Steve Nenonen

North American Industry Sales Manager, Milling

Background:
Sales Director, Romer Labs
Customer Operations, Monsanto
Corn Detasseling, DeKalb

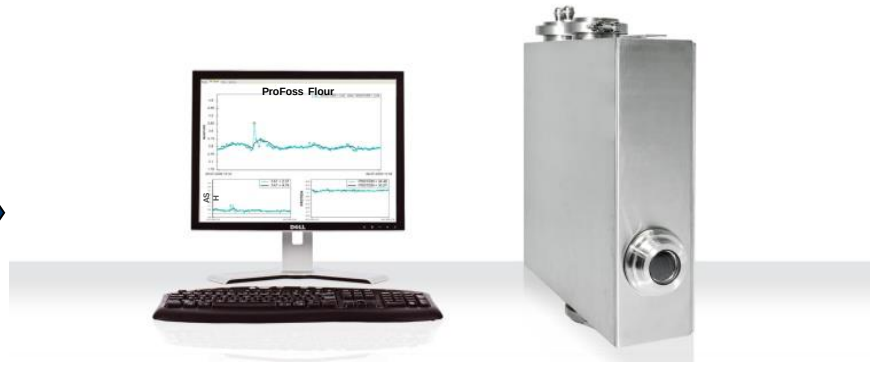
Board Member, Wheat Quality Council

Board of Directors, AAGIWA (American Association of Grain Inspection & Weighing Agencies

FOSS

Move the process control from the laboratory to production-floor

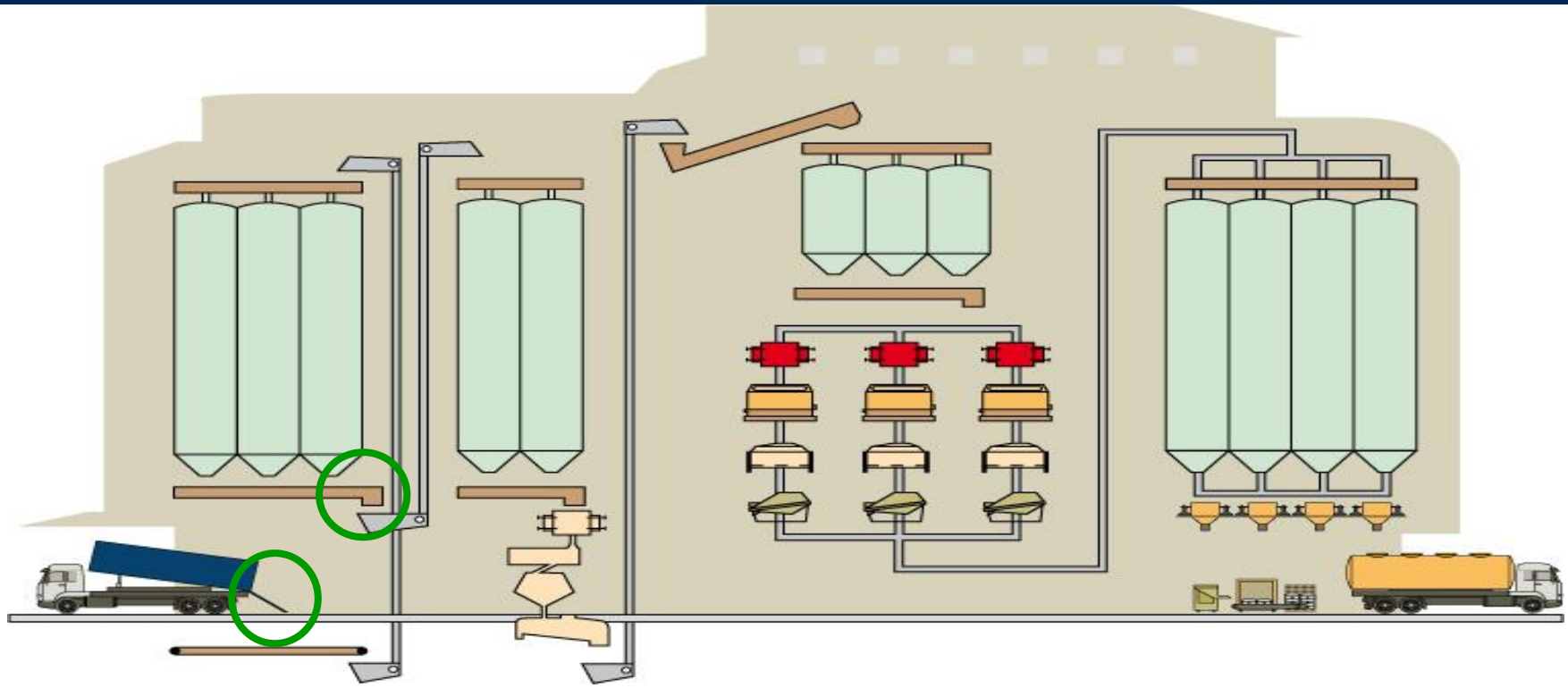
Whole Grain Analyzer



Move analytical power to production-floor!

Grain Receival

Profit opportunity – More accurate control of protein or moisture at receival or blending



Measuring Point	Why here	Focus parameters
• Installation prior to the blend/mix bins. It may be pre silo or post silo dependant on blending opportunities and can be installed in a pipe or transport system.	• Segregation of incoming grain and accurate blending out of the silo allows for more precise protein management in your grain and hence flour. • More control of incoming grain allows to control tempering process more precisely. Minimise energy and water consumption • Verify the total homogeneity of a wheat batch as ProFoss will monitor 100% of the batch coming in • Better blending control will lead to a point of almost "zero defects" in the flour production	• Protein, Moisture

ProFoss Whole Grain – Window Reflectance

Whole Grain

Critical quality parameter	Value chain
Protein	Improved control of protein blending allows saving of costly high protein wheat. A realistic estimate is $1/ton for each 0.2% protein that is out of specification.
Moisture	Improved moisture control helps you to avoid storage damages (fungi) and allows you to target the correct moisture content for tempering more accurate. More efficient tempering increases yield as well as throughput in your mill. $10,000 profit can be made on 0.2 % moisture at a production level of 25,000 ton/year

Component	N	Min % (asis)	Max % (asis)
Protein	1620	7.80	16,4
Moisture	1454	11.60	16.50

Performance

The calibrations for Moisture and Protein were developed using a PLS modelling. The performance was evaluated using independent validation sets and the results are presented in the table below.

