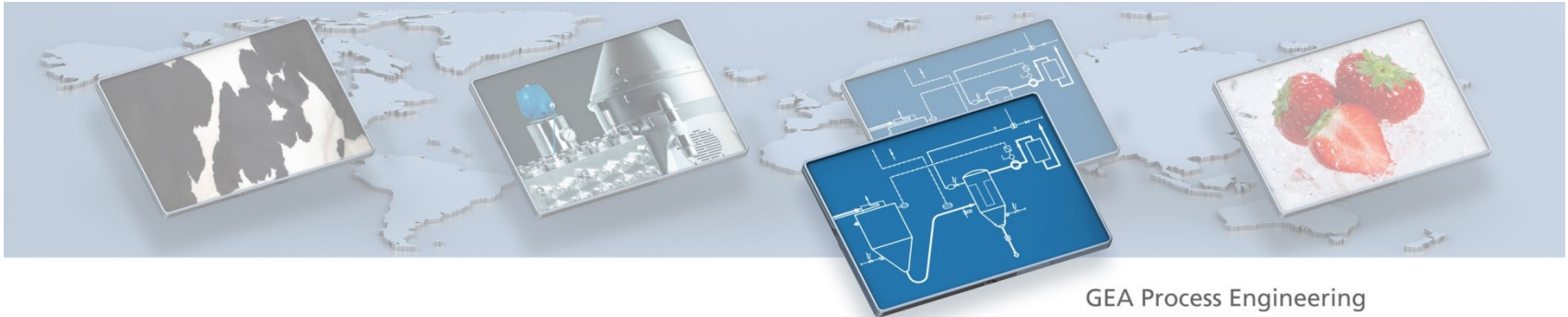


Morten Lykke Poulsen



**Nuovi processi produttivi
per ampliare la gamma
degli ingredienti lattieri**

**How new process development contributes to
enrich the choice of dairy ingredients**



How new process development contributes to enrich the choice of dairy ingredients

5th Dairy Forum Clal

Morten Lykke Poulsen – Innovation Manager

GEA Process Engineering



Better use of raw materials

LEAN

Product quality

Plant safety

Resource management

Re-engineering

- Higher yield
- Conversion of bi-product
- Variable sources

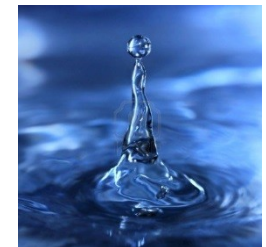
- Waste
- Uptime
- Overtreatment

- Shelf life – control of microbial growth
- **Organoleptic quality and nutritional value**
- **Functionality**, design and packaging

- Worker safety
- Environmental control
- Protection of equipment

- Heat recovery
- Energy source
- Water supply

- From batch to continuous
- **Application driven innovation**
- **Simplification**

