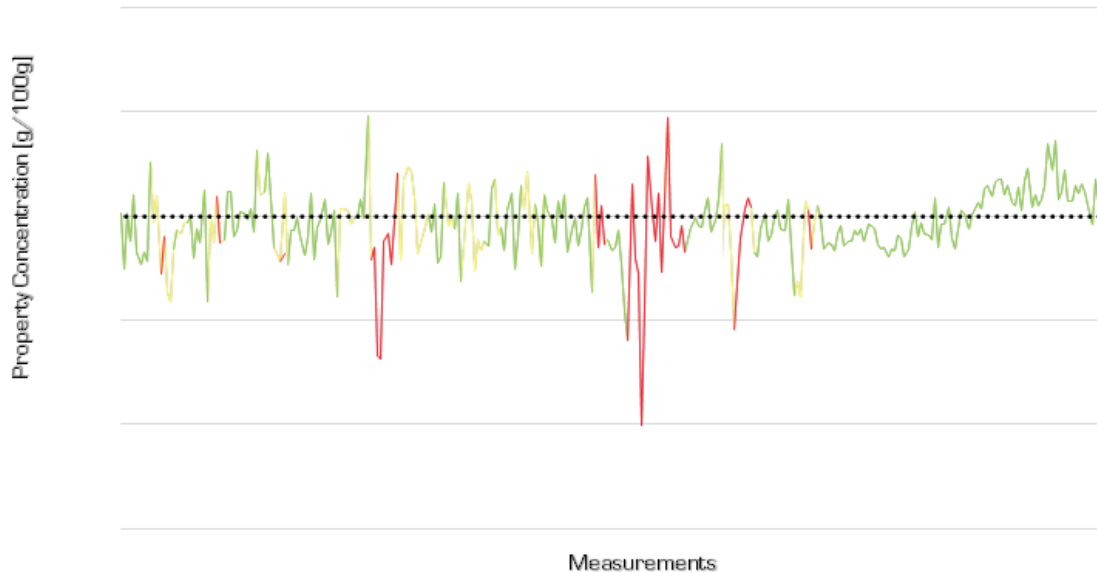


Interface to handle calibration samples

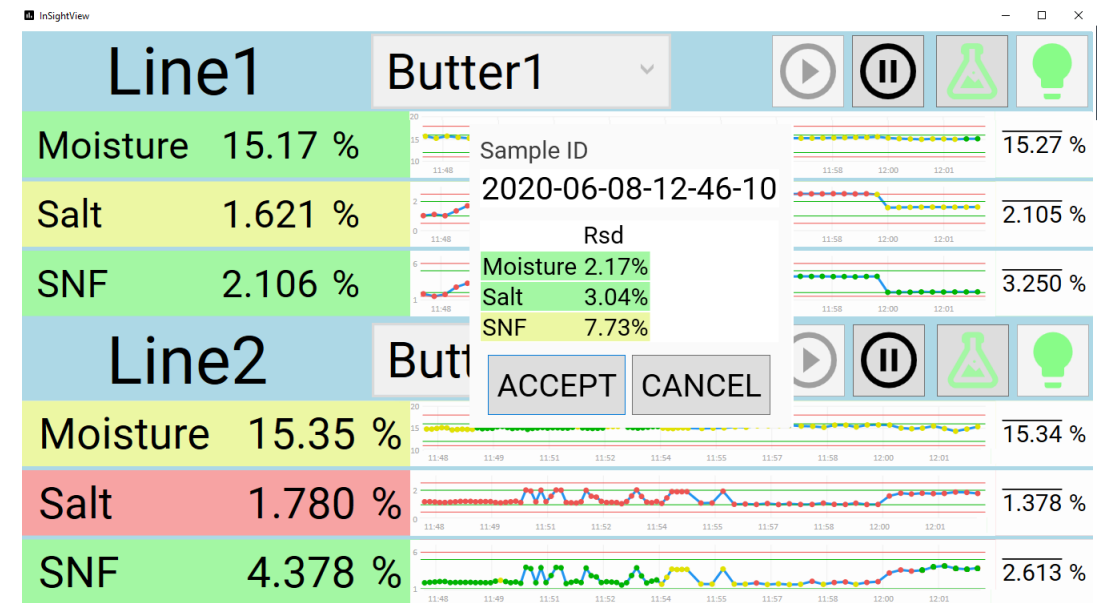


Challenge: Process variation

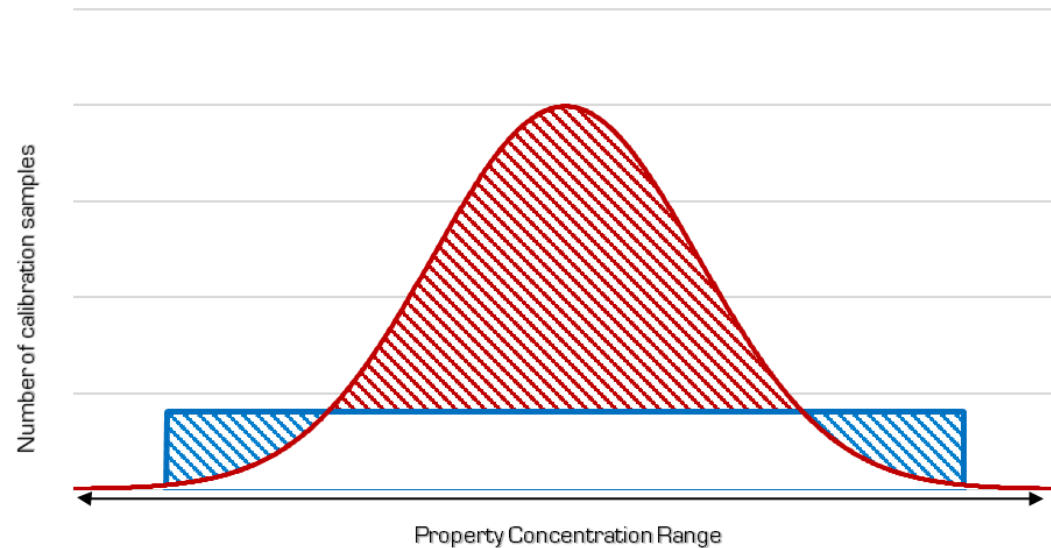
- Recommendation in InSightView guides for sampling when the process is stable
 - Relative Sampling Deviation (Rsd)



- Colour indication of process variation:
 - Green: Small variation
 - Yellow: Medium variation
 - Red: Large variation

