SDT Members Event

Improving Cheese Quality and Efficiencies

Introduction

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SYCAMORE
PROCESS ENGINEERING

Content:

- Curd Handling
- Open Curd Table (OCT)
- Curd Distribution Vessel (CDV)

Quality

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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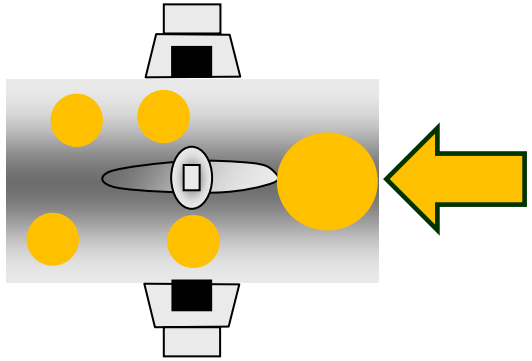
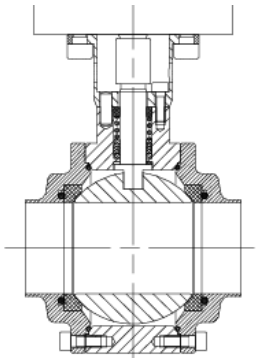
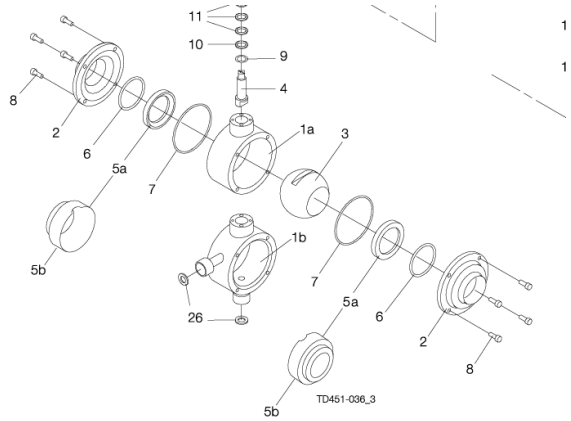
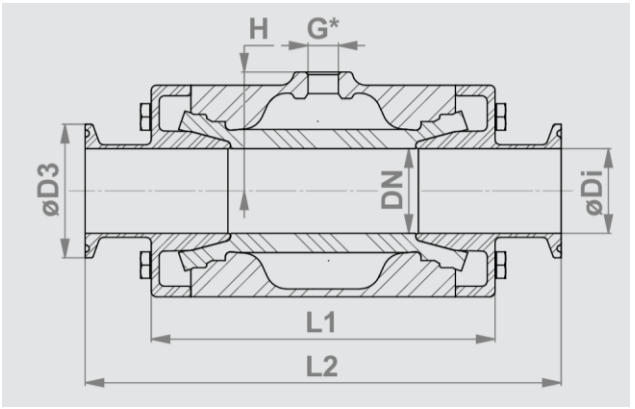
Fragile Curd

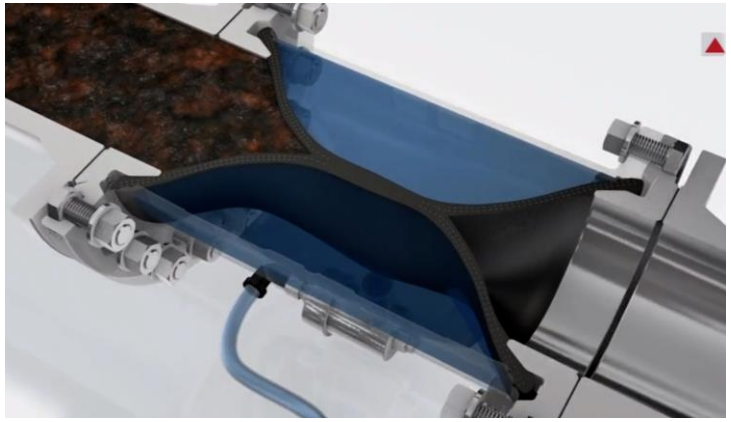


- All curd is fragile – treat it like a baby*!
- Protein stitched together, trapping fat and moisture
- Target pipework velocity for curds and whey during transfer 1m/s - 2m/s
  - Too low – curd sinks and sticks to the bottom of the pipework
  - Too high – increased mechanical force on curd particles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





