Dedicated Analytical Solutions

FOSSOMATIC™ FC

CMT Workshop, Taiwan 16 October 2015

Steen Kold-Christensen, International Market Manager, FOSS, Denmark

Dedicated Analytical Solutions

AGENDA

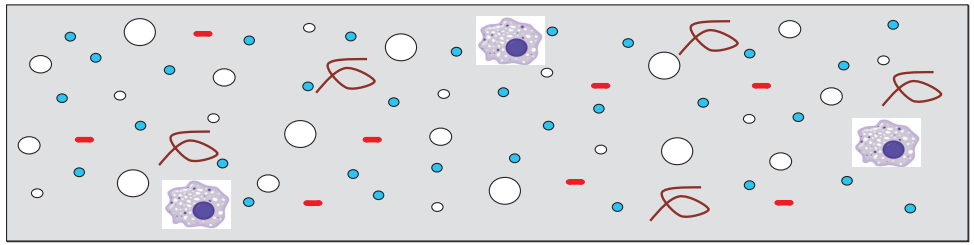
- "The raw milk challenge"
- Flow cytometry
- Measuring principle
- Best of the proven
- Specifications

FOSS

Dedicated Analytical Solutions

"THE RAW MILK CHALLENGE"

Milk on the microscopic level:



87.3 % water

4.6 % lactose + 0.65 % minerals + 0.18 % acids + 0.8% protein (dissolved)

2.45 % casein (protein micelles, ≈ 0.2 µm diameter)

3.9 % milk fat (globules, 0.1 - 20 µm diameter)

Some somatic cells (50.000 – 2 million / ml; 5-10 µm diameter)

Some bacteria (5.000 – 20 million / ml; 0.5-5 µm length)

Dirt in general – hair, grains of sand, fibres etc.

FOSS

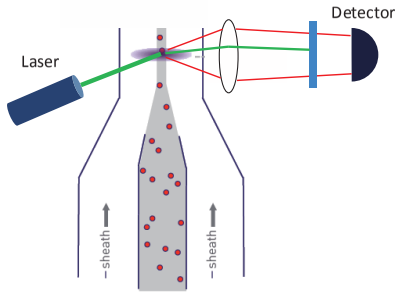
Dedicated Analytical Solutions

FLOW CYTOMETRY

Flow cytometry is a technology designed to count cells in suspension.

The basic steps are the following:

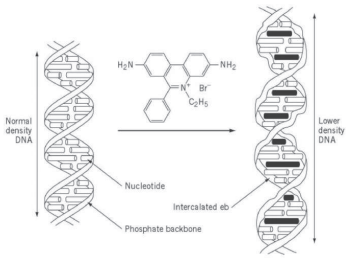
- The cells are stained with a fluorescent dye.
- The sample is stretched to a very thin string (20 µm).
- The sample passes a focused light beam which excites fluorescence from the dye.
- The cells are seen as individual light pulses The fluorescence is collected, filtered and detected.

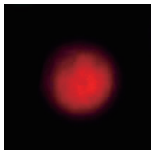


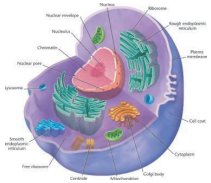
FOSS

FLUORESCENT STAINING

- There exists a large palette of dyes which bind to specific cell structures, such as DNA.
- The fluorescence from such a dye in a cell gives a strong contrast with respect to the surrounding liquid and to other particles.
- One example is Ethidium Bromide, which binds to DNA (intercalating)
  - High local concentration of EB inside the cell
  - When EB binds to DNA the fluorescence yield is increased by more than x10 pr molecule.
  - This is used in both Bactoscan™ and Fossomatic™ FC.



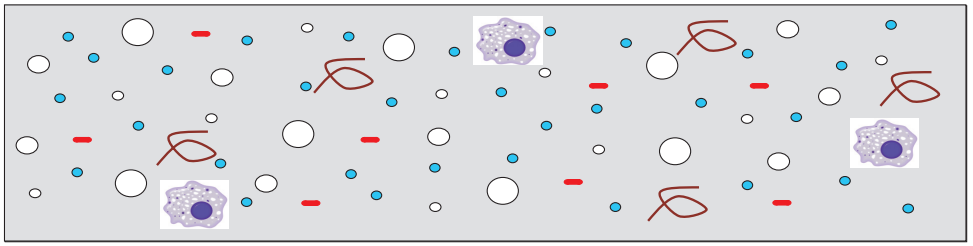




FOSS

"THE RAW MILK CHALLENGE"

Milk on the microscopic level:



87.3 % water

4.6 % lactose + 0.65 % minerals + 0.18 % acids + 0.8% protein (dissolved)

2.45 % casein (protein micelles, ≈ 0.2 µm diameter)

3.9 % milk fat (globules, 0.1 - 20 µm diameter)

Some somatic cells (50.000 – 2 million / ml; 5-10 µm diameter)

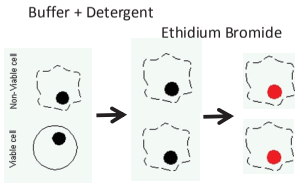
Some bacteria (5.000 – 20 million / ml; 0.5-5 µm length)

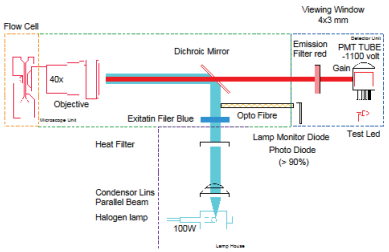
Dirt in general – hair, grains of sand, fibres etc.