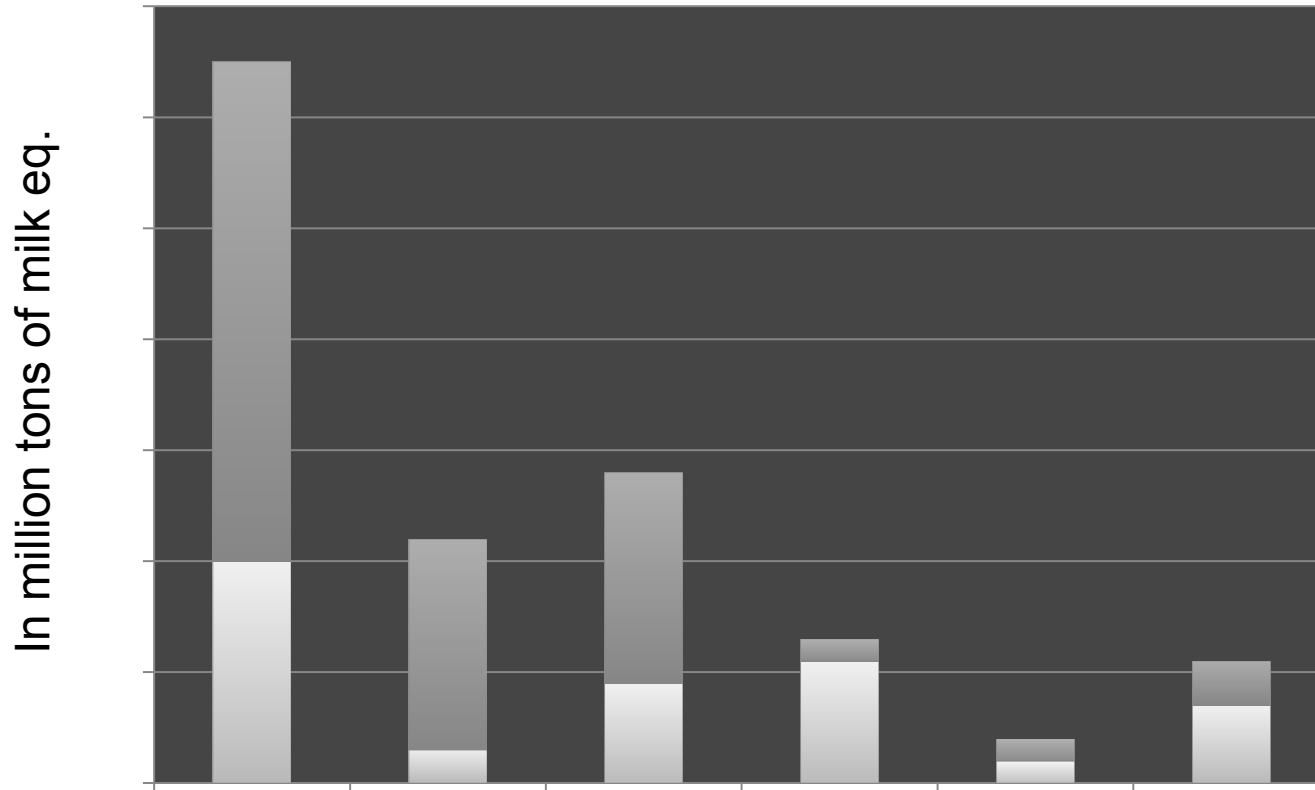


- *3 billion consumers will join the middle classes from 2010 to 2030 [OECD Working Paper]*
- *From 2015 to 2025 population will grow by 760m [UN World Population Statistics]*
- *People are moving to the cities [UN World Population Prospects]*
- *EU post quota → +14 million tons milk in 10 years [EU Commission DG AGRI]*
- *Dairy farmers in downward spiral as price of milk falls below costs [Financial Times]*
- *Export to Russia affected by embargo and China imports slow down [Eucolait]*

Innovation and product differentiation is an enabler to obtain growth and suppress price pressure and commoditization

What will Happen with the Extra Volume in EU?

10 years Outlook: Distribution of additional milk production

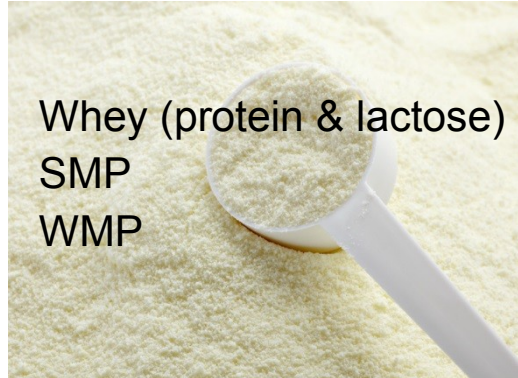


Source: EU Commission DG AGRI

Cheese



Powder



Butter



Liquid?



