SDT Members Event
Improving Cheese Quality and Efficiencies
Introduction

Content:
- Curd Handling
- Open Curd Table (OCT)
- Curd Distribution Vessel (CDV)
EVERYONE CAN MAKE GOOD CHEESE, BUT HOW CAN WE MAKE ALL CHEESE GOOD?

Richard Newell Cheese & Dairy Services

- Process optimisation
- Recipe development
- Grading services
- Benchmarking
- Project management
- Feasibility studies
- Technical sales support
- Interim management

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Fragile Curd

- All curd is fragile – treat it like a baby*!
- Protein stitched together, trapping fat and moisture
- Target pipework velocity for curds and whey during transfer 1m/s - 2m/s
  - Too low – curd sinks and sticks to the bottom of the pipework
  - Too high – increased mechanical force on curd particles
- Consider valve selection
  - Pitch Line - Butterfly Valve? Ball Valve? Pinch Valve?
- Consider pipework routing
  - Long radius bends
  - Gentle flow characteristics
Fragile Curd

- Pump selection

Ref: https://www.springerpumps.com/productnews/certa-100-and-200-pumps-now-available-from-masosine/

Ref: https://gifs.com/gif/alfa-laval-s-sru-rotary-lobe-pump-K2LxX3
Fragile Curd

- Pump Selection

<table>
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<th>WM Certa Pump</th>
<th>Lobe Pumps</th>
<th>Screw Pumps</th>
<th>Centrifugal Pumps</th>
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<td>Before:</td>
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Image courtesy of: [Watson Marlow](https://www.watsonmarlow.com)
Quality Curd Treatment

- Lose up to 0.25% fat in whey in the cheese vat
- Save 0.1% fat content in whey through gentle handling
- Lost fat = lost yield
- Consistent curd bed depth – with vats and belts
  - 13/20th Vat empty, start overlapping pitching to manage to differentiate curd/whey mix as vat empties
  - Adjustable speed curd pumps – percentage of curd in whey drops as vats empty
- Targets:
  - Consistent moisture retention
  - Consistent salting
  - Consistent matting
  - Consistent temperature
- Increased block consistency and quality
Cleaning

- Good cleaning regime is critical to cheese quality
- CIP of equipment is an efficient way of achieving cleaning of cheese equipment
- Correctly selected equipment gives energy, water and chemical savings
- Optimised cleaning schemes give production efficiency benefits

Ref: Industrial Fuel Switching Market Engagement Study – Element Energy and JACOBS 2018

General overview
Sycamore Open Curd Table

- Trolley track
- Heating connection
- Whey outlet
- Adjustable legs
- 4mm vat bed
- Trolley
- Curd door
- Reinforced supporting frame
- Curd dam
- Milled or stirred Curd tools (and curd pusher)
- HMI Operator Panel
Open Curd Table

- Designed to reduce manual labour with features such as automatic unloading, cutting and stirring
- Configurable recipes – cut time, stirring times etc.
- Repeatable processes without fully automating – cheesemaker keeps control
- Flexibility to manage smaller batches
- Heating jacket to maintain curd temperature
  - Cold curd has a reduced “knitting” capability leading to block cracking
- Challenges:
  - Consistent mellowing – due to the unload sequence, product nearest the door/unloader has shorter mellowing than the opposite end
  - Curd size consistency – cutting and stirring doesn’t provide accuracy on curd size before salting
- Salt mixing equally in curd of varying sizes is one of the biggest quality control issues in cheese making
Open Curd Table

- Configurable Recipes
- Stirring options
  - Continuously stirred?
  - Intermittent?
  - Rpm?
  - Traverse speed?
- Cutting options
  - When to cut?
- Heating on table
  - Benefit of keeping curd warm?
- Drawbacks
  - Consistency of curd treatment?
  - Time on table? Unloader clears first end curd left on table
CDV – Curd Distribution Vessel

- Purpose: provide even distribution of curd to downstream equipment, e.g. blockformers
- Project: Replaced a side inlet, top-driven Curd Distribution Vessel with a central inlet, bottom-driven design
  - Curd supplied from CDV to blockformers – curd vacuum formed into blocks within the blockformers
- Key deliverables:
  - Improved curd distribution
  - Improved hygiene
  - Safer operation
  - Easier maintenance
Curd Distribution

- Central inlet stops curd build-up on one side
- Rotating “shovel” design giving equal curd distribution around blockformer ports
- “Shovel” manufactured from low friction stainless steel plate
- Agitators keeping curd moving and ports clear of blockages
- Consider location when placing CDV in the process room
  - We only have 1bar vacuum available vs 6bar+ of positive air
  - Positive air can be warmed
Hygiene

- Rotary sprayheads for efficient 360° cleaning performance
- Double lip seal, complete with leak detection and CIP flush functionality for moving seal
- EHEDG design guidelines implemented throughout
  - Open section
  - Minimal flat areas
  - Hygienic bolts
Safety

- Bolted connections preventing unplanned access
- Manway latches prevent operation of handles
- Castell interlock keys on manway latches
Maintenance

- Ease of disassembly for all components
- Internal structure fits through manway
- Bottom fitted agitator – removed from CDV without removal or disconnection of other equipment
Results

- **45% reduction in block fill time**

- **Improved Quality and Consistency**
  - Reduced fill time gives increased consolidation time in blockformer giving more block consistency, from the 1st block, resulting in less waste, downgraded or recycled blocks
  - Curd temperature better maintained before entering the blockformer, further enabling better consolidation and block consistency, due to consistent curd bed depth around all ports

- **Increased Production Capacity**
  - Allowing room for redundancy (production can run on 4 instead of 5 blockformers)
  - Increased hourly capacity (one additional vat processed every day)

- **Improved Cleanliness and Hygiene**
  - Double lip seal design allowing safe, automatic CIP of potential leak areas
  - Rotary sprayheads ensure thorough cleaning with minimal water consumption
  - Reduced manual intervention with CIP changeover – ports designed to facilitate incorporation with valve manifold, meaning operators not on hands and knees changing over bends and carrying contamination from floor to other areas of the process

- **Increased Consistency of Block Ejection**
  - More predictable pattern for manual operations, such as, installing bags on blockformer outlet – calmer more user-friendly environment
Conclusion

- Curd is very fragile and needs to be treated accordingly to maximise yield
- Well-considered treatment of curd and curd conditioning leads to improved consistency in cheese
- Salt distribution through curd is one of the largest contributors to cheese quality
- Good cleaning is an integral part of a quality cheese-making process
- Open Curd Tables provide a flexible way to make and manage cheese
- Improving curd distribution with CDV’s can lead to numerous benefits in the overall process
Questions