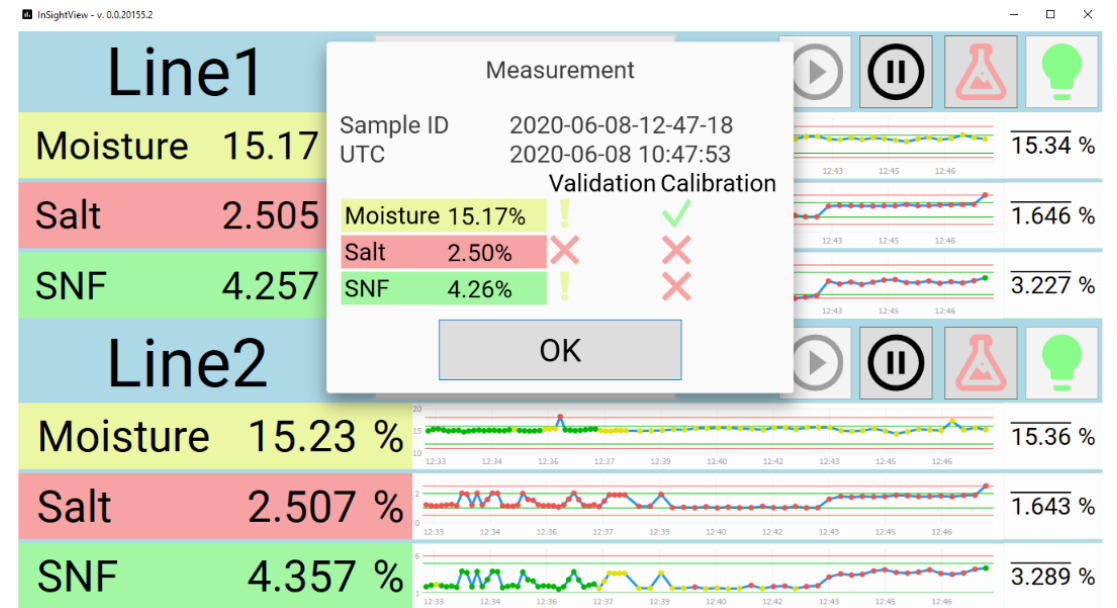


Challenge: Sample relevance



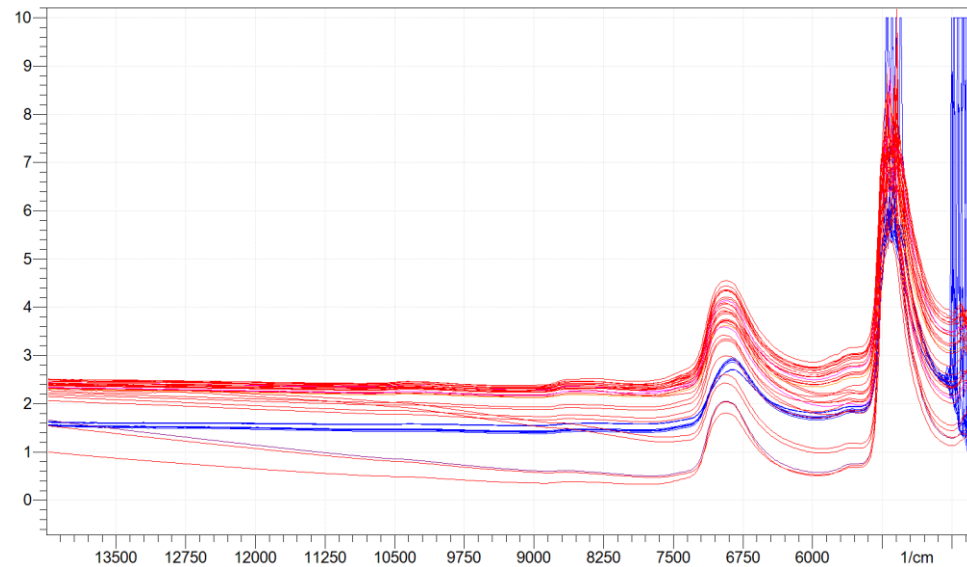
- Under the red curve: Calibration samples typically taken during an implementation
- Under the blue curve: Optimal calibration set

- Recommendation in InSightView guides for less samples in the red shaded area and more samples in the blue shaded area



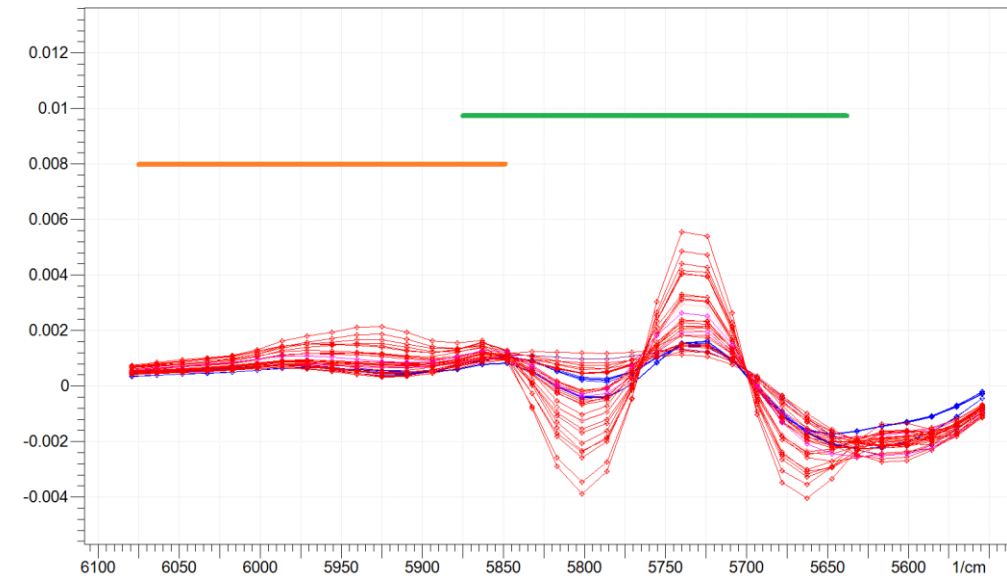
Direct combination of at-line and on-line data