- +136% (2007-2014) export world wide
- EU 40%
- 0.5 billion €

Liquid process
Powder process



Quality driven process



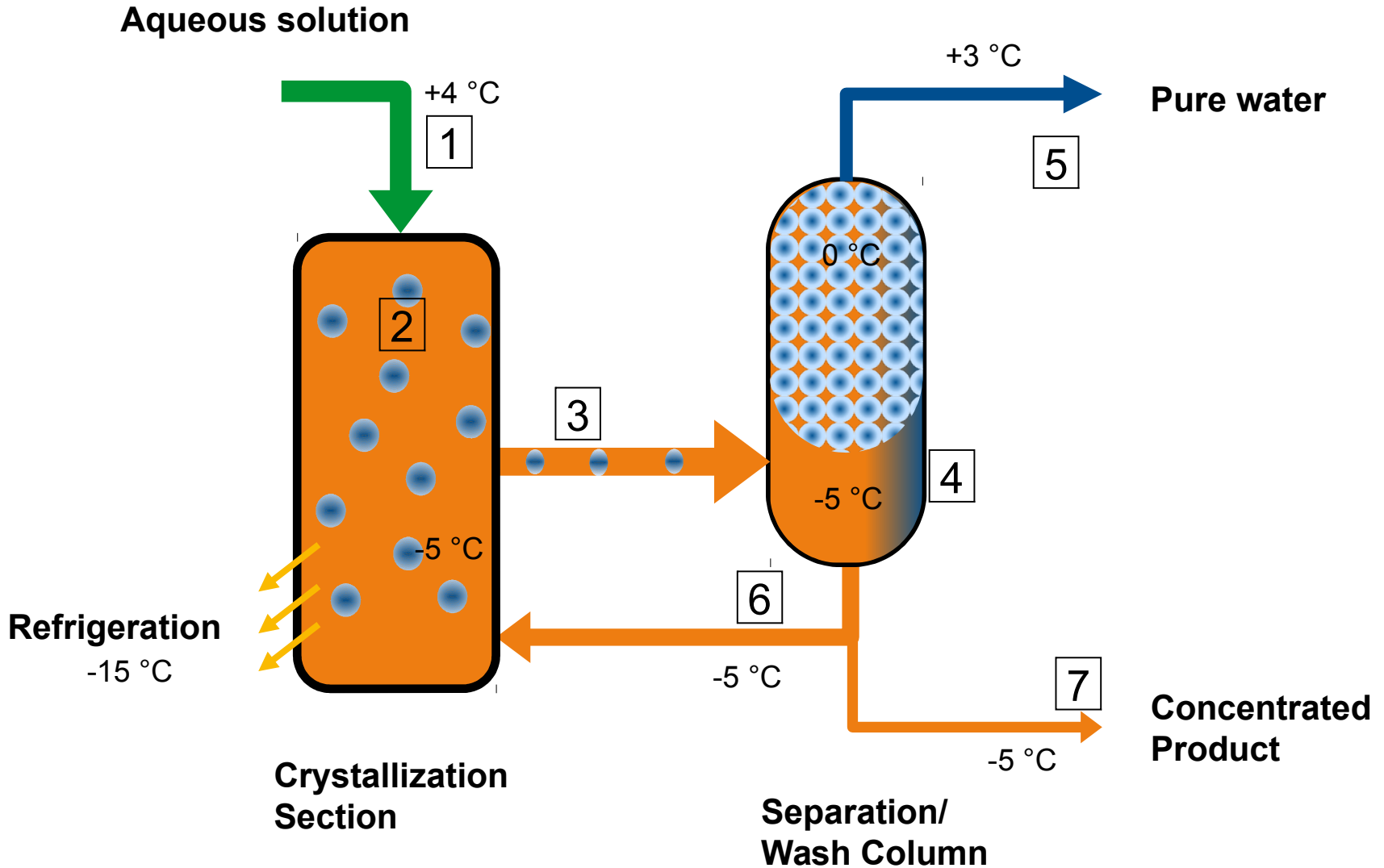
- Removal of pure water in the form of ice crystals at sub zero temperatures

= maximum quality retention



= added value

Freeze Concentration of Aqueous Solutions



The Drive to use Freeze Concentration

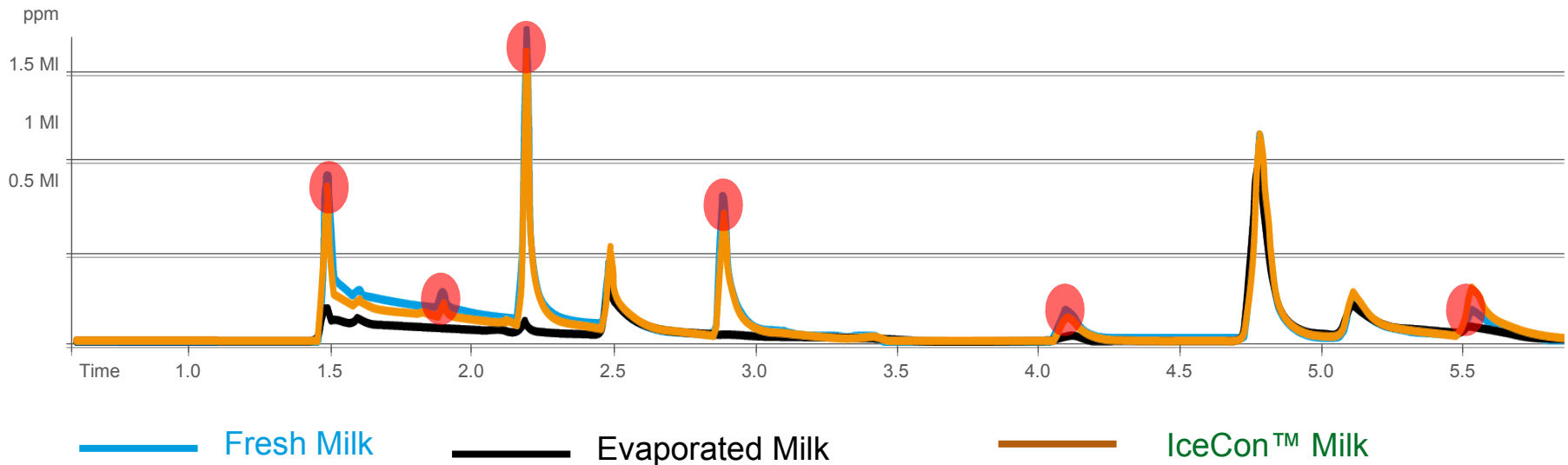


Evap Quality-loss

- Heat damage
- Flavour loss
- Measurable reduction

IceCon™ Quality preservation

- Concentration at sub-zero °C
- Full retention of aromas
- Freshness and better taste
- Thermal degradation eliminated



Freeze concentration systems are on the market since 1975. The traditional design is based on separate ice production and ice crystal growth, needing pressurized vessel and filters.