FOSS

MEASURING PRINCIPLE

- Cells are easy to stain and give good signals.
- All somatic cells contain the same amount of DNA.
- Ethidium Bromide staining is used to distinguish somatic cells from other particles.
- Ethidium Bromide cannot penetrate the cell membrane of a viable cell, but the membrane is easily opened with a detergent.
- "Mix and measure": The sample is mixed with the stain and measured immediately after

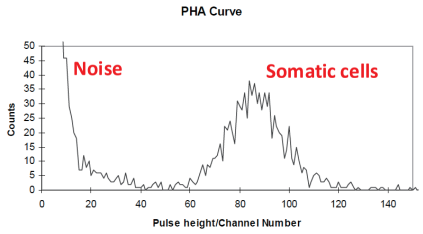


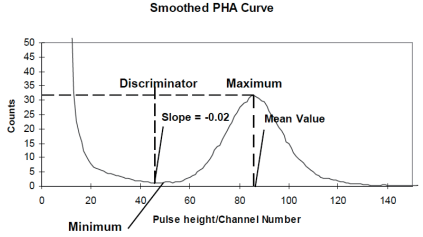


FOSS

RESULTS

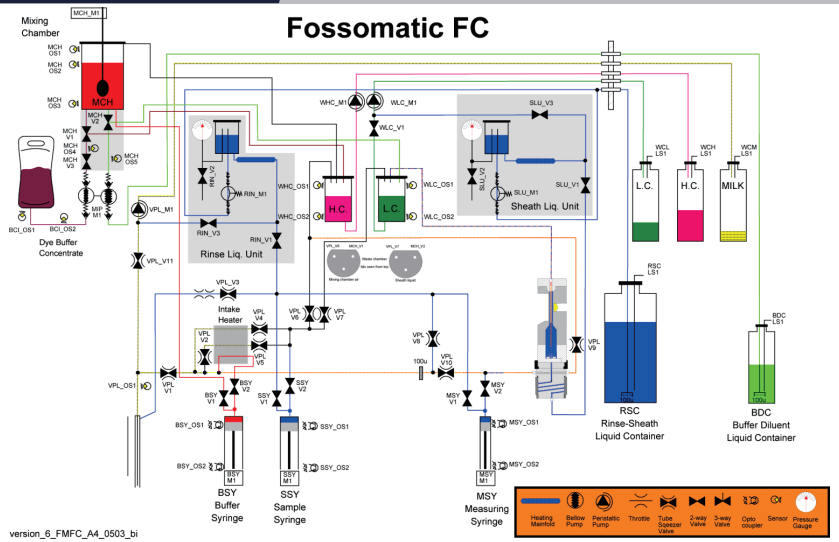
- The instrument creates a histogram of detected pulse heights: the PHA curve (Pulse Height Analysis).
- An algorithm determines the threshold for counting and the number of cells pr ml is calculated.
- The measurement is carried out on 3.3 µl milk (from 2.5 ml sample).
- Reference method is cell counting in a microscope
  - Poor statistics, slow but in the end measures the same thing.





FOSS

FLOW SYSTEM



FOSS

BEST OF THE PROVEN

- Performance options from 100 to 600 samples
- Closed reagent and effective waste handling
- Accurate measurements based on FOSS flow cytometry
- Patended Dynamic Precision
- Integrated with MilkoScan™ FT+ for Combi™ operation
- Applies FOSS universal Foss Integrator™ software
- Mosaic Network™ compatible
- Used by more than 400 CMT laboratories around the globe
- More than 3.000 Fossomatic™ sold world-wide (six generations)

FOSS

ROBUST INSTRUMENT

- Pressurised sheath and rinse liquid system known from the Bactoscan™ FC
- Reduced cost for maintenance, higher uptime