- Absorbance spectra



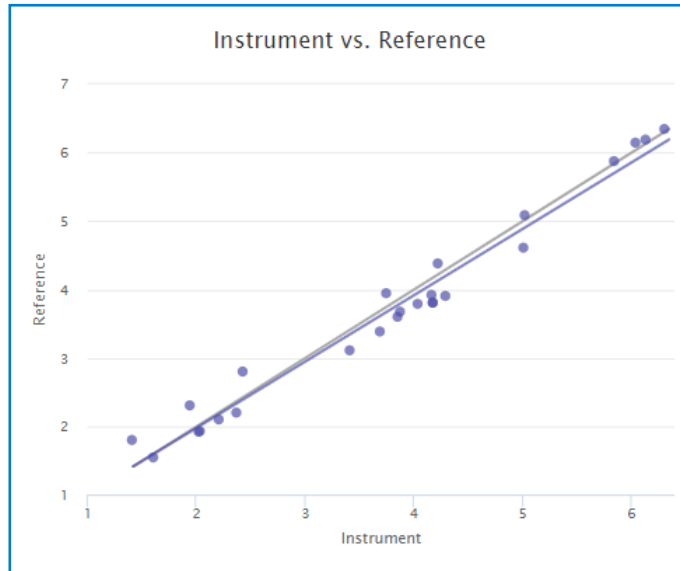
- Red data: At-line data, milk, 40° C
- Blue: On-line data, milk, approx. 10° C

- SG 2nd order derivative, 13 s.p.



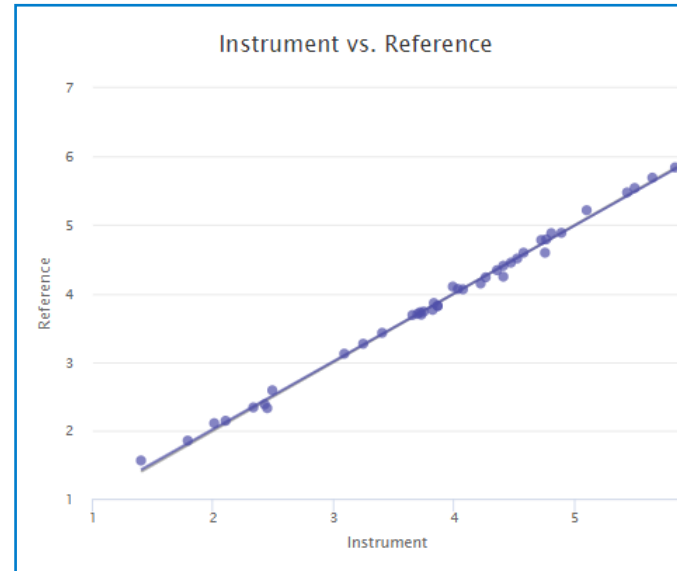
Iterations - optimize calibrations with local data