This needed relatively high investment cost.

New freeze concentration technological innovations have resulted in the development of the **IceCon™ system** and **40 % reduction of the capital cost and reduction of energy consumption with 20-30%**

...let you still produce premium product as usual

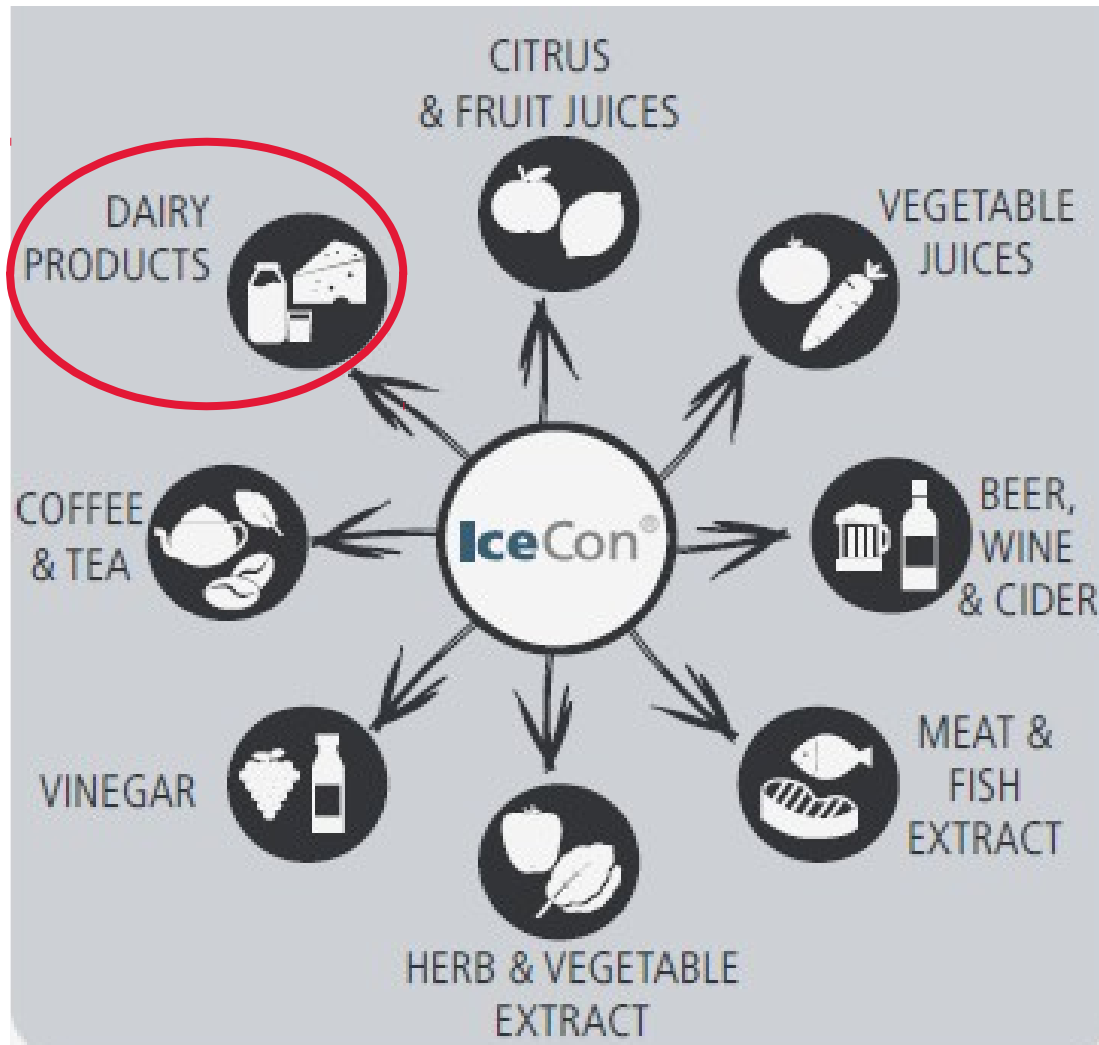
The cost reduction opens the door for applications in many more fields

