

## Microparticulation of Whey Proteins – Applications in Dairy

Berit Skindersoe  
Global Technology Sales Manager  
Membranes & Microparticulation

INOFOOD EXPO2011, Santiago - Chile

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

- Global Technology Sales Manager – Membrane & MP
- Year's with SPX – APV Brand – 4 years (Aug'07)
- Background:
  - EDUCATION
    - MSc. Dairy Science and Technology (KVL, Copenhagen) - 2002
    - BSc. Organisational Theory and Strategic Management – 2010
  - BUSINESS
    - Key Account Manager – Distributor for Pall Corporation
- Responsibilities
  - Membrane Technology Sales & Sales Support
  - Business & Market Development (TM, R&D, Marketing)
  - New Product Launching & Training



- What is Microparticulation?
- Benefits from using Whey Proteins
- Functionalities of Microparticulated Whey Proteins
- The Equipment
- SPX Leancreme™ Technology
- Applications of Leancreme™ – new idea's
- Contact Details

A large, stylized grey arrow graphic is positioned on the left side of the slide, pointing towards the right. It is composed of several overlapping, semi-transparent layers of the same arrow shape, creating a sense of depth and movement.

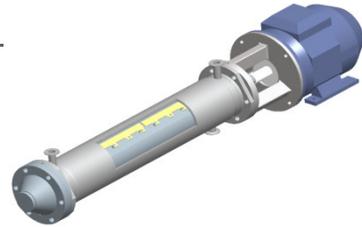
# What is Microparticulation?

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

# MP - Microparticulation



## Plant Picture



## Product Definition

Thermal and Mechanical Treatment to Denature Whey Proteins and create Ideal Particles similar to the size of fat globules in milk.

**Product Name:** The SPX Microparticulation unit, produces Leancreme™

**Principle:** High Heat Treatment combined with Controlled Shear Force

**Product:** Boosting functionality compared to traditional WPC: Water Binding, Emulsifier, Stabiliser

**Plant Sizes:** From 150 l/h to 3000 l/h

## Common Applications

- Cheese
- Fermented Milk Products & Milk Desserts
- Protein Enriched Drinks
- Dressings, Sauces and Mayonaise
- Icecream, Chocolate and Confectionary
- Nutraceuticals and Powder Ingrediens
- Bakery
- Meat

Feature	Benefit
Variable Shear Force	Superior accuracy in Particle Sizes & High reproducibility
Variable Holding Time	Optimal Degree of Denaturation (for feed)
Variable Temperature Setting	Optimal Degree of Denaturation (for feed)
Variable Feed	Essential for end product functionalities



## Improved Functional Properites

A large, stylized grey arrow graphic pointing to the right, composed of multiple overlapping layers of varying opacity, creating a sense of depth and movement.

# Benefits from using Whey Proteins

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

- Previously Whey = Waste product from cheese-production – Animal Feed, Disposals to rivers etc.
- Today Whey Proteins are valorized due to superior functional & nutritional properties
- Growing market for healthy protein-boosed products
- Increased demand for functionalized foods especially for; malnourished Children, Elderly and Hospitalized people
- With Leancreme™ you can tailor-make products for specific customer segments

A large, stylized 'X' graphic is positioned on the left side of the slide. It is composed of multiple overlapping, semi-transparent grey layers that create a sense of depth and movement, pointing towards the right.

# Functionalities of Microparticulated Whey Proteins

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

- Product Characteristics:
  - Creamy mouth feel and viscosity and colour like coffee cream
  - From Lactic whey: Flavour and viscosity like buttermilk
  - Protein particles identical to the size of fat globules in milk (5  $\mu$ )
- Functional properties in dairy and food products:
  - Creamy mouth feel particularly in low-fat products
  - Water-binding, improved texture and viscosity
  - Excellent emulsification properties
  - Soft consistency and excellent foaming/whipping stability
  - Superior gelation capabilities
  - High nutritional value
- Pure dairy based ingredient designed for various functions