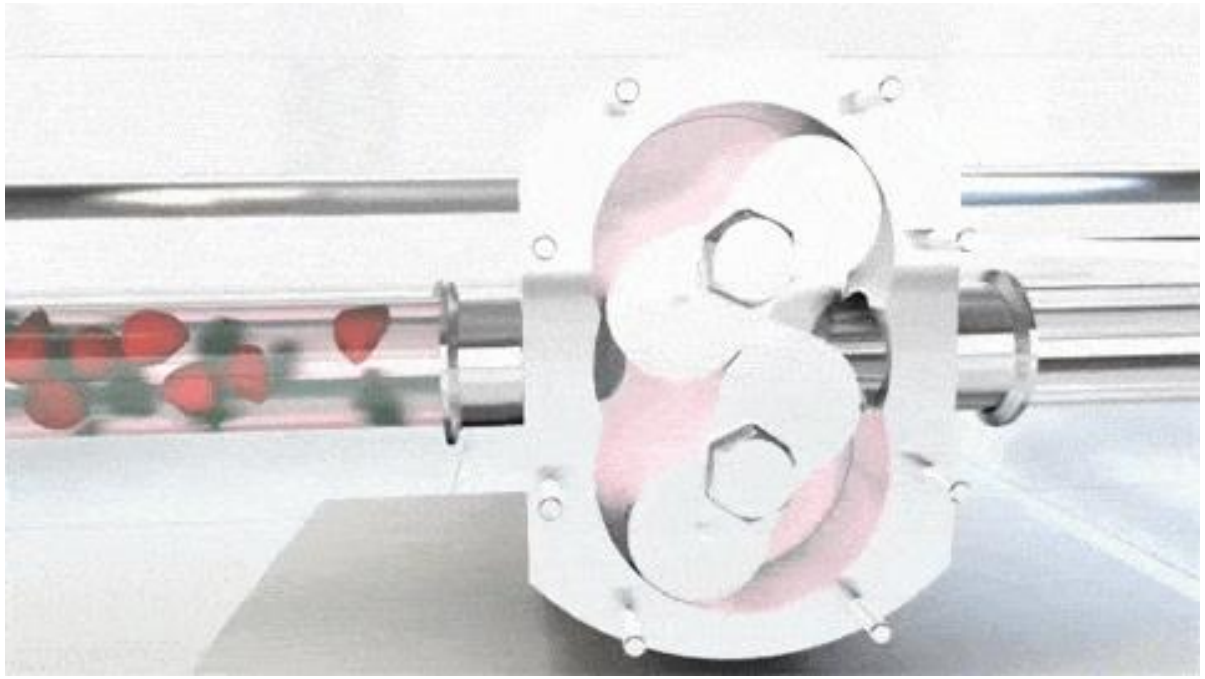




Fragile Curd

- 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-KzLkX3

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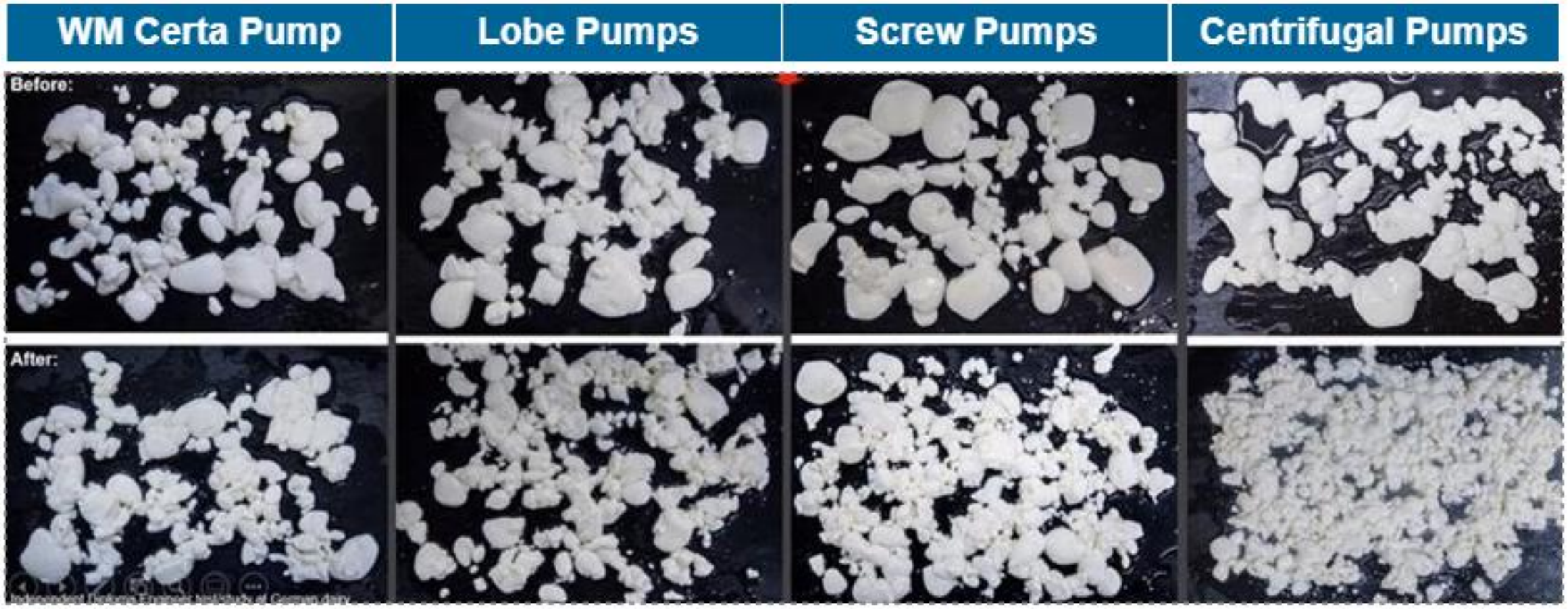
Fragile Curd