Image of IceCon™ unit

Crystallizer



Wash column



Industrial Food Ingredients

- Milk chocolate
- Sour cream
- Cream cheese
- Frozen desserts
- Ice cream



Consumer Beverage

- Reconstituted fresh milk
- Milk concentrate
- Milk fortification

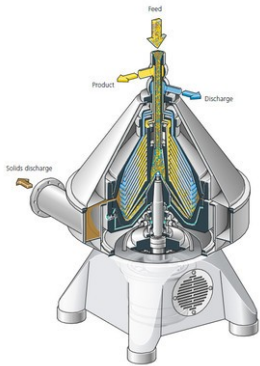
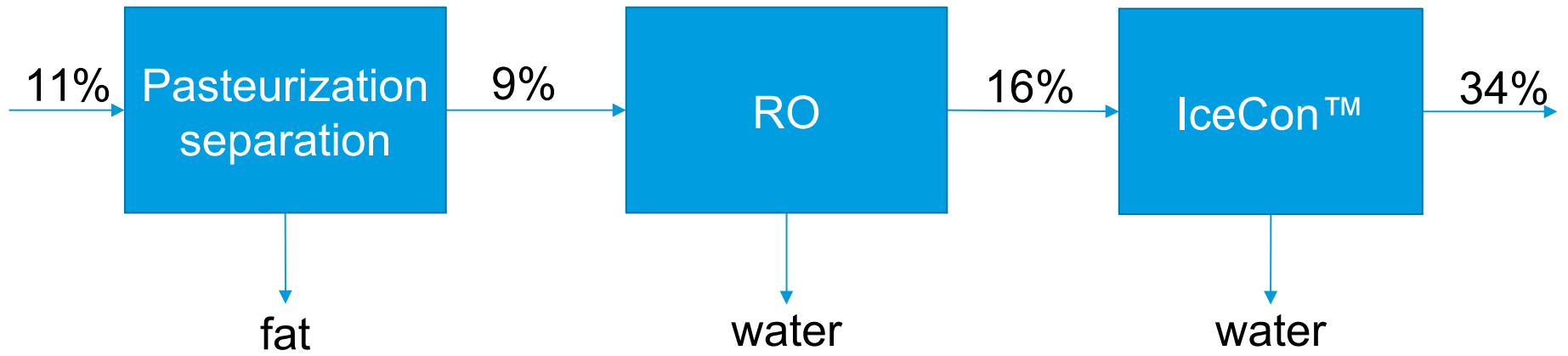


Others

- Whey proteins and lactose
- Milk powder
- Cheese making



Skimmed Milk Production Scheme



Example of an Industrial Project for Skimmed Milk



Current operation at a large dairy company in Asia:

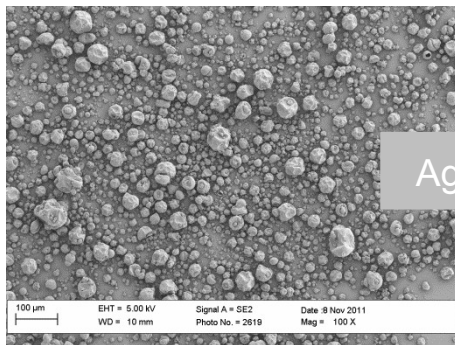
Concentration of **skimmed milk** by evaporation for transportation savings.

Evaporation will be replaced by freeze concentration because:

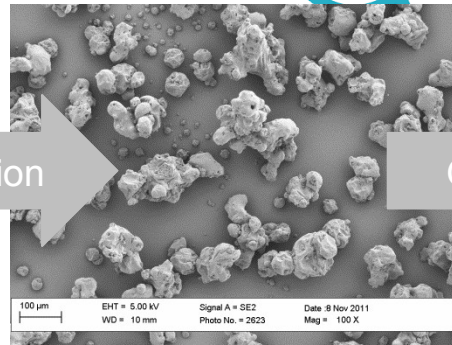
Operating cost proves to be lower due to:

- Favorable local electricity cost due to climate conditions
- Much lower CIP frequency saves on production time, CIP cost and effluent treatment
- Cost of ownership for evaporation and freeze concentration is similar

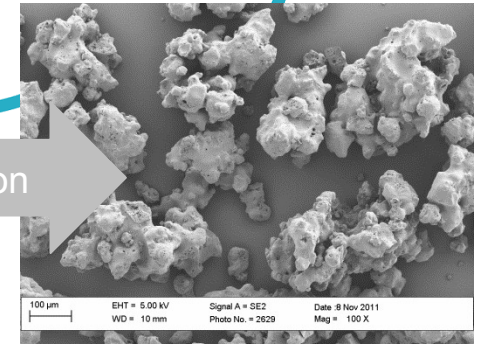
Quality retention is much better which gives better market opportunities.