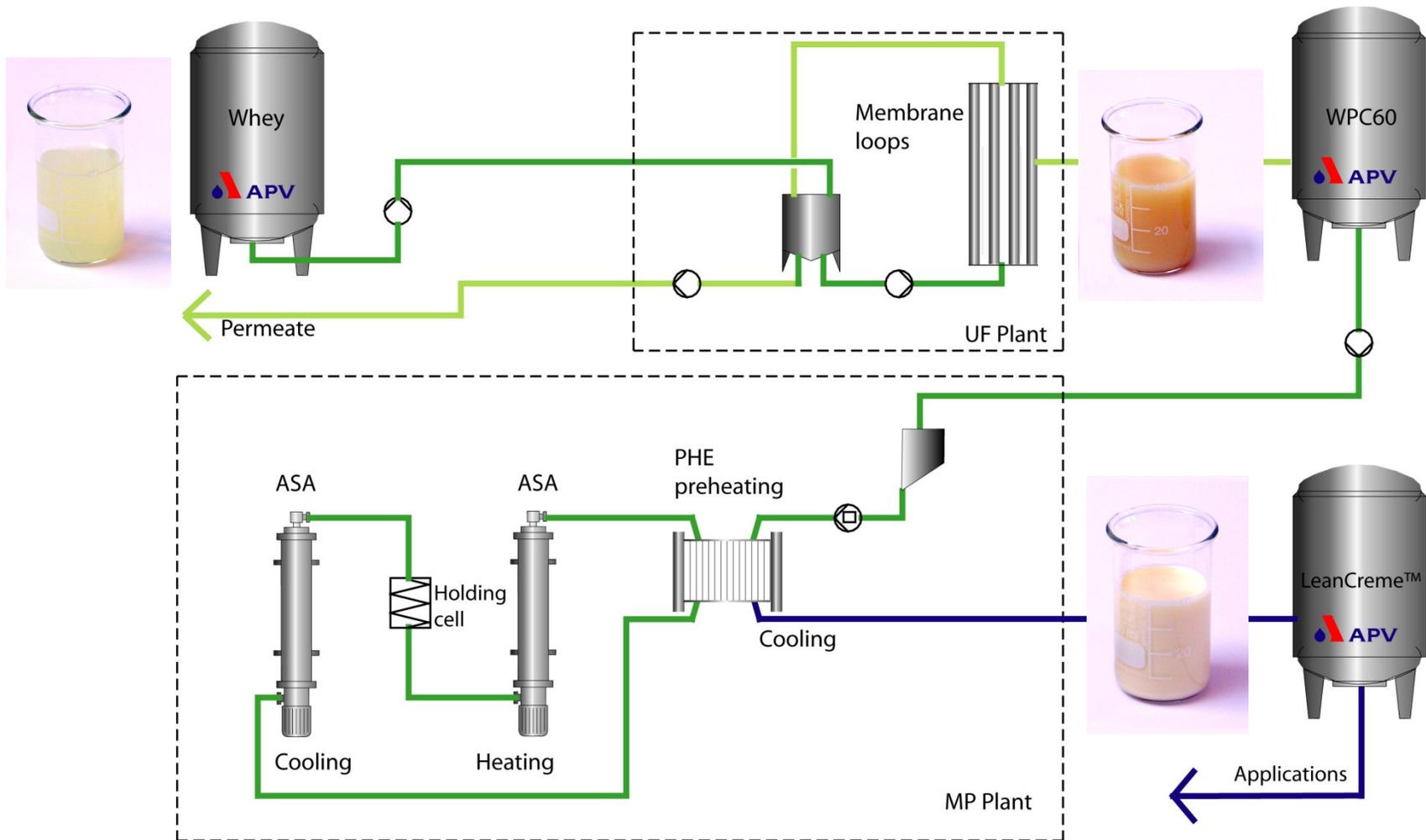
A large, stylized grey arrow graphic is positioned on the left side of the slide, pointing towards the right. It is composed of several overlapping, semi-transparent layers of the same arrow shape, creating a sense of depth and movement.

# The Equipment

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

# The LeanCreme™ process line

- from whey to LeanCreme™



A large, stylized arrow graphic is positioned on the left side of the slide, pointing towards the right. It is composed of several overlapping, semi-transparent grey shapes that create a sense of depth and movement.