Calibration version: ProFoss Wheat vers 100

Component	Model	N	SEPC % (asis)	Min % (asis)	Max % (asis)	RSQ
Protein	PLS	204	0.183	7.80	16.40	0.989
Moisture	PLS	164	0.050	11.60	16.50	0.997

Example: Protein and Moisture moving average

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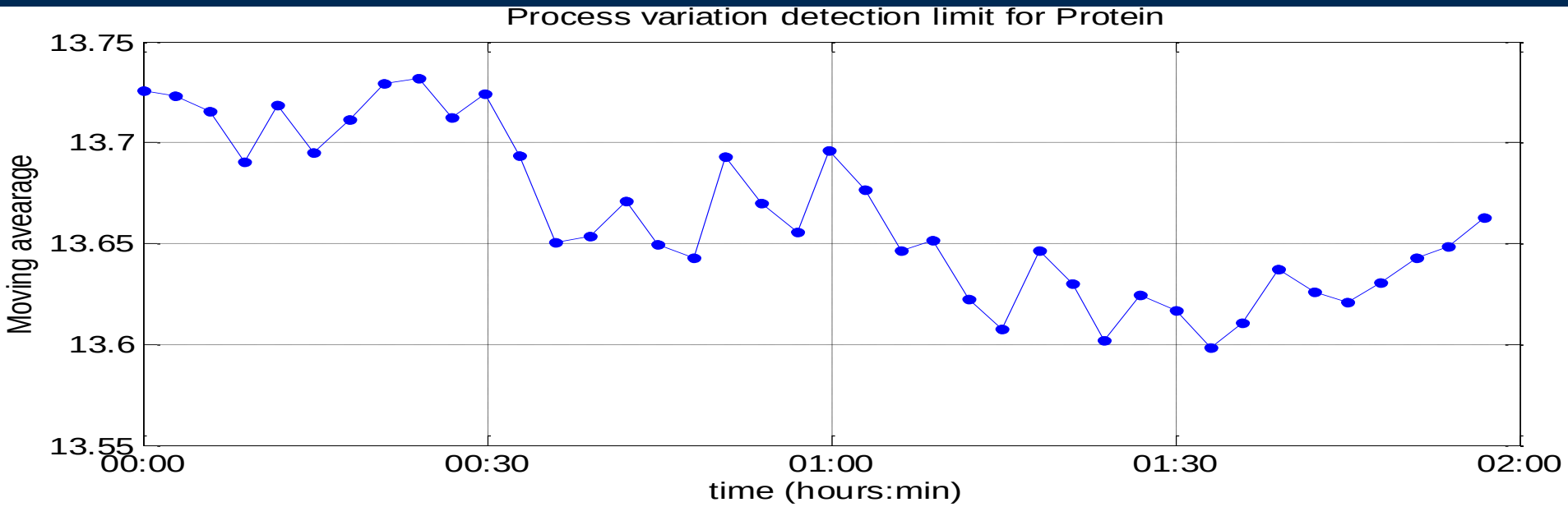
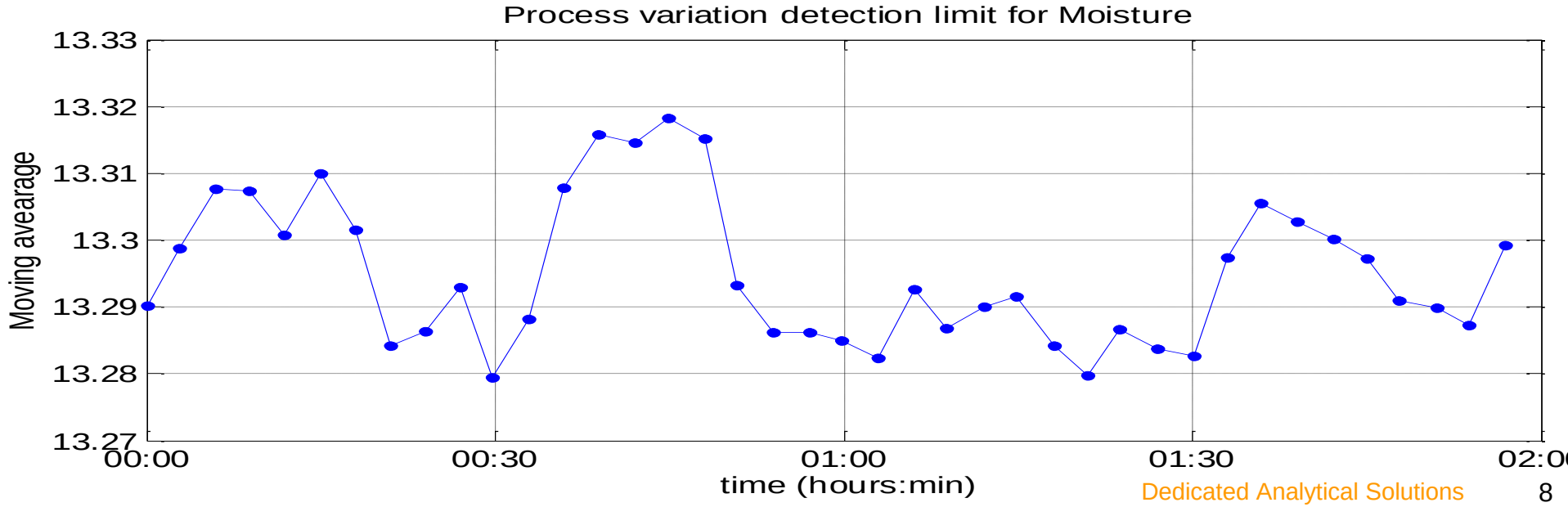
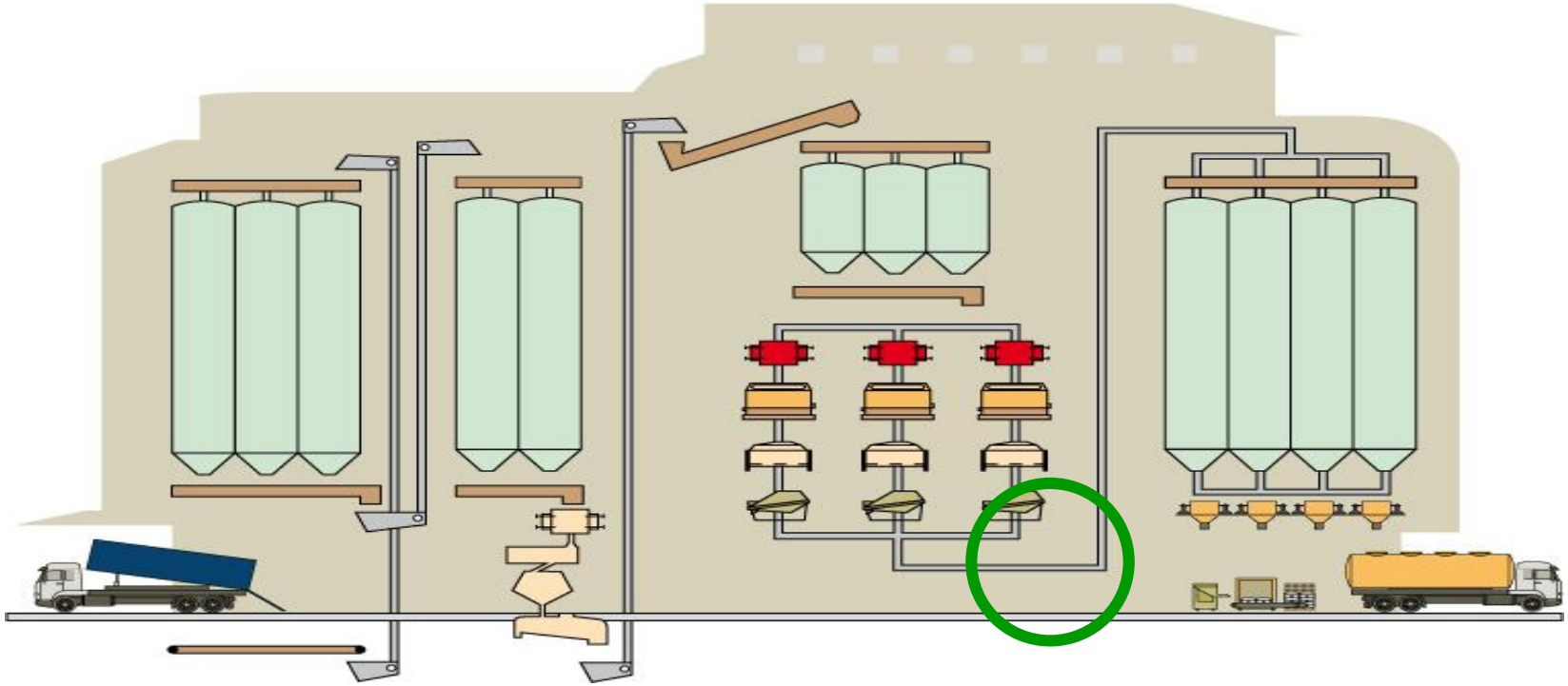