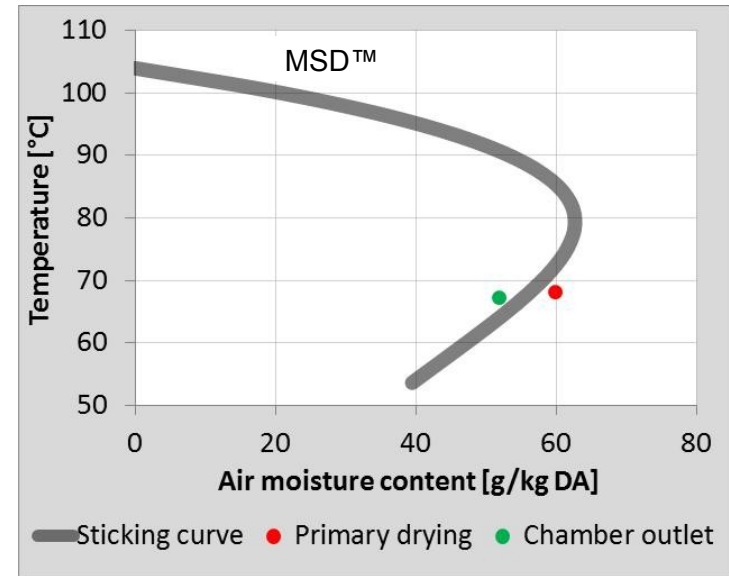
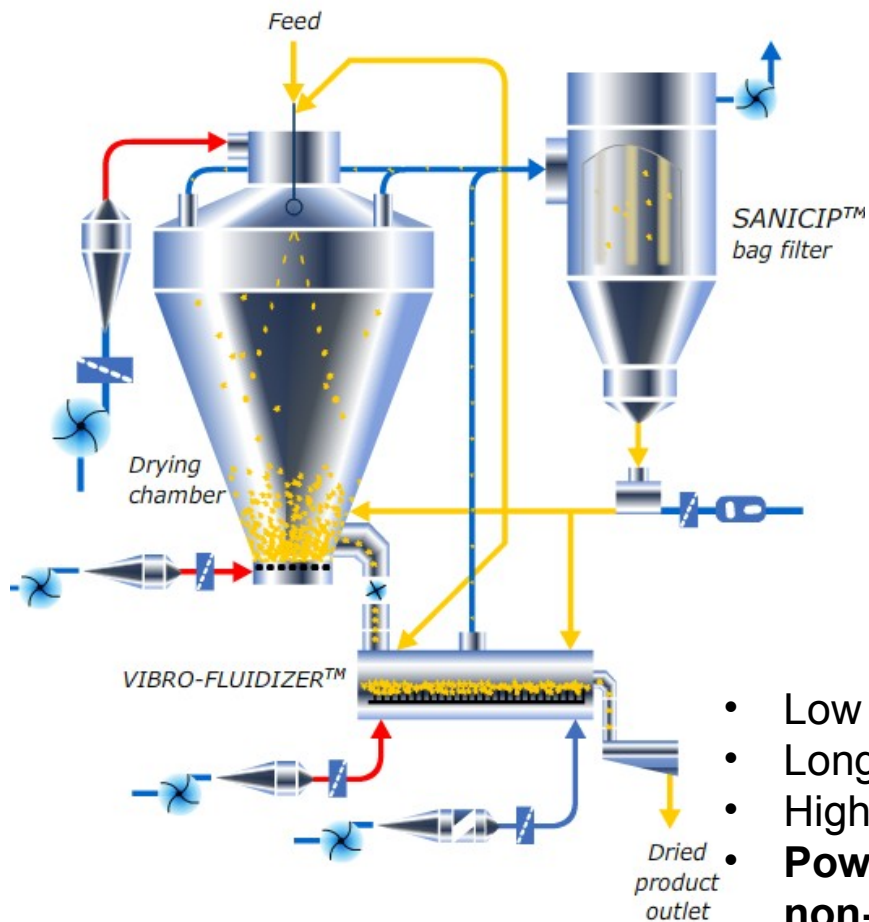
Agglomeration