Image courtesy of: WATSON MARLOW Fluid Technology Solutions

- Pump Selection



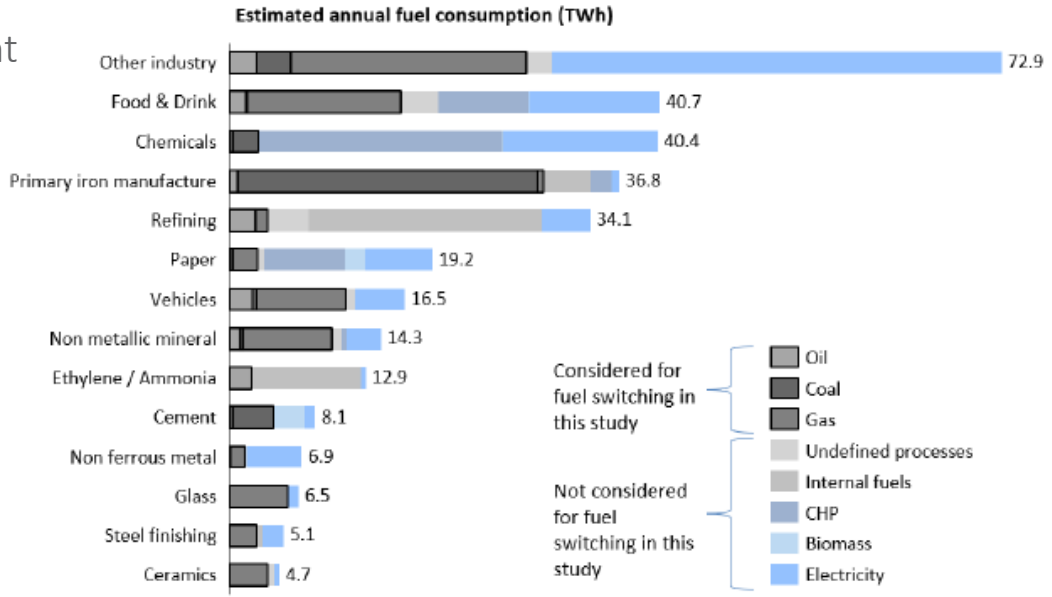
Quality Curd Treatment

- 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

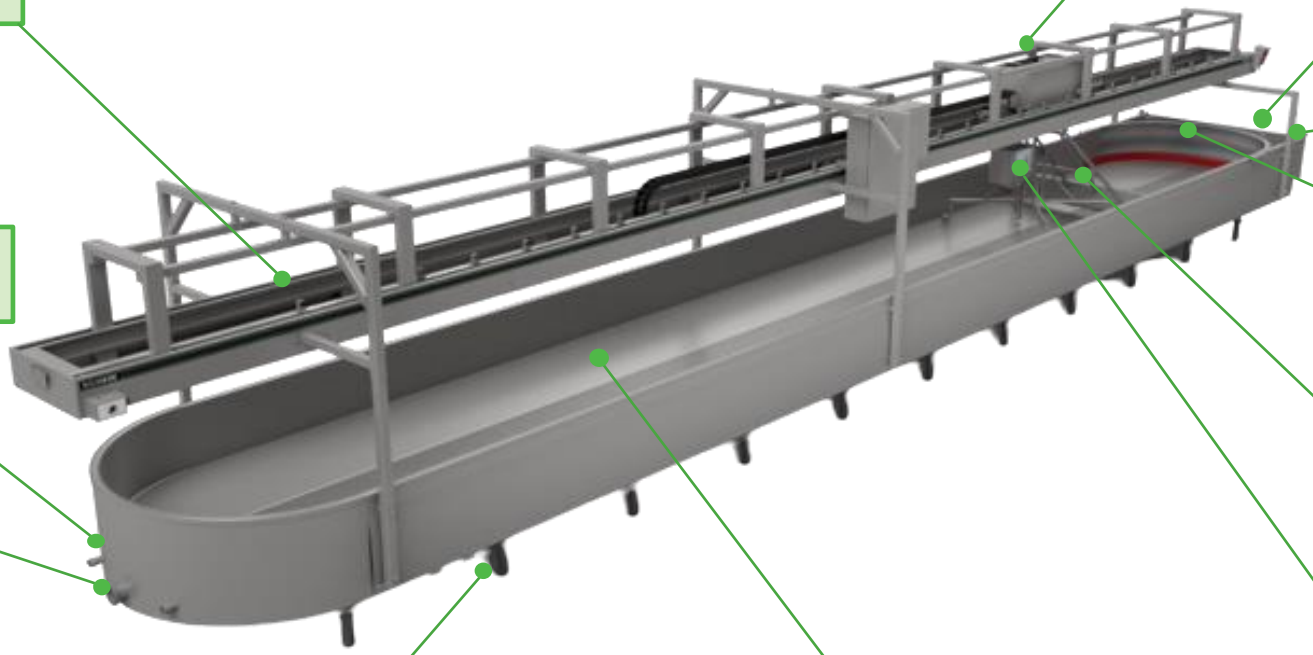
Ref: https://www.south-staffs-water.co.uk/news/brits-urged-to-be-water-savvy-as-small-changes-could-help-save-almost-500-a-year-on-bills