FLOUR PRODUCTION

ProFoss solution for Flour



Measuring Point	Why here	Focus parameters
• After the final sieves in the milling process surface	• Optimizing protein level in final flour by reducing the number of days with out of spec production (up to 0,2% excess protein), by reducing the amount of high-protein wheat source. • Reducing out-of-spec production due to broken sieves by up to 30 hours per year, by continuously monitoring ash levels .	• moisture, protein and ash.

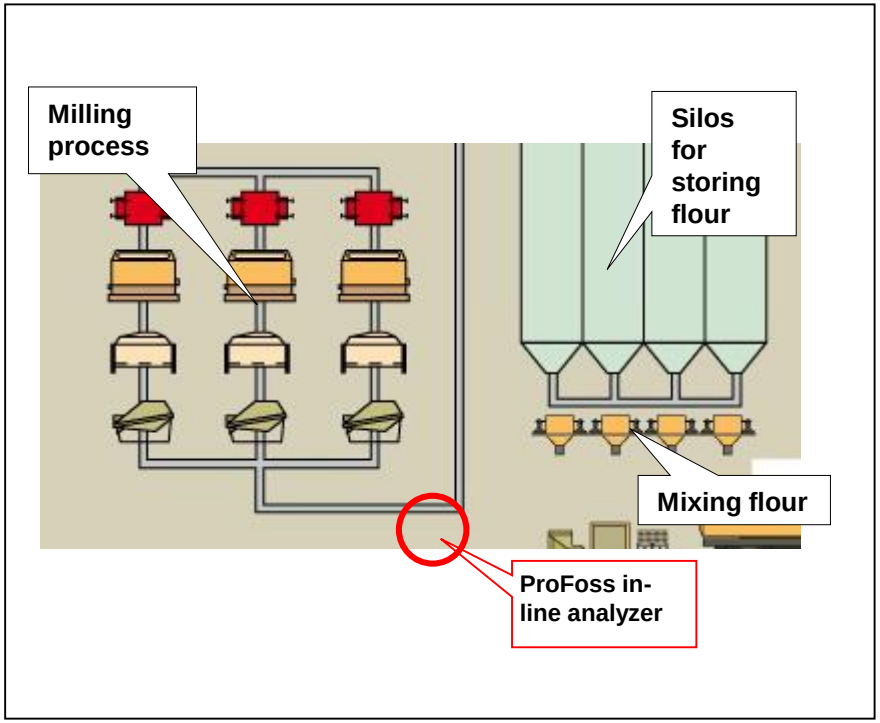
ProFoss – Windows reflectance

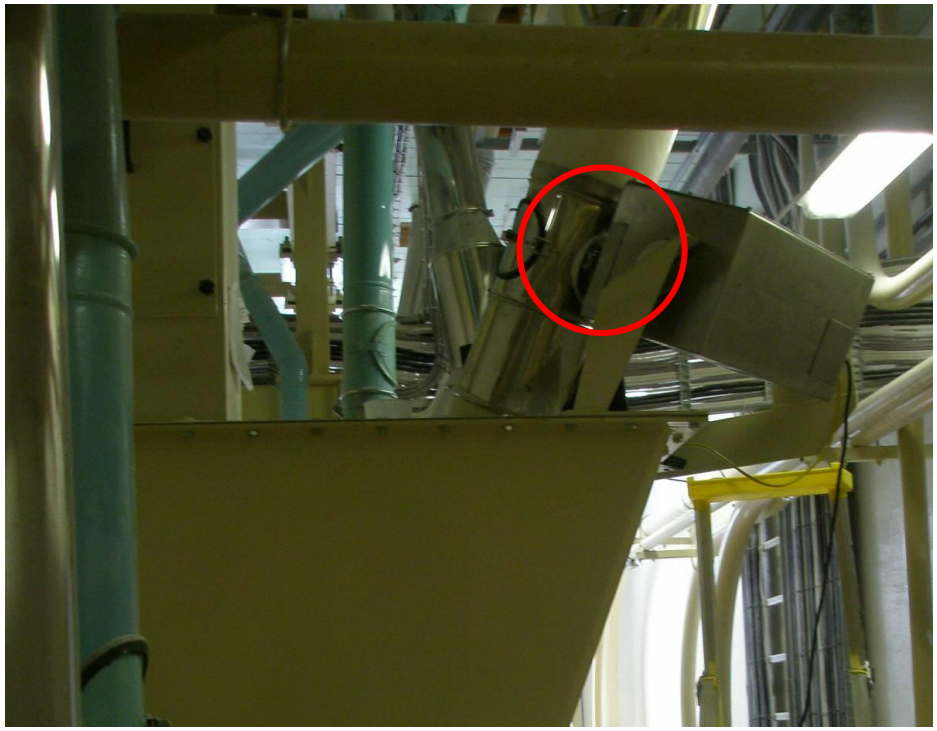
ProFoss Process Window:
Connects to either
Sanitary Flange (SF) or
Sanitary Flow Cell (SFC)

Sanitary Flange (SF)

Sanitary Flow Cell (SFC)

ProFoss Flour solution installed after the final sieves in the milling process – measuring moisture, protein and ash.





Samples used in the calibration

The calibration is based on wheat flour data collected in-line after the final sieve from different countries and different continents. The calibration includes data from different flour quality and contains calibrations for three parameters – Ash, protein and Moisture. The concentration ranges covered with this calibration can be seen in the table below.

Component	N	Min. % AsIs	Max. % AsIs
Ash	2523	0.3 %	1.0 %
Protein	2707	6.5 %	17.6 %
Moisture	3119	6.4 %	16.1 %

N: Number of samples in the validation set.
Min % (AsIs): Minimum concentration in the calibration set not corrected for moisture concentration*.
Max %(AsIs): Maximum concentration in the calibration set not corrected for moisture concentration.