Fat (g/100g) in milk



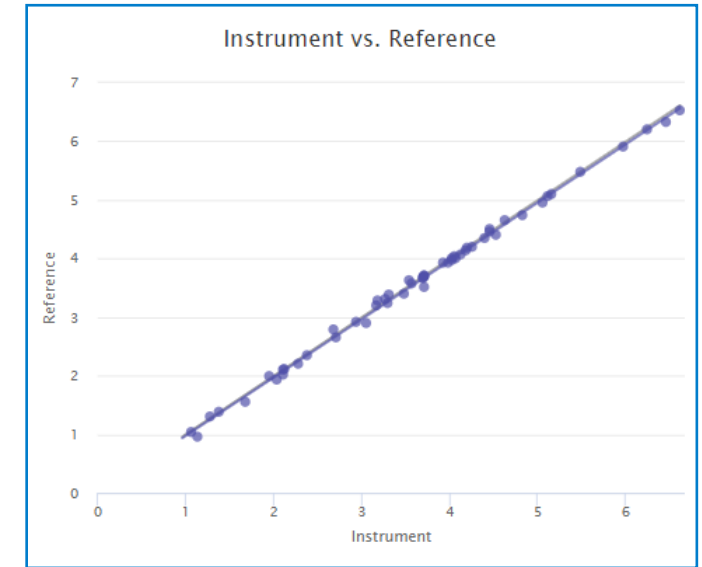
SEP/SEC 0.24347
Bias on Current 0.07536

Day 1



SEP/SEC 0.06655
Bias on Current -0.00336