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

General overview

Sycamore Open Curd Table



Trolley

Curd door

Trolley track

Reinforced supporting frame

Heating connection

Curd dam

Milled or stirred Curd tools (and curd pusher)

Whey outlet

HMI Operator Panel

Adjustable legs

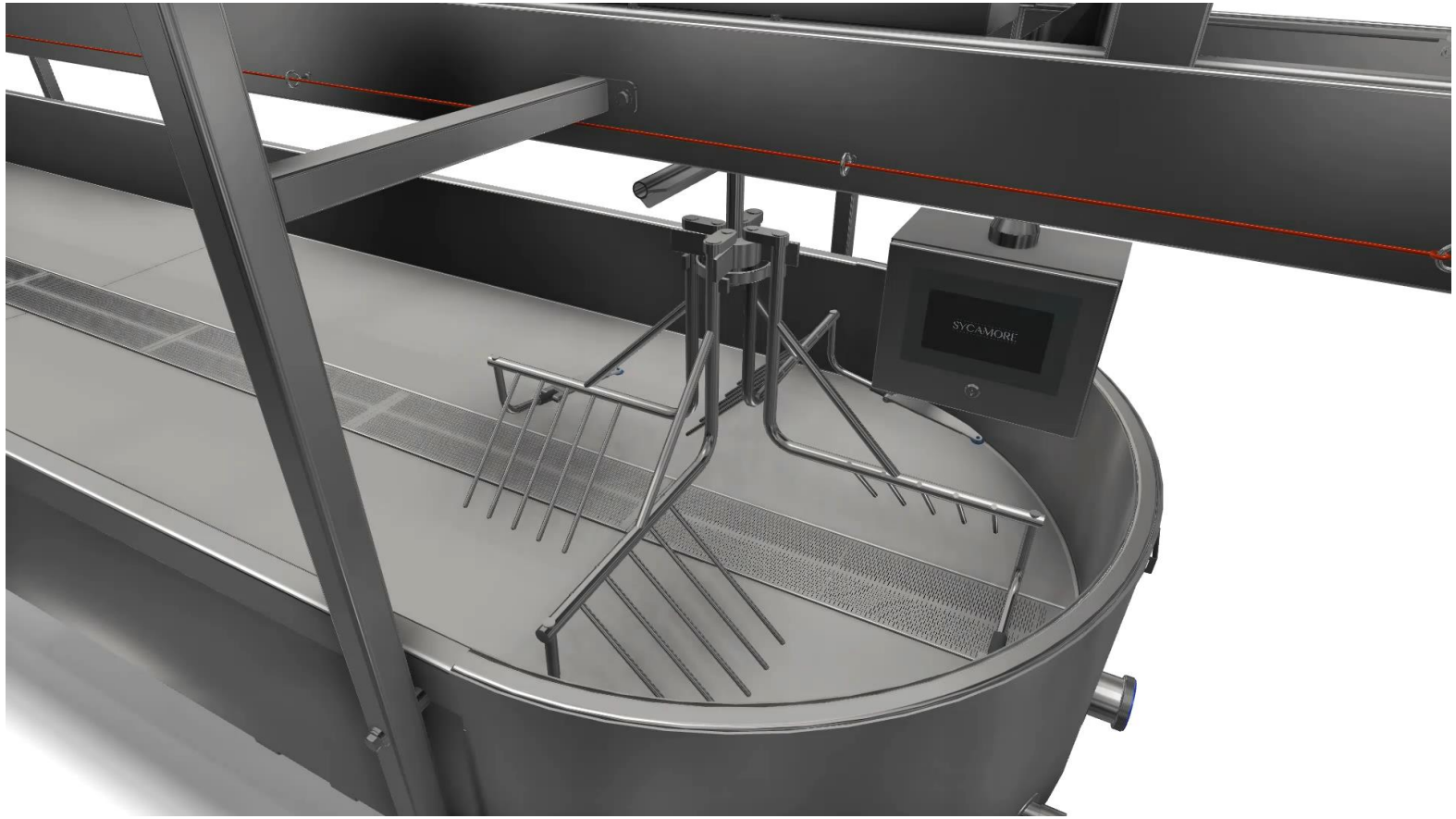
4mm vat bed

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

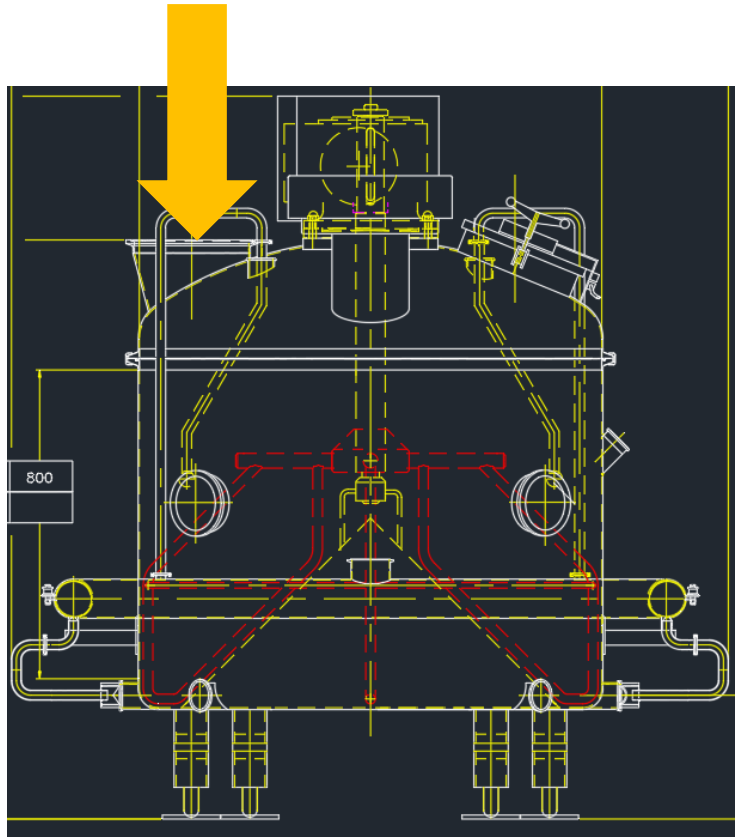
Open Curd Table