# SPX LeanCreme™ Technology

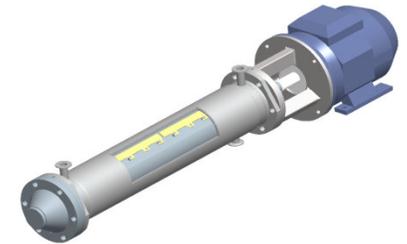
GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS

# Microparticulation of whey

- the traditional process versus the new innovative SPX solution



- The old process – a two-step solution:
  - Thermal treatment in PHE or THE to denature the protein
  - Mechanical treatment in a homogeniser or a stir mixer to particulate the protein aggregates
- The new SPX process – a combined one-step solution
  - Thermal treatment in PHE and ASA at controlled high
  - shear force
- Advantages of the new SPX LeanCreme™ solution:
  - Highly accurate particle size distribution and variable particle sizes
  - Excellent **particle structure** and **functional properties** of the LeanCreme™



**The APV Shear Agglomerator (ASA)  
makes the difference**

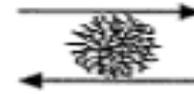


## Traditional process in two steps

**Step 1 – thermal denaturation and protein aggregation**

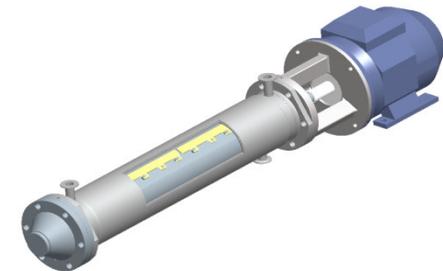


**Step 2 – microparticulation of the protein aggregates**



## New SPX solution in one step

**Thermal denaturation and microparticulation in one step**



The APV Shear Agglomerator (ASA) makes the difference

# Benefits of the process

- a superior system and technology



- The innovative SPX Shear Agglomerator (SSHE) and process parameters ensure:
  - Superior accuracy in particle size distribution
  - High reproducibility of particle size distribution
  - Possibility to vary the particle size
  - Optimal degree of denaturation
  - Long running time between CIP
  - MP plants from 500 l/h to 3000 l/h
  - Proven system and process technology