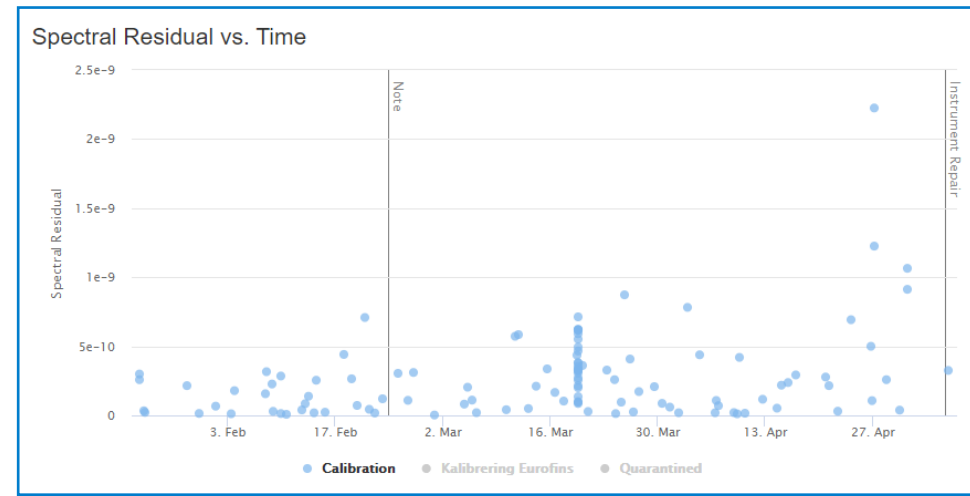
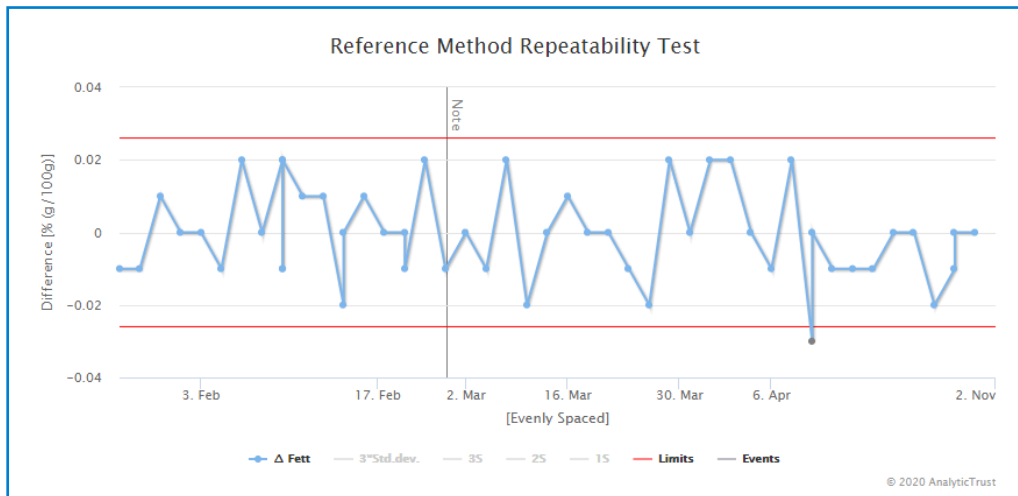
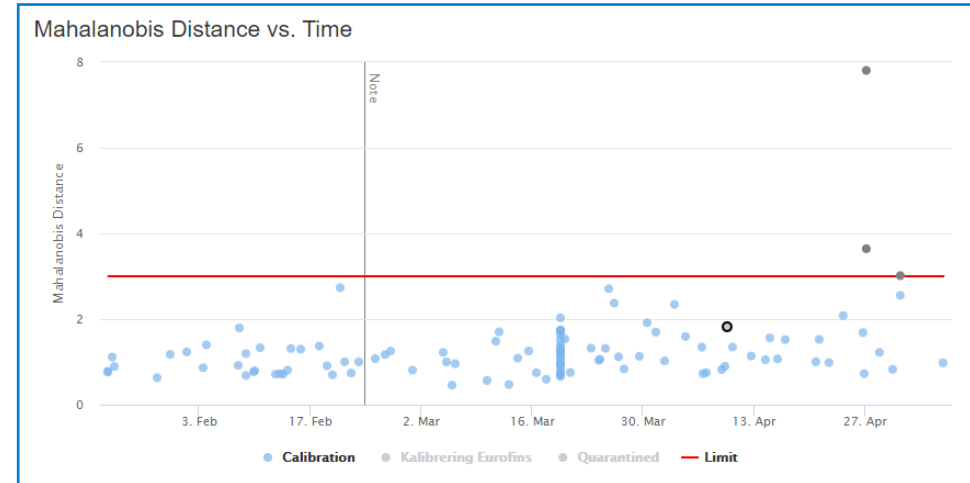
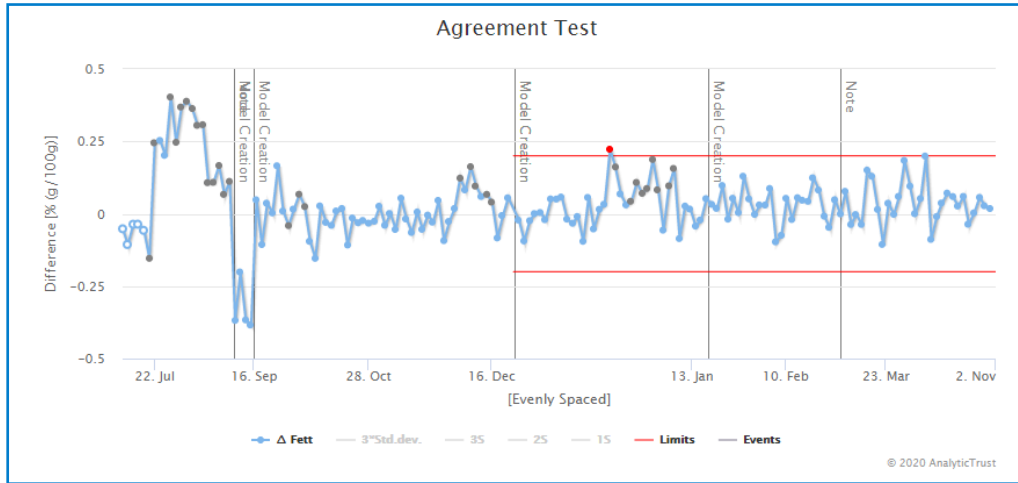
Day 21