- 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



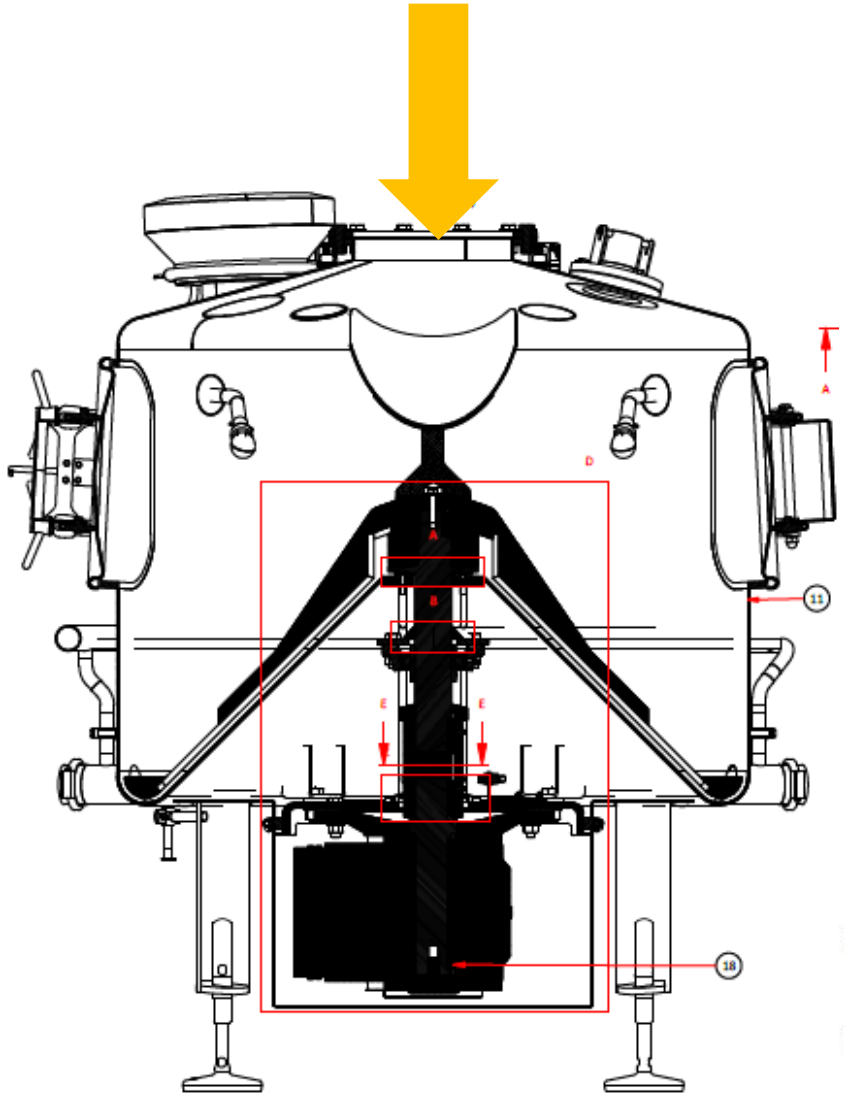
CDV – Curd Distribution Vessel

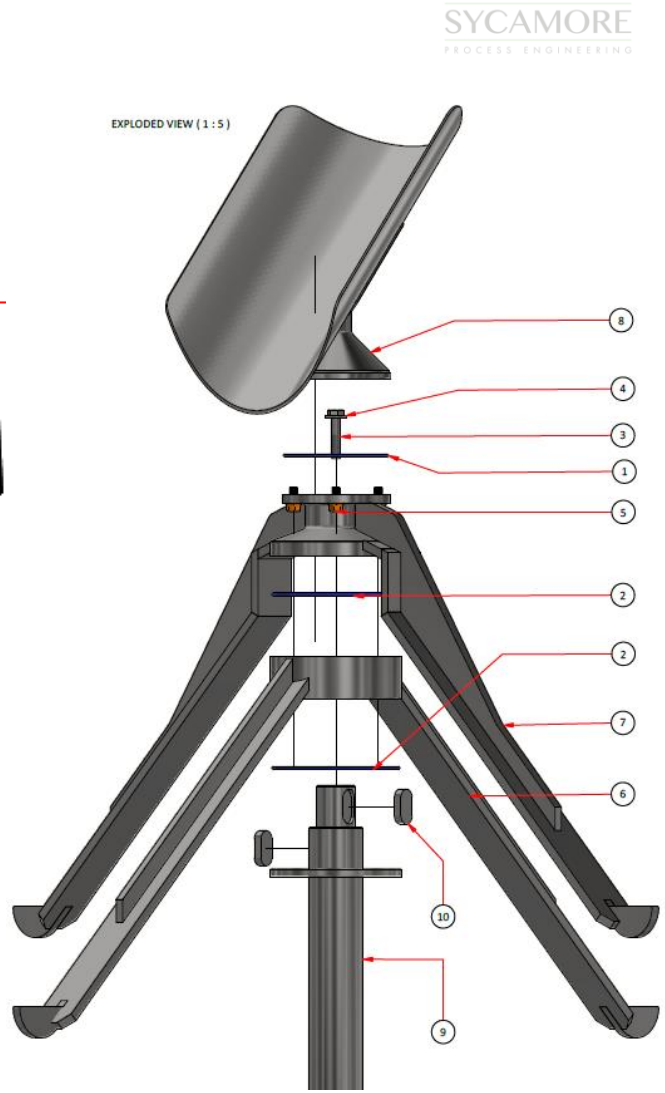
- Purpose: provide even distribution of curd to downstream equipment, e.g. blockformers
- Project: Replaced a side inlet, top-driven Curd Distribution Vessel with a central inlet, bottom-driven design
  - Curd supplied from CDV to blockformers – curd vacuum formed into blocks within the blockformers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