* If protein and ash has to be determined on variable Dry Matter or fixed Dry Matter base the same calibration can be used by adding the conversion formula to the calibration model.

Flour - Producing closer to the target specification

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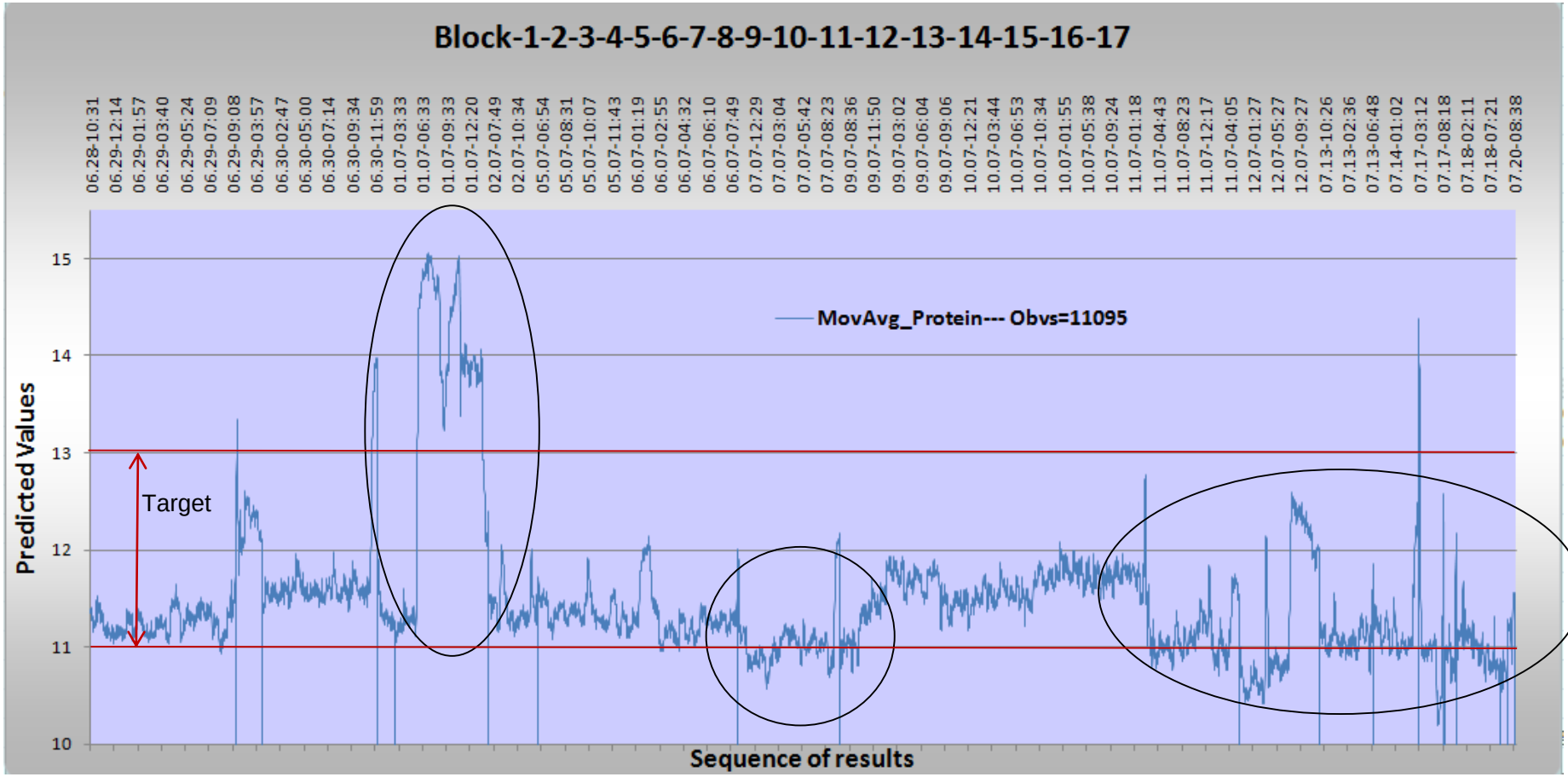
Results from real installation (moving average to show trends):

Protein distribution detected over trial period, detection of out of spec Production (target 11-13 %)



Showing trends is more important than accuracy on single results

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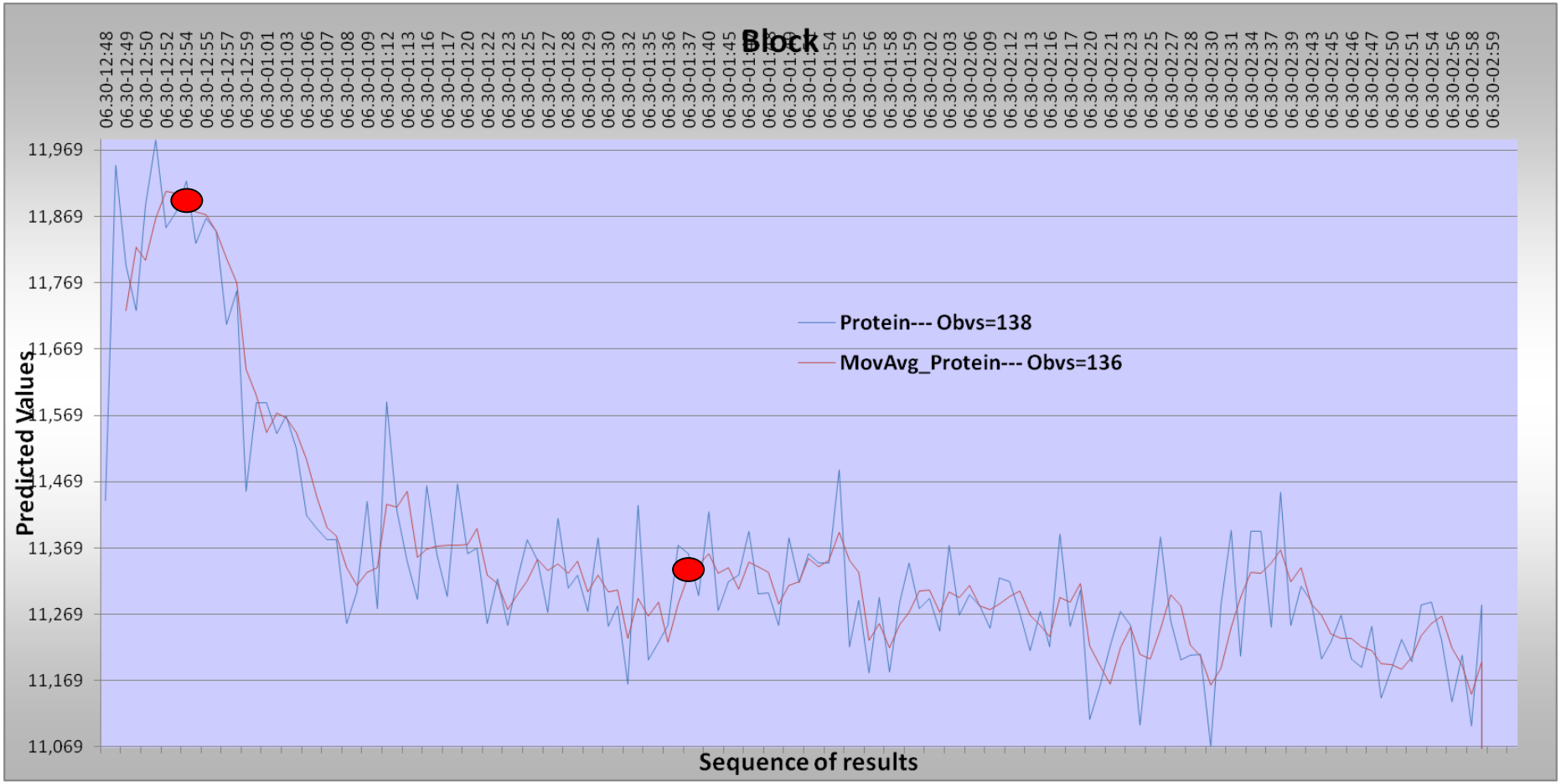
Blue line: individual results, red line moving average