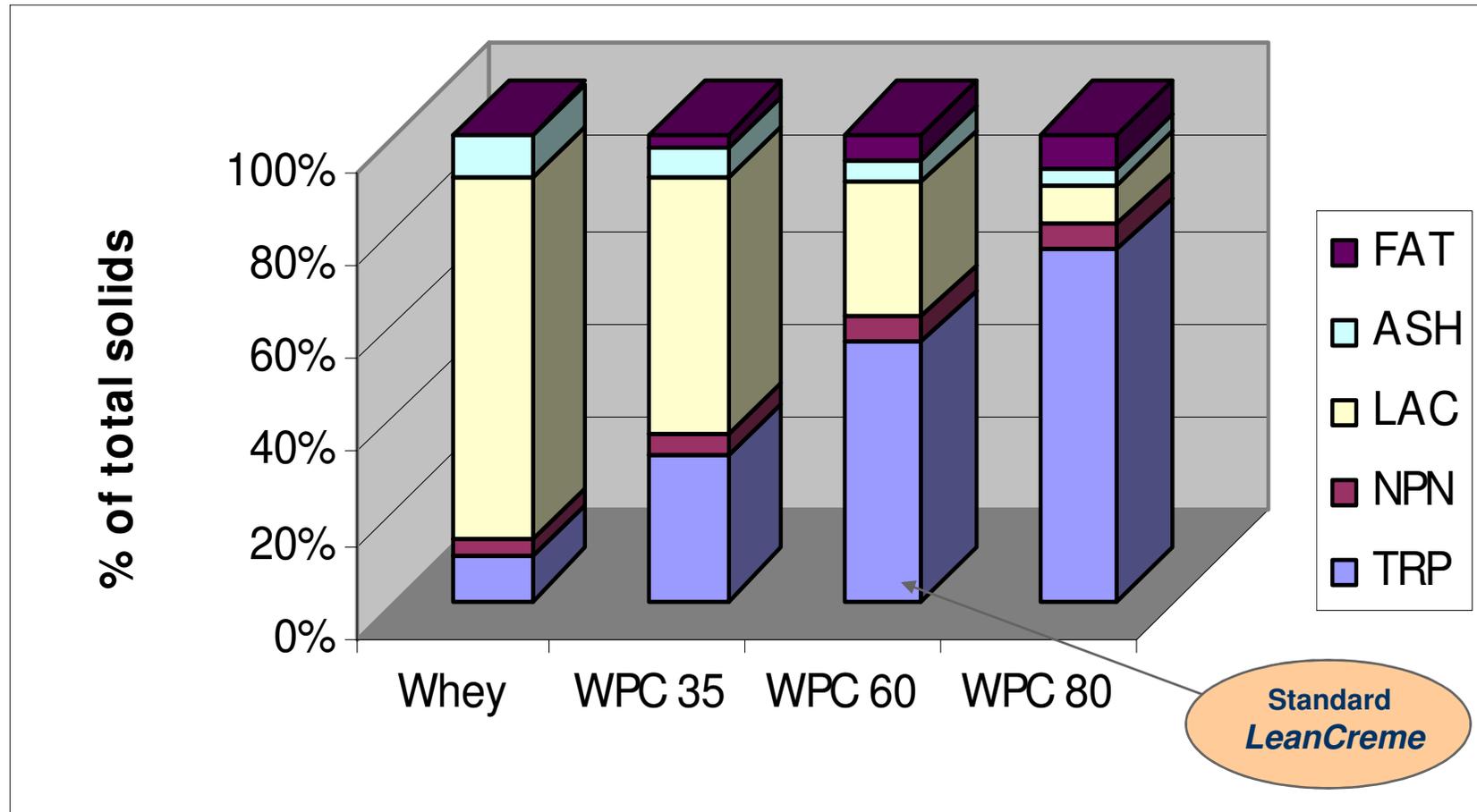


**The APV Shear Agglomerator (ASA)  
makes the difference**



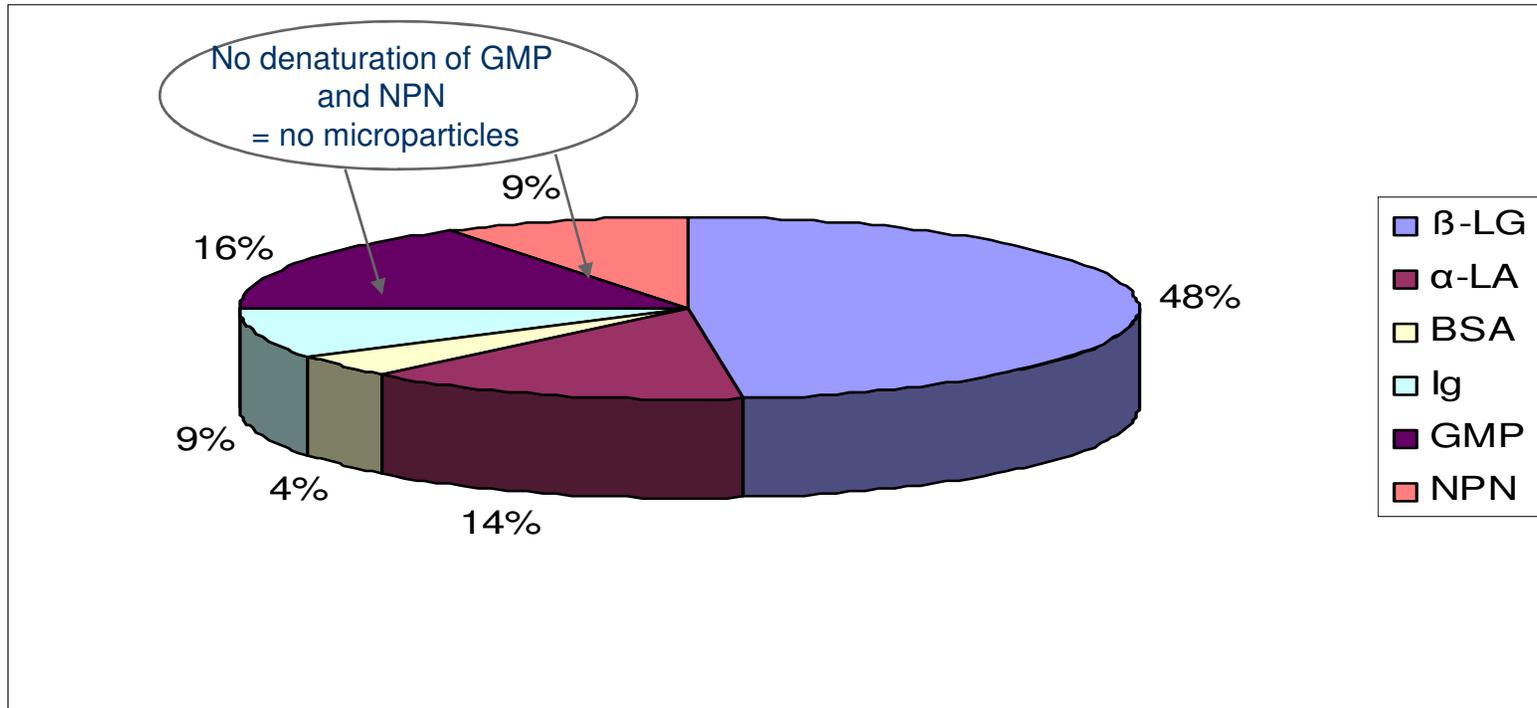