SEP/SEC 0.06434
Bias on Current 0.03462

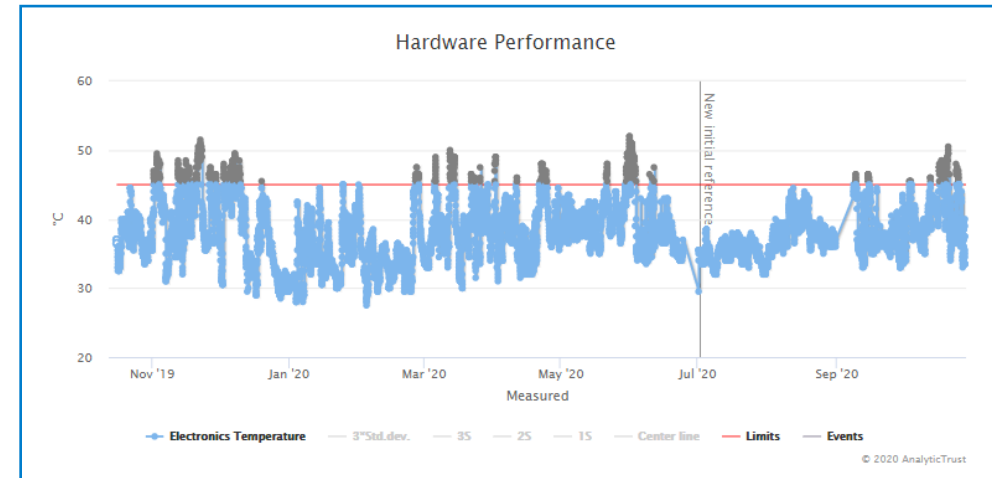
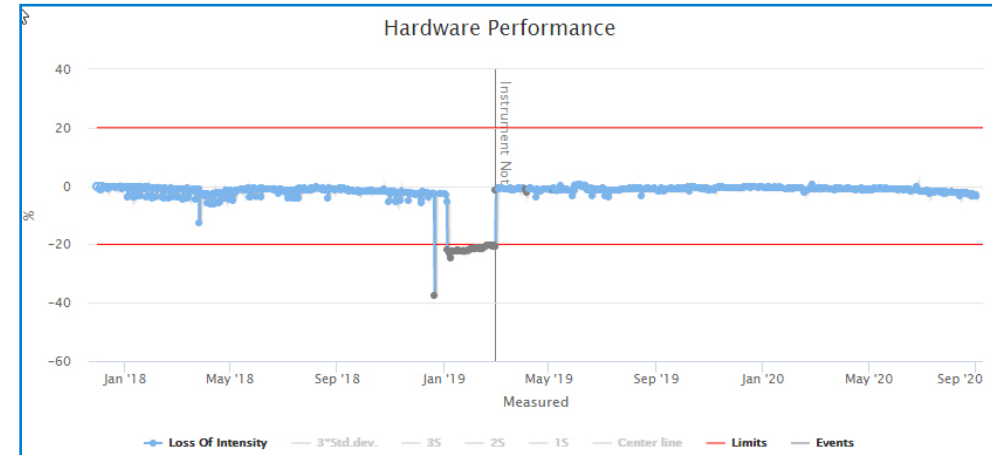
Day 365

Application performance monitoring



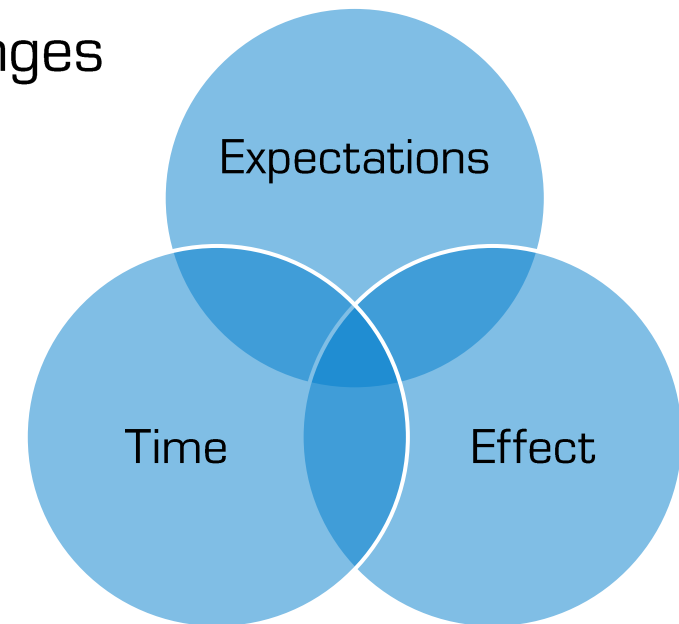
Hardware performance and instrument health

- ✓ Analyser
- ✓ Laboratory
- ✓ Sampling
- ✓ Precision
- ✓ Agreement



In summary...

- Steps to a successful implementation?
 - Careful preparation – expectations and effect
 - Effective user interfaces – overcome the challenges
 - Fast implementation – make utilization possible
 - Facilitate long-term use – ongoing validation
- Make it easy to be owner of the analyzer!
- Hardware and calibration are just a small part of success...





Value through insight

SINCE 1998

Thank you



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