Curd Distribution

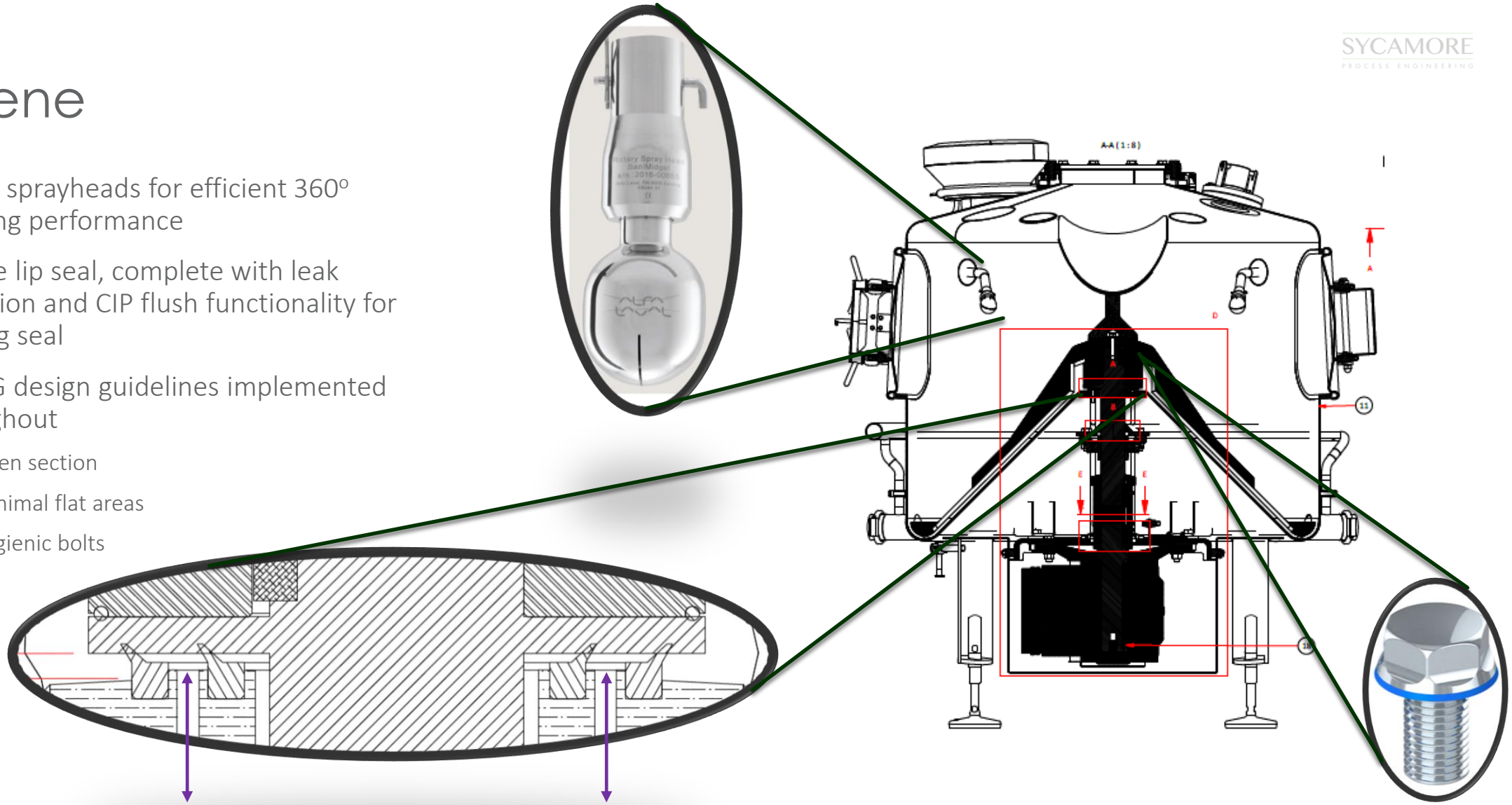
- Central inlet stops curd build-up on one side
- Rotating “shovel” design giving equal curd distribution around blockformer ports
- “Shovel” manufactured from low friction stainless steel plate
- Agitators keeping curd moving and ports clear of blockages
- Consider location when placing CDV in the process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





