Production optimisation by use of in-line sensors in Arla Foods

Christian B. Zachariassen Excellence Manager, Manufacturing Intelligence Corporate Supply Chain

Simon Mortensen Project Manager, Butter Holstebro Dairy





Why sensors?









24 January 2019 United States Food and Drug Administration, Guidance for industry PAT – A framework for innovative pharmaceutical development, manufacturing and guality assurance, U.S. Department of Health and Human Services, Rockville, 2004

Sensor development

1975, 0.01MP bw



1997, 0.3MP

2007, 2MP







Sensor interfacing to the process



Processtream ——



Calibration interfaces



Calibration workflows

Production line



PAT/Laboratory





Sensor implementation - Way of working



Idea	Discovery			Development						Roll-out			
Stakeholder identification	Identify relevant PAT sensors	Feasibility studies and initial PAT models		Project planning	Setup local teams	Plan interfaces to operators and control systems	Installation	G	Verification	Setup local teams, support, governance and user roles	Installation	G	Verification
Scope and technical concept	Proof of principle	Proof of concept		PAT process acquisition	Site planning and kick-off	Documentation	Testing and training	- L I	Evaluation and benefit tracking	Site planning and kick-off	Testing and training	- L I	Evaluation and benefit tracking
Identify benefits		Documentation incl. benefit estimates		Reference sample acquisition	Define system support, governance and user roles		Calibration development	Ĕ	Operation and maintenance	Plan interfaces to operators and control systems	Calibration development	Ē	Operation and maintenance



Optimization with in-line NIR at Holstebro Dairy



Optimization with in-line NIR at Holstebro Dairy

- What do we produce?
 - Butter and spreadable (butter mixed with vegetable oil)
- What do we measure?
 - Water and salt in end products
- How do we measure? - In-line, At-line, laboratory
- Why in-line???





URPAK



URPA



Implementing a new instrument

- What do you get?
- It is a long proces, break it down into steps.
- Prioritize what is important to get out of the instrument. Where are you today?







Sampling and understanding your process

- Secure that your sampling is correct, or at least the best you can get.
- Know your proces and your products.
- The need of actually getting product on the line and have the variation in the sampling data.
- What is the variation in the proces. Make small tests and secure to take samples when the process is stable.





How to use the output

What do you want to show your operators?







What should the operators do?

- Setting up control limits
- Measurement frequency
- Moving average







Wrong results might be better than none?

Can still give valuable information





Complete view



Arla

How does it work?





Live production and how it works





Benefits from in-line sensors

- High frequency of measurements
- Reduce process variation
- Increasing average
- Securing quality, high percentage measured by the in-line censor
- Valuable knowledge of the process





Getting closer to targets





Keeping focus

- Maintenance of calibrations, what and when is it enough?
- Keep validating results (products, concentration, etc.)
- Prepare for new products and changes in production.