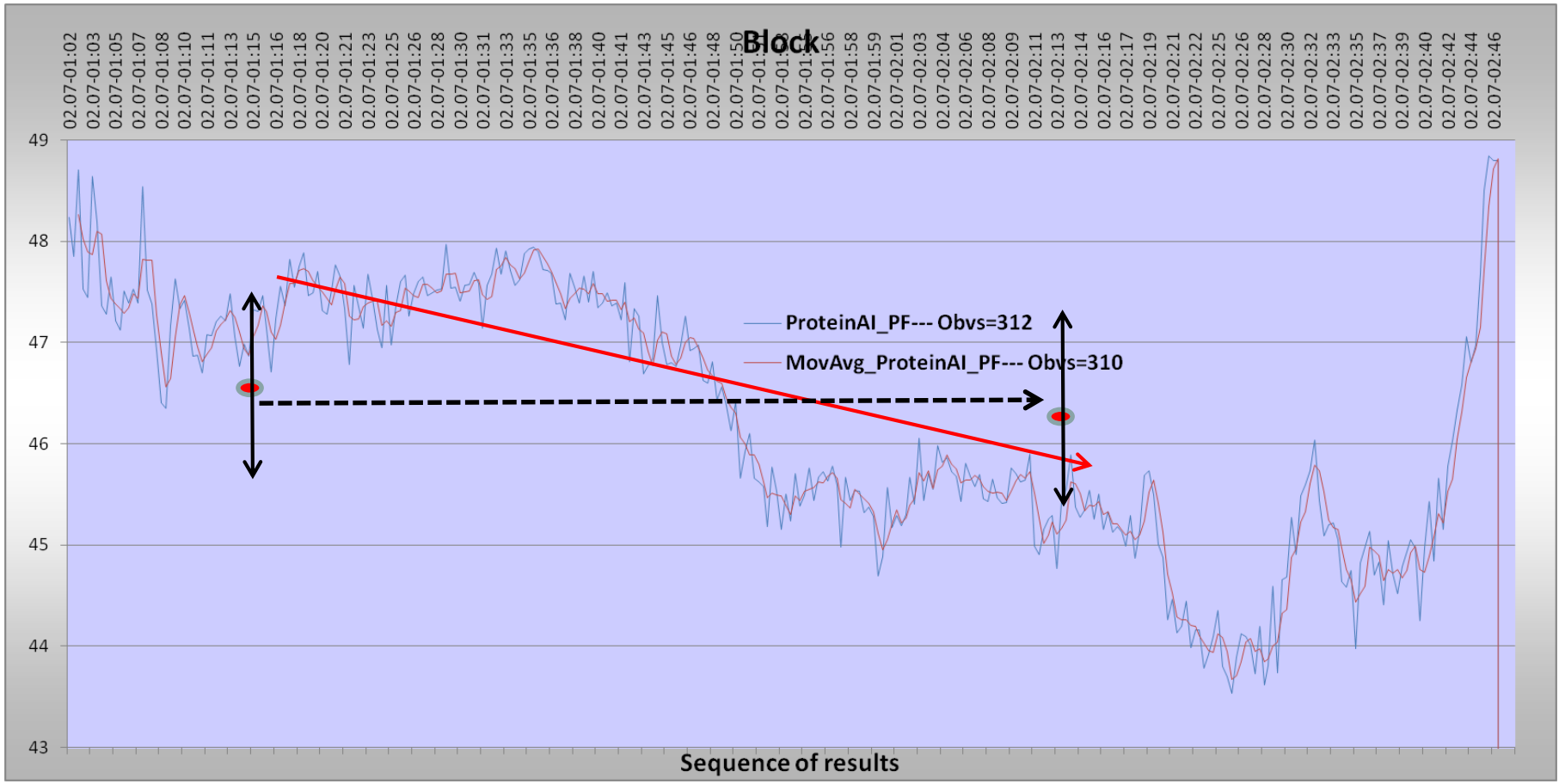
You can detect Protein changes down to 0,05 %

Red dots: classical Reference sampling – no control over Process for 1 hour !



Process Variation Detection Limit: Trend is more important than accuracy

Blue Line = individual results
Red Line = moving average of 5 results (PVDL 0.20 %)
Customer is able to react in real time on small changes in during Process
(red dots = Lab with accuracy and sampling error 2%): you do not detect the trend with hourly sampling