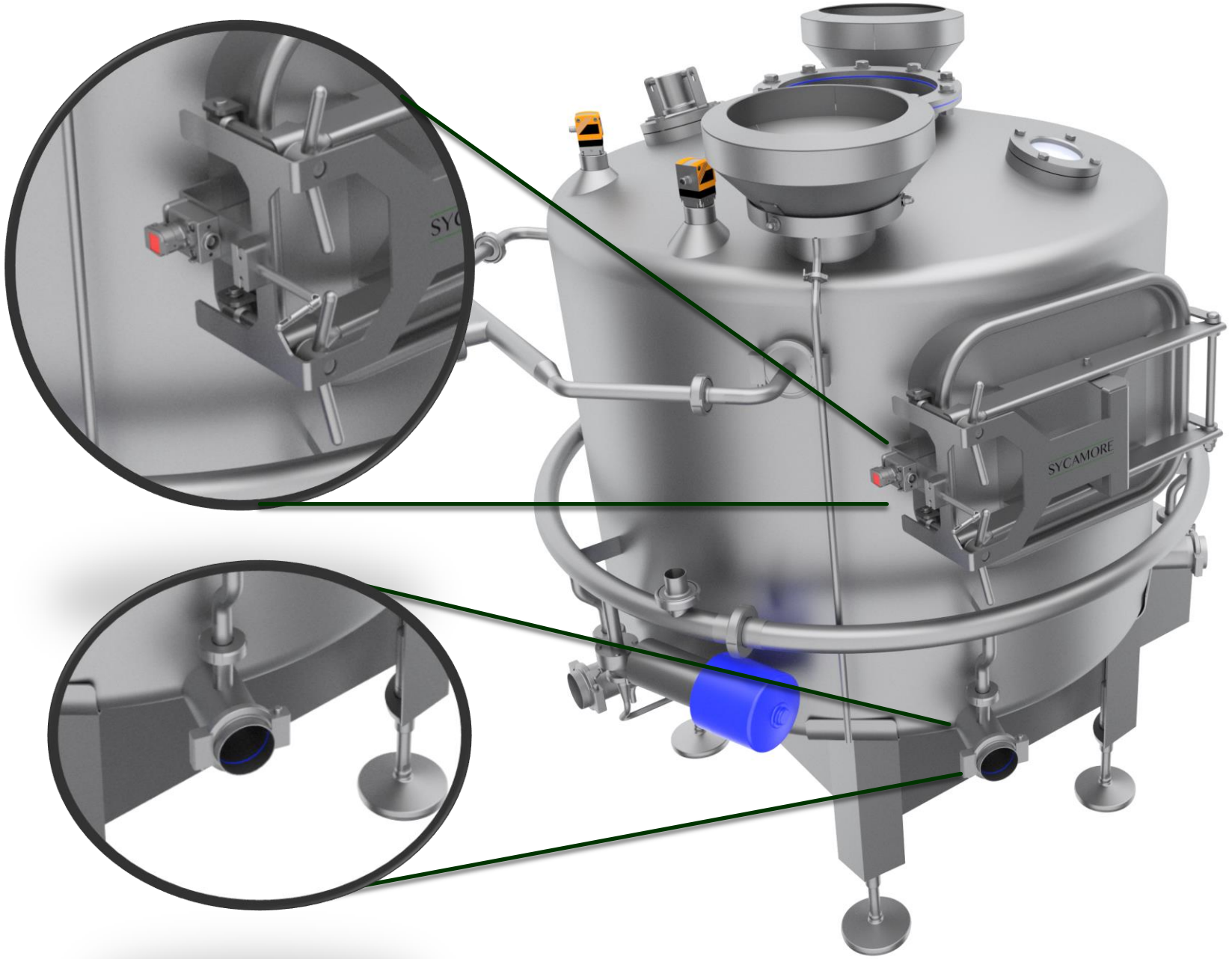
Hygiene

- 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



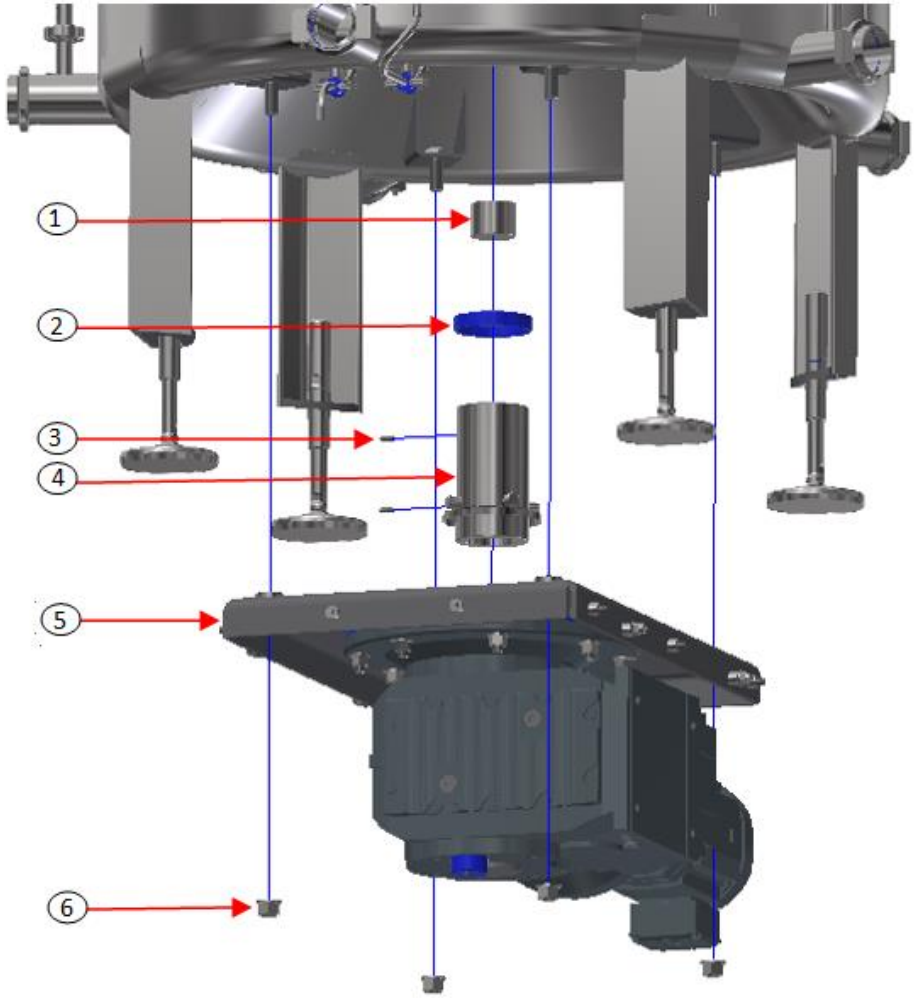
Safety

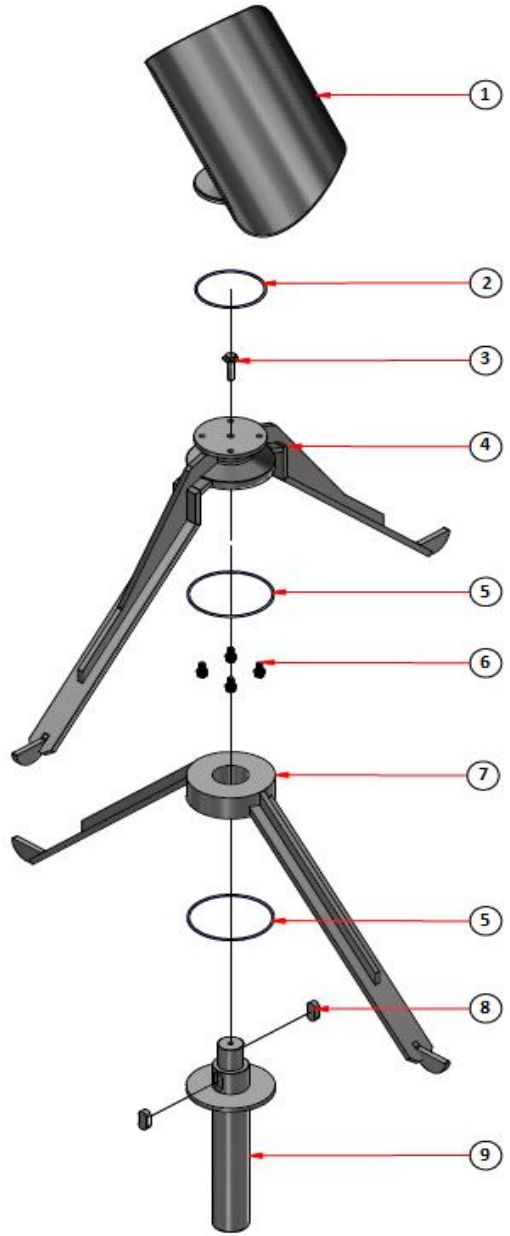
- Bolted connections preventing unplanned access
- Manway latches prevent operation of handles
- Castell interlock keys on manway latches



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