# UF of cheese whey

- various WPC composition



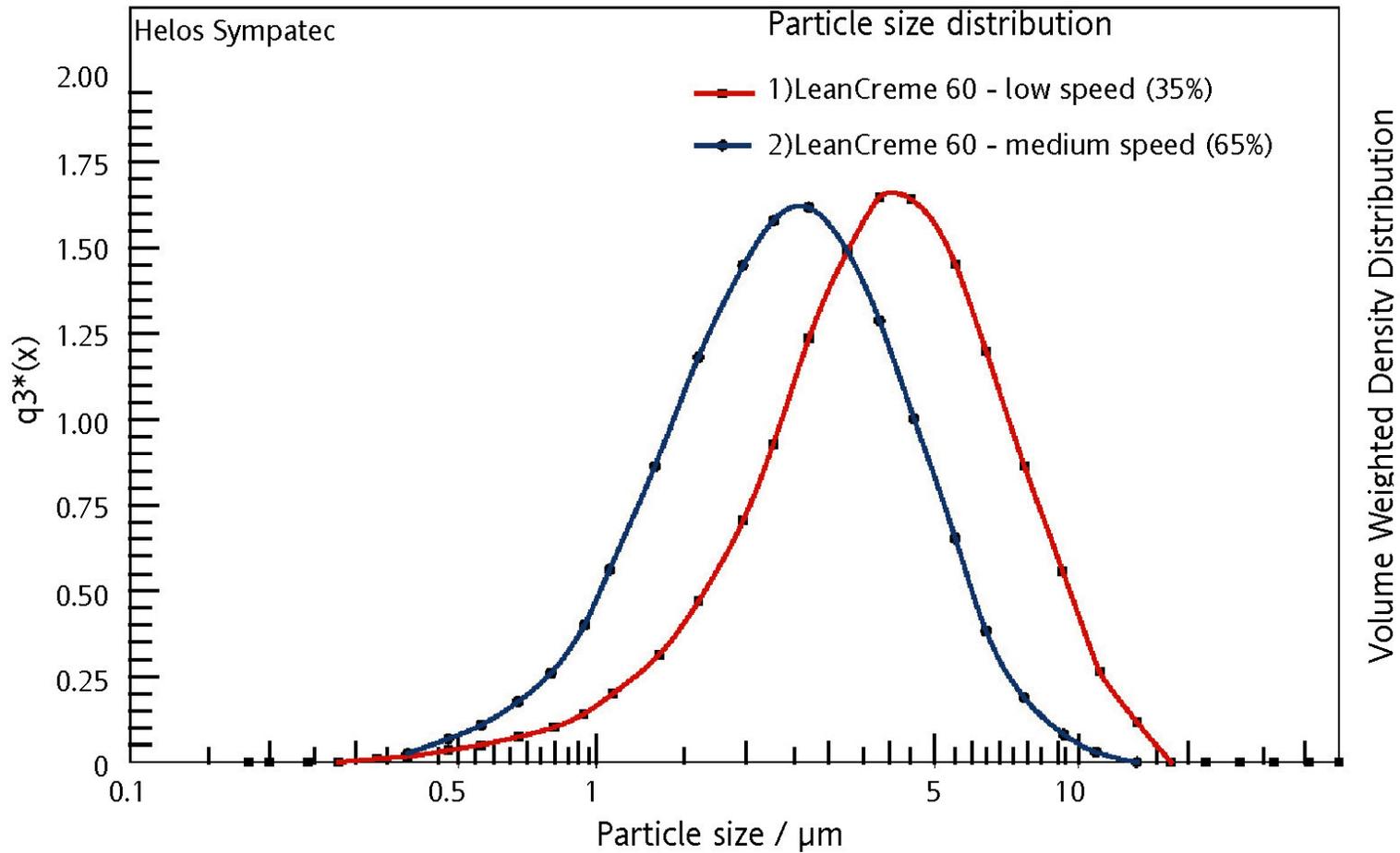
# Which whey proteins will form microparticles?