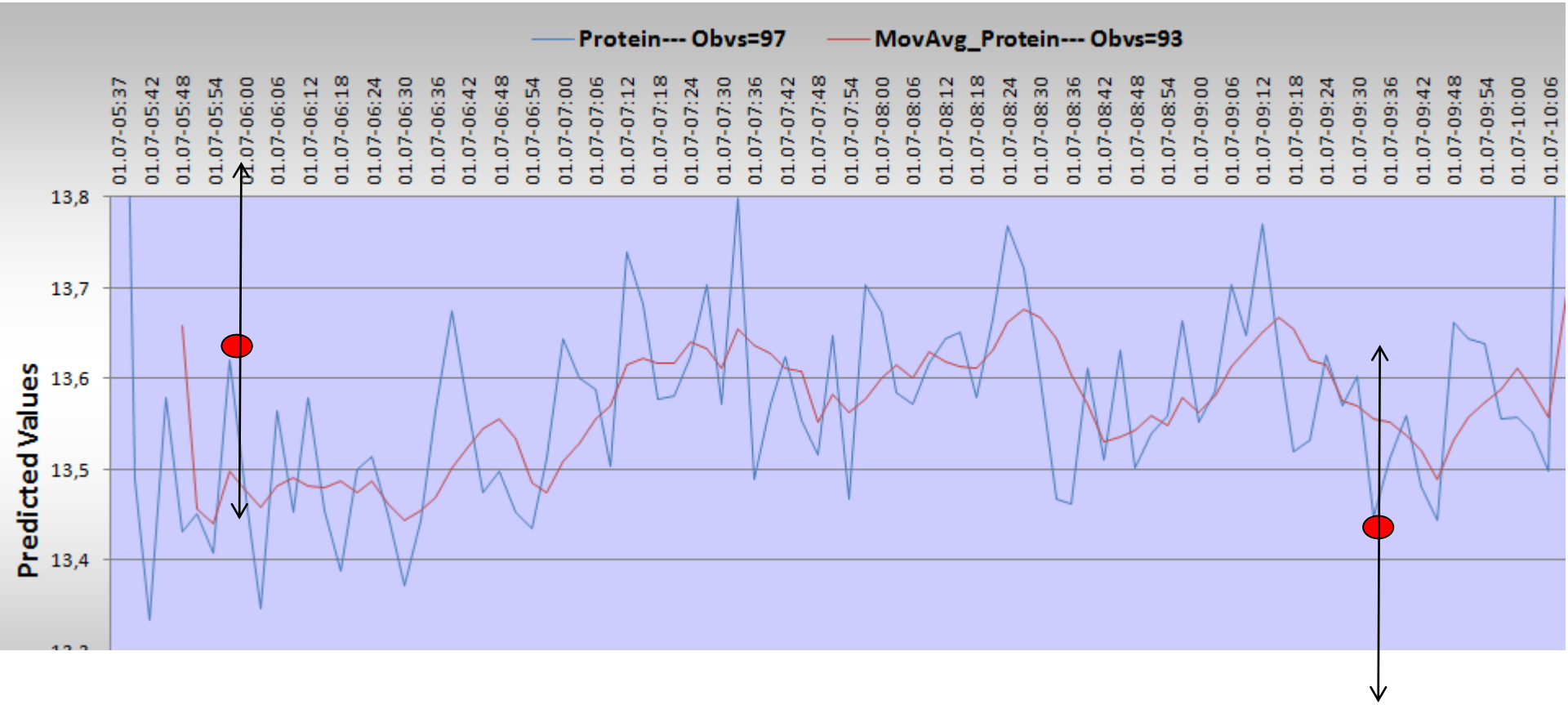
Showing trends is more important than accuracy on single results

FOSS

Blue line: individual results, red line moving average

You can detect Protein changes down to 0.05 %

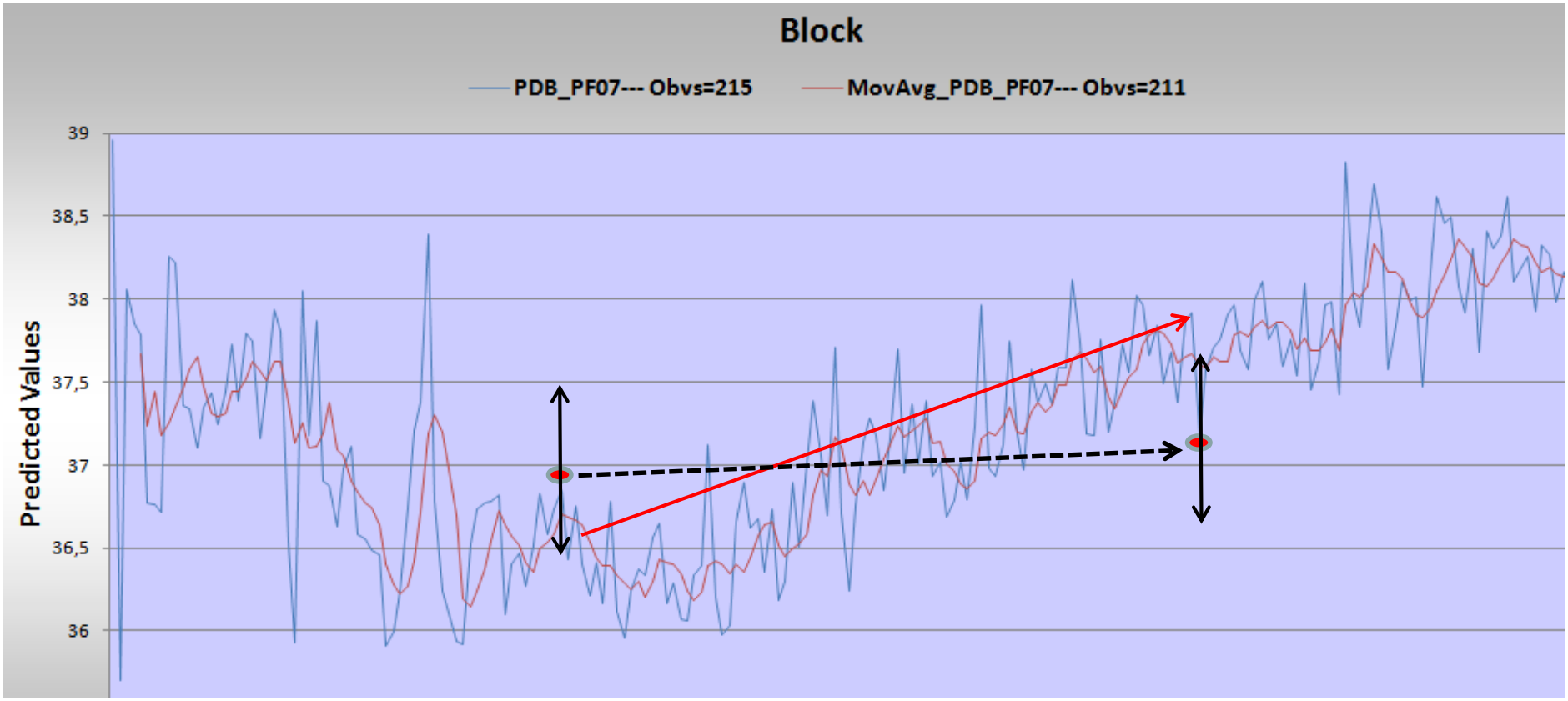
Red dots: classical Reference sampling – do you control the whole batch ?



Process Variation Detection Limit : Trend is more important than accuracy

FOSS

Blue Line = individual results
Red Line = moving average of 5 results (PVDL 0,17 %)
Customer is able to react in real time on small changes in during Process
(red dots = Lab with accuracy 0,50): you do not detect the trend with hourly sampling



ProFoss statistics in

FOSS

ProFoss Wet chemistry comparison – after calibration update

	Moisture	Ash	Protein
Mean (Bias)	-0.013	0.063	0.131
Std Dev of diff	0.100	0.024	0.148

Note: The “out of box” ProFoss calibration was Bias adjusted only . Validated against wet chemistry. All wet chemistry results were corrected to a 14% Moisture basis at the wet chemistry level.