Granulation

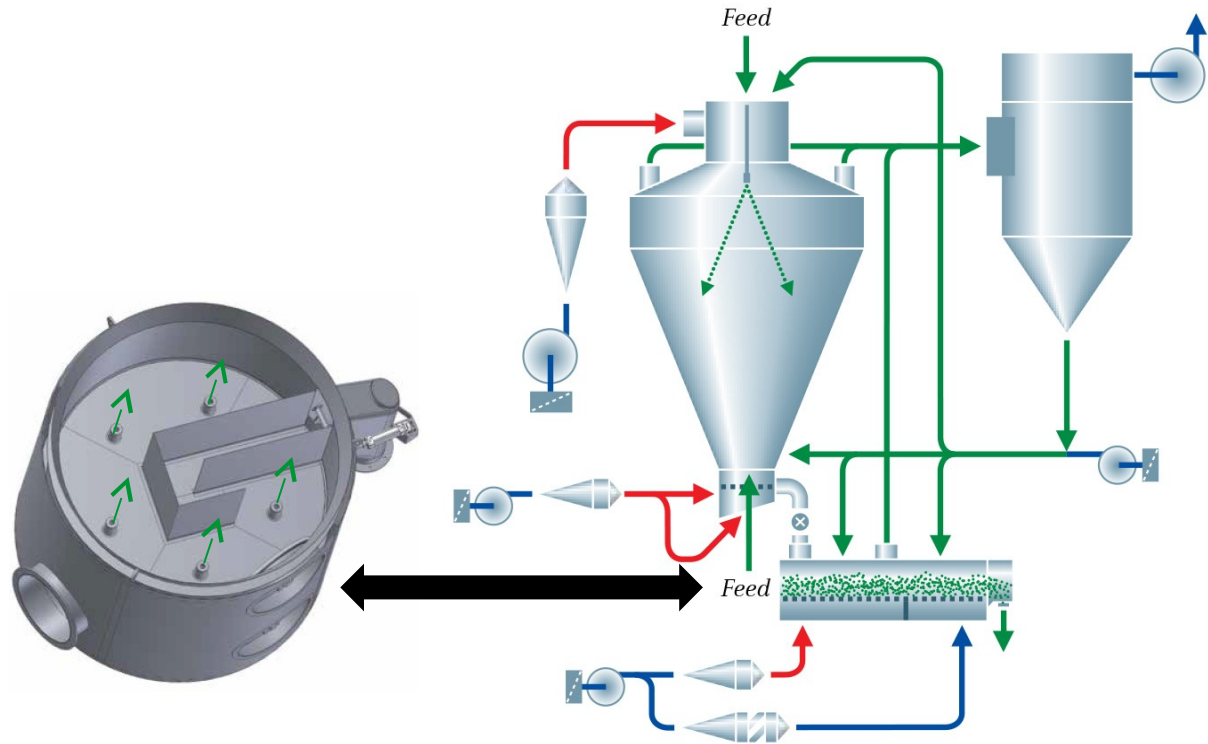


Multi-Stage Dryer (MSD™) for the Dairy Industry



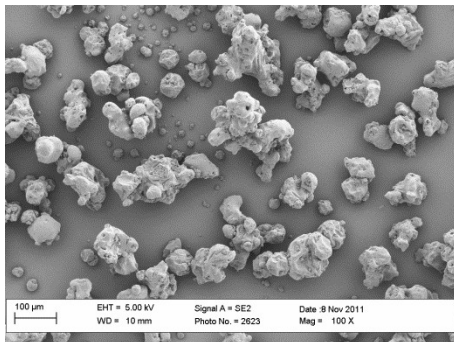
- Low outlet temperature
- Longer residence time
- Higher energy efficiency
- **Powder: Agglomerated, non-dusty, free flowing with improved solubility**





- Agrochemicals
- Vitamins
- Food
- Dairy

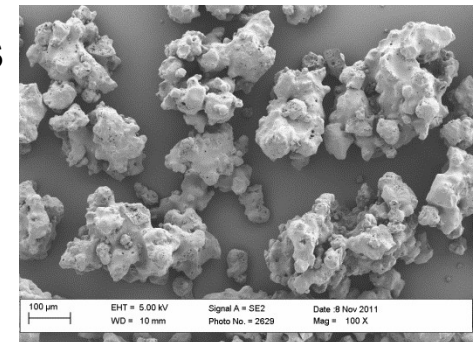
MSD™



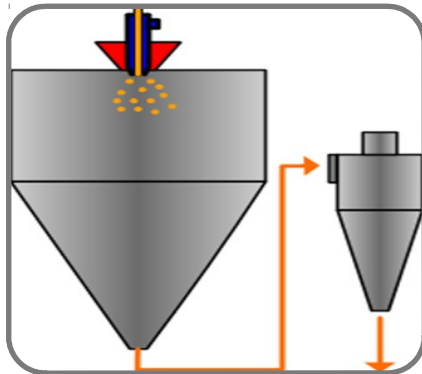
Larger and stronger particles



MSD-Granulator™

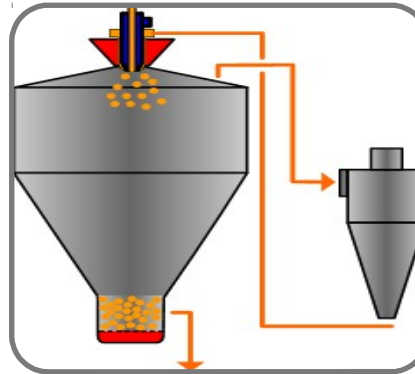


Product Property Comparison



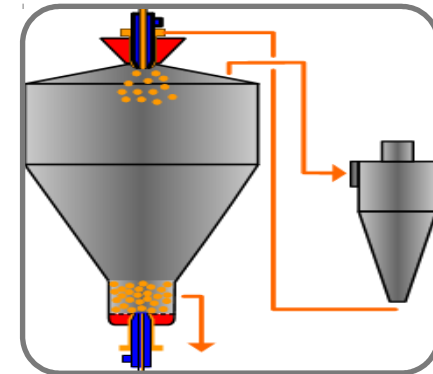
SD

High temperature
Small particle size
No-agglomerated
Dusty with many fine particles
Slowly dissolvable



MSD™

Low temperature
Larger particle sizes
Agglomerated
Non dusty
Free flowing
Good solubility