FOSS

HEATING OF ALL LIQUIDS

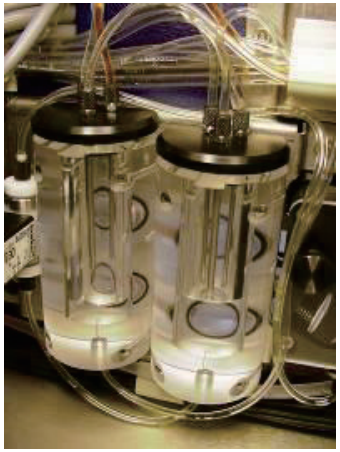
- Milk and reagents are heated to optimal temperature for staining the cells
- Rinse liquid is heated to secure optimal cleaning, and avoid blockage of the waste tubes
- More robust instrument, higher uptime

FOSS

Dedicated Analytical Solutions

NEW SENSOR FUNCTION

- New sensor function system for the waste chambers
- Longer lifetime of the tube pumps
- Reduced cost for maintenance
- Higher uptime

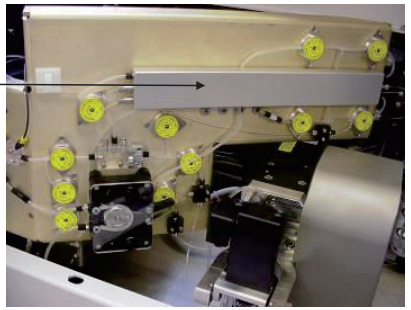


FOSS

Dedicated Analytical Solutions

MOVEABLE VALVE PLATFORM

- The platform can be moved for easy access to the valves and tubes
- Vertical orientation secure longer lifetime of the valves
- Higher uptime

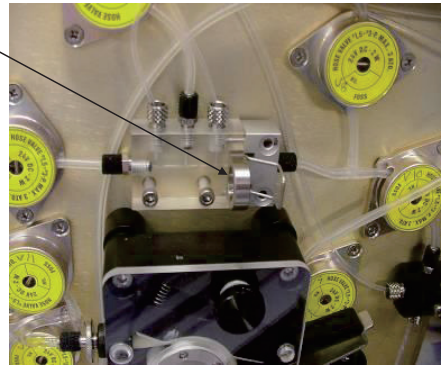


FOSS

Dedicated Analytical Solutions

IN LINE FILTER

- Easy access to clean the in-line filter
- Avoid blocking of the flow cell
- Is back flushed for every sample taken
- Higher uptime

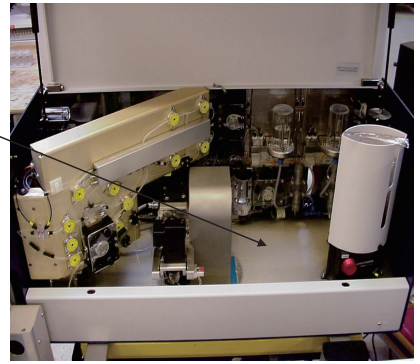


FOSS

Dedicated Analytical Solutions

SERVICE AND MAINTENANCE

- Easy access to clean the instrument in case of any liquid spoilage
- Easy access for service and maintenance
- Cost efficient and higher uptime



FOSS

FMA QUALITY CHECK

- The software needed to run the FMA samples is incorporated in the Foss Integrator IMT software - no extra costs
- One box of FMA samples is supplied free of charge with each new instrument
- Maximise the uptime of the Fossomatic
- QA tool and higher security for correct result

FOSS

PATENDED DYNAMIC PRECISION

Precision Set-up

The Precision Set-up software feature allows the Fossomatic™ to run milk samples at a higher precision in certain areas, for example around grading limits, without significant loss of capacity.

The Precision Set-up offers three options:

- Standard precision set-up
- Fixed Repeatability
- Dynamic Repeatability

Working Factor (WF)
The working factor refers to the volume of milk sample in which the somatic cells are counted.

Repeatability
The repeatability (CV) expresses to which degree the analyser is capable of counting the same amount of somatic cells in the same milk sample.

The higher the SCC, the better the CV. The lower the WF, the better the CV.

FOSS

SPECIFICATIONS

Specifications

Performance	
Measuring range	0 – 10 mill cells/ml
Performance range	0.1 – 1.5 mill
Repeatability*	CV < 6% 100-299k SCC/ml CV < 4% 300-499k SCC/ml CV < 3% 500-1500k SCC/ml
Repeatability with precision setup in use	CV < 3.5% 100-299k SCC/ml CV < 2.5% 300-499k SCC/ml CV < 2% 500-1500k SCC/ml
Accuracy	< 10% relative mean diff. from DMSCC (Direct Microscopic Somatic Cell Count)
Carry-over	< 1% relative usually below 0.4%
Sample types	Cow's, goat's, sheep's milk and other

**CV = Coefficient of variation (STDev/AVG) x 100. (STDev = Standard deviation. AVG = Average)*

FOSS

APPLICATIONS

Application data

Analysis Capacity	100 – 200 – 300 – 400 – 500 - 600 **(samples/ hour)**
Sample intake	2.5 ml (programmable 2.0 – 5.0 ml)
Required sample temperature	30 - 42 °C (86-107.6 F)
Working factor	300 or better

FOSS