	Moisture Wet chem (Minus) PF_03c	Protein 14MB Wet chem (Minus) PF_03c	Ash 14MB Wet chem (Minus) PF_03c
Mean difference	-0.02	-0.017	-0.008
Std Dev of diff	0.113	0.139	0.03
Count	82	78	80

Note: from ProFoss *Wet chemistry comparison* Word document submitted

Windows reflection sample interface welded into the side wall of the pipe where flour is transported

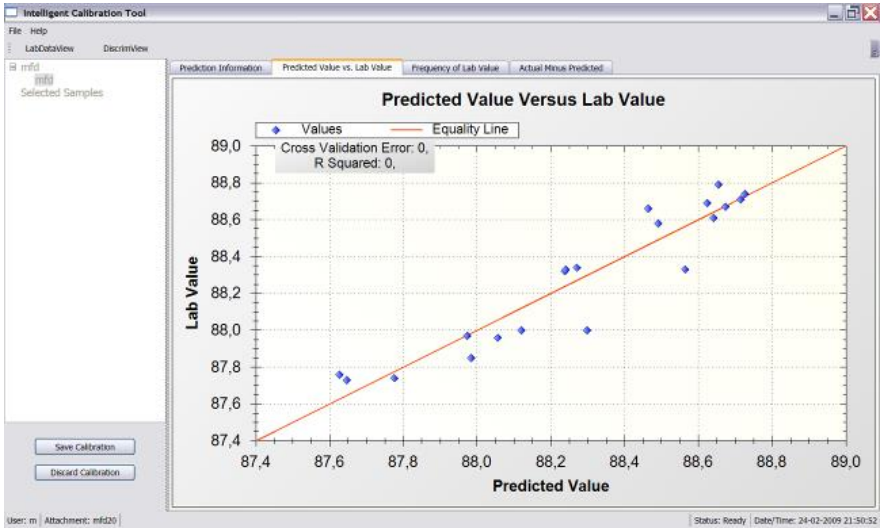
Sampling port for reference samples

Measuring point

Example – Expanding a calibration with ISIcal™ is fast and does not require calibration expertise

“Reference Sampling Button”

ISIcal™ – Easy calibration tool



Installation Examples continued

ProFoss installed after mixer

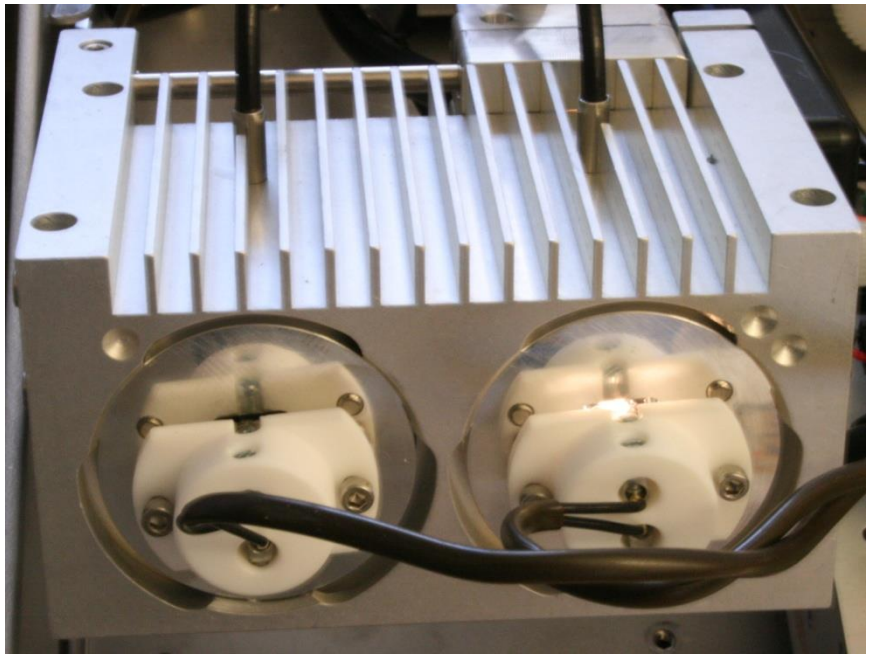
ProFoss installed on open chute

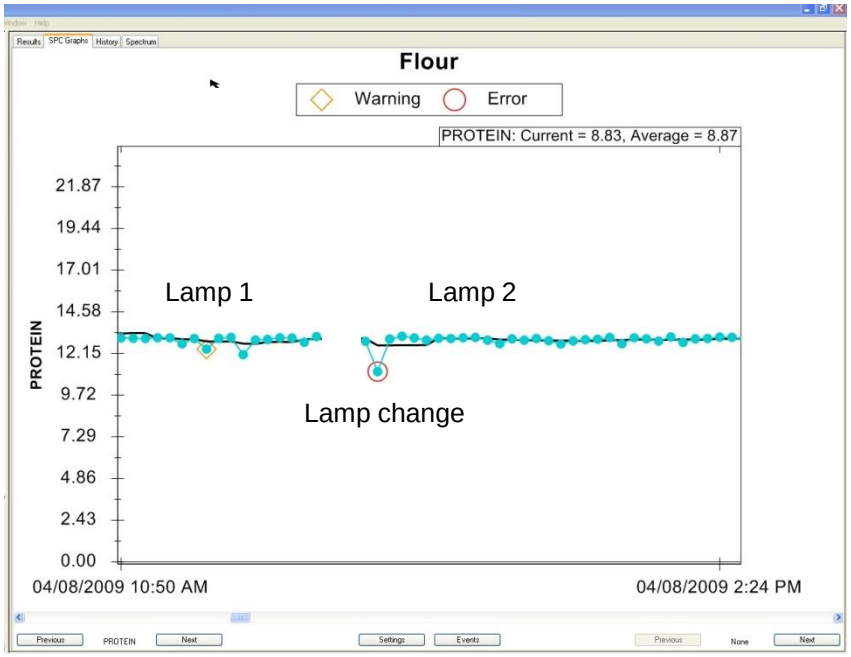
ProFoss installed on chute

ProFoss installed chute feeding conveyor

Example – Fail-safe dual lamp technology

- When the primary halogen lamp fails, a secondary lamp automatically takes over to avoid any downtime of the analyzer
- The secondary lamp is pre-adjusted to be identical to the primary lamp, thereby ensuring identical measurements after the changeover