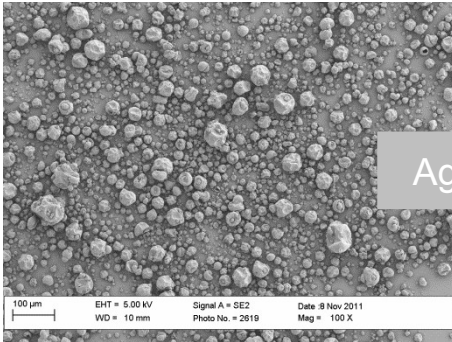


MSD-Granulator™

Low temperature
Very large particle sizes
Agglomerated/-Granulated
No dust
Free flowing
Good solubility
Combination of two different ingredients

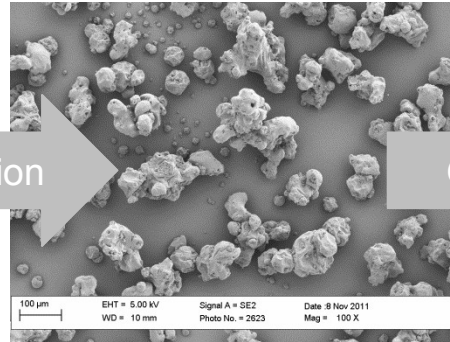
Particle Size Distribution Comparison

SD



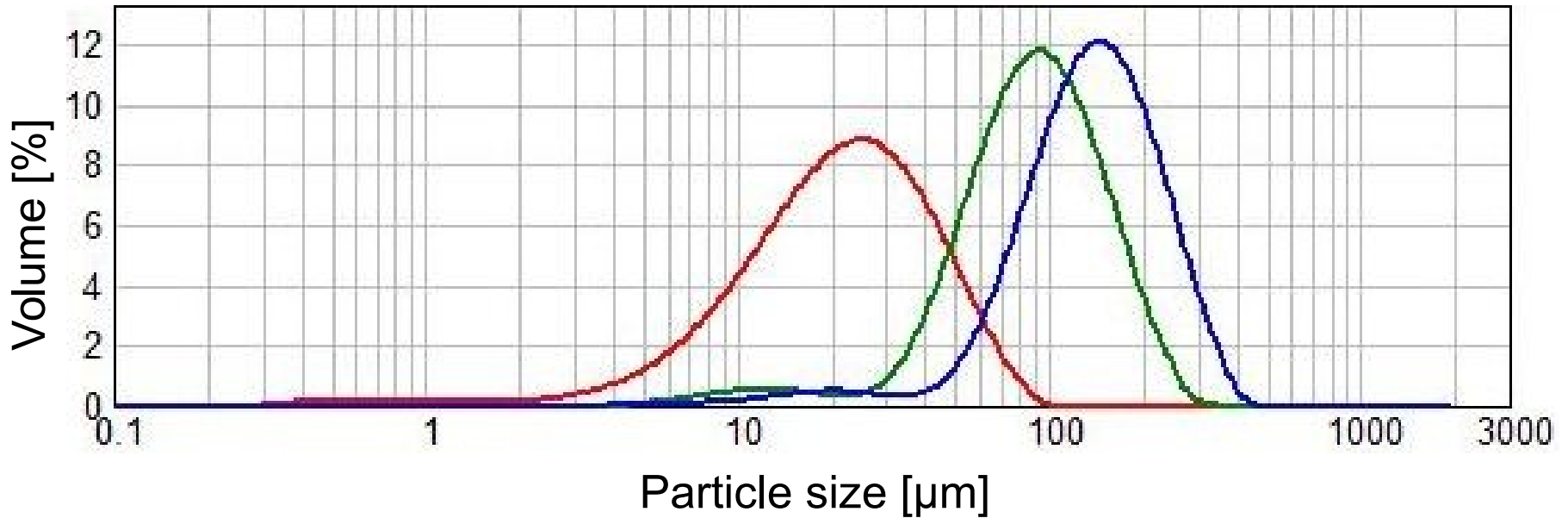
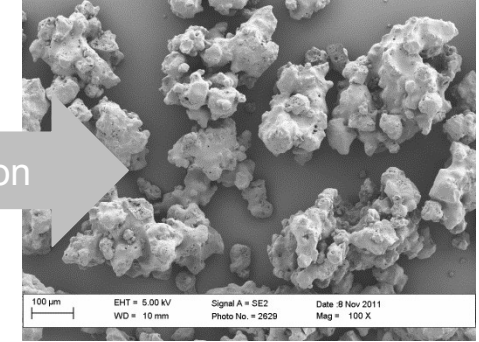
Agglomeration

MSD™



Granulation

MSD-Granulator™



The GEA logo is rendered in a bold, black, sans-serif font. A thick, black, curved line sweeps across the middle of the letters, starting from the left side of the 'G', passing through the 'E', and ending at the top of the 'A'. The logo is centered against a background of a blue-tinted world map with a radial light effect emanating from behind it.

GEA

engineering for a better world

www.gea.com