ProFoss Hardware Specifications

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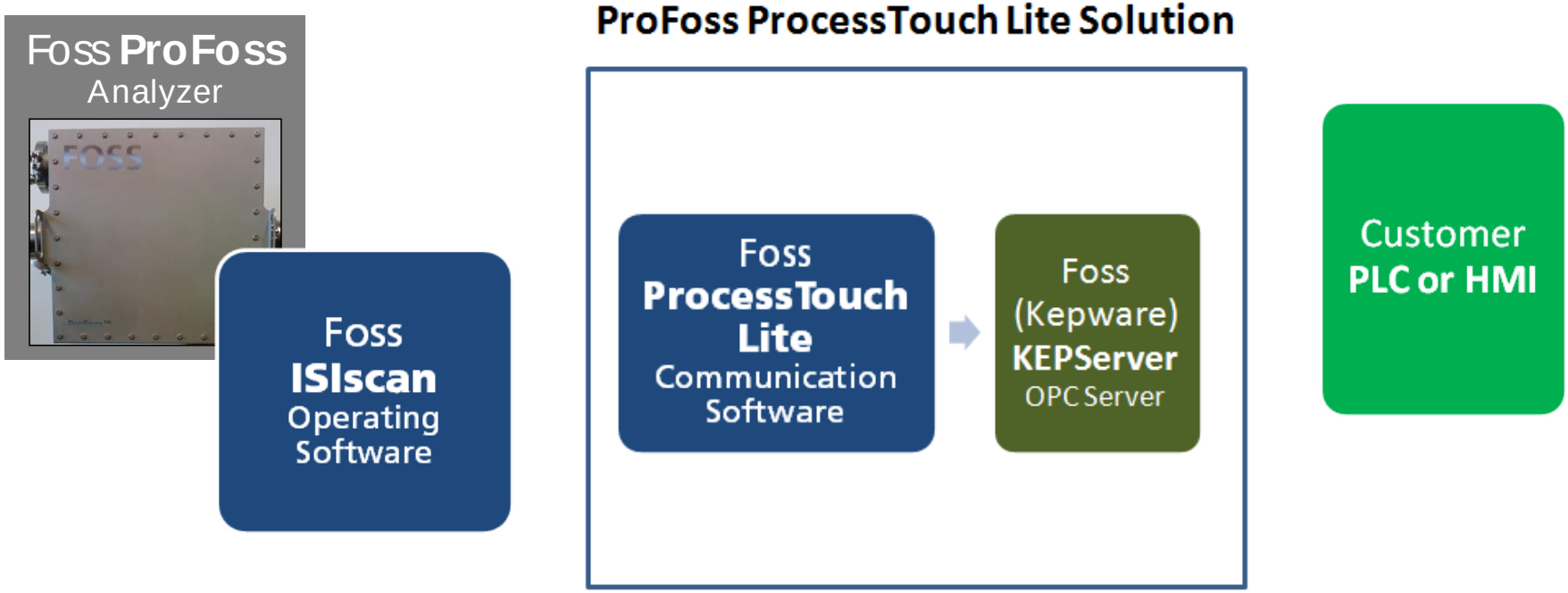
General:

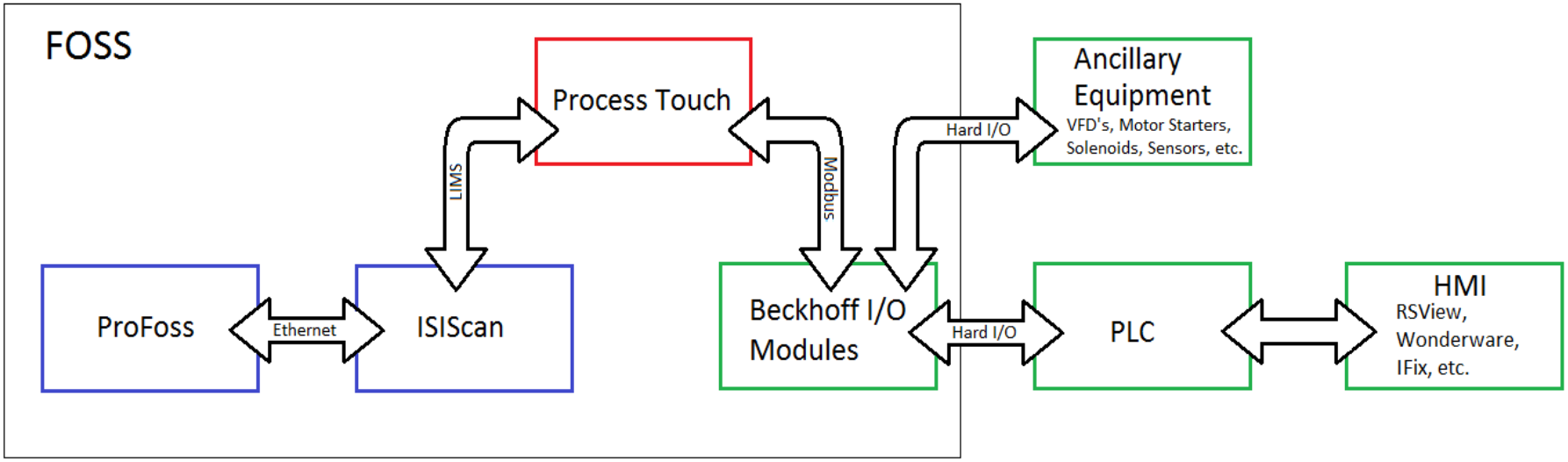
Light source lifetime:	Dual lamp system MTBF = 17500 h
Software package:	ISIscan™ for instrument control; ISIcal™ for calibration development
Wavelength accuracy:	0.5 nm
Wavelength precision:	< 0.02 nm
Wavelength stability:	< 0.01 nm/°C
Noise:	< 60 micro AU
Random Vibrations:	0.4 grms at 10 – 150 Hz according to IEC 60068-2-64 0.4 grms at 10 – 1250 Hz according to FOSS internal standard (more information available on request)
Temperature:	-5 – 40°C (23 – 104°F). With purge -5 – 65°C (23 – 149°F) Installation in ATEX zone: 0 – 40°C (32 – 104°F). With purge 0 – 65°C (32 – 149°F)
Purge air:	Flow rate minimum 5 l/min, > 99.9% water free, > 99.9% free of oil and fine particles down to 0.3µm
Ambient humidity:	10 – 90 % relative
Dimensions (w × h × d):	42 × 42 × 13.5 cm (16.5 × 16.5 × 5.3 inches) + brackets to hold the unit
Weight:	25 kg / 55 lbs
Cabinet:	1.5 mm (lid 2.5mm) Stainless Steel EN 1.4301 (SS2333)
Protection:	IP69K[1)] according to IEC 60529 and DIN 40050 part 9, NT ELEC 023
Communication:	Ethernet, OPC, RINA, FossCare™
Power supply:	Recommended isolated or conditioned line power 100 – 240 VAC, 50 – 60 Hz, 2.0 A, 150W

[1)] *IP6x is the highest protection for dust entering the unit. IPx9K means protected against the effect of high-pressure water and/or steam cleaning at high temperature.*

ProFoss ProcessTouch Lite



Example 2



I/O Modules

Conclusions

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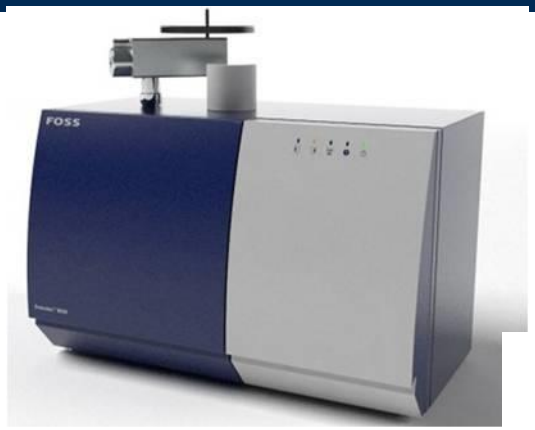
Many benefits to real-time inline analysis:

1) **Reduce standard variation to ensure more consistent products**
2) **Move closer to target to gain extra PROFIT**
3) **Reduce sampling and analysis time in laboratory**
   – ***eliminate sampling error from process***
4) **Reduce rework**
5) **Improve efficiency → such as energy by not over drying**
6) **Typical payback is 6-12 months**

Thank You!!

Alphatec
Falling Number



Dumatec
Combustion

DS2500
Flour Analyzer

Infratec Nova
Whole Grain Analyzer

Cyclotec
Sampling Mill

Hammertec
Sampling Hammer Mill

Contact Information

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