- Whey protein distribution in WPC 60



Maximum 75% of whey proteins will form microparticles

# Excellent distribution of particle size

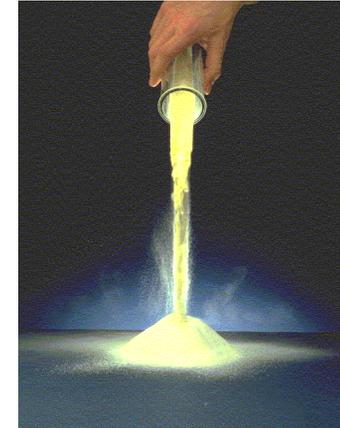


# Raw materials for LeanCreme™

- liquid or powder based



- Based on sweet whey
  - WPC 28-35-50-60-70-80
- Based on lactic acid whey
  - WPC 28-35-50-60-70-80
- Based on HCl acid casein whey
- Based on reconstituted WPC powders ...
  - High-quality powder > low denaturation, high solubility and excellent hydration
- For high TS LeanCreme™ (for powder ingredients)
  - WPC can be evaporated prior to the LeanCreme™ process
  - High TS WPC types can be made by RO of whey prior to UF
- WPC can be mixed with cream prior to the LeanCreme™ process
- Sweet WPC can be fermented prior to the LeanCreme™ process



A large, stylized arrow graphic on the left side of the slide, pointing to the right. It is composed of several overlapping, semi-transparent grey shapes that create a sense of depth and movement.

# Applications of LeanCreme™

- new idea's

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS



## Cheese Types where Leancreme™ is used

- Semi Hard Cheeses; Gouda, Edam & Swiss Types
- Soft Cheeses; Camembert & Brie Types
- Cheddar's
- Mozzarella & Pizza Types Cheeses
- Feta & Queso Fresco
- Cottage Cheese (incl. cream dressing)
- Processed Cheeses
- Fresh Cheeses; Cream Cheese, Quark, Petit Suisse etc.
- Ricotta & Mascarpone

## Benefits of LeanCreme™ in Cheese Production

- Production of cheeses with 5 – 45 % fat in TS with increased yield partly from replacement of casein in the cheese by LeanCreme™, but also from the increase of water content in the cheese
- Improved creamy taste and texture in low fat cheese
- Easier to cut and handle in prepress and moulds - Important for low fat cheese
- Cheese meltability maintained – Pizza-cheeses
- Proven Recovery of > 80% of Leancreme™ in the cheese curd
- Increased yield of 6-10 %
- Premium price due to excellent quality
- A payback time of less than one year





## Benefits of Leancreme™ in Drinks

- Easy “on-the-go” access to protein sources
- Ideal Products for; the gym, travels etc.
- Natural Stabilized Product
- High Viscosity
- Perfect for any WPC source
- Drinks based on 100% WPC60 Leancreme™
- Drinks based on Joghurt or Milk Base + WPC35 Leancreme™
- High Product Stability during shelf time
- Long Shelf Life Product – UHT

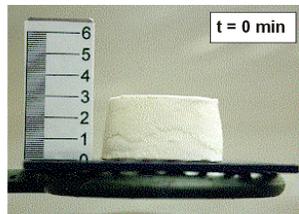
## Benefits of Leancreme™ in Drinking Milk

- Improved Whiteness of low fat milks
- Improved mouthfeel, especially for low fat milks
- Excellent opportunity for long shelf life with Microfiltration or UHT
- Excellent opportunity for Innovative Drinking Products
- Perfect for usages of Leancreme™ Powder

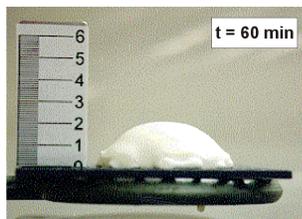


## Benefits of Leancreme™ in Joghurts

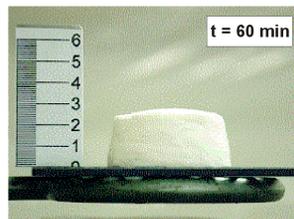
- Replace part's of skim milk and milk fat with whey proteins
- Ideal Application for usage of Leancreme™ Lactic
- Joghurt's with no concentration of skim milk
- Joghurt's with no addition of skim milk powder's
- Low fat Joghurt's with rich and creamy mouthfeel
- Reduce amount of stabilizer's added
- Simulate a 3,5% fullfat Joghurt with 0,3% fat
- Increased content of essential amino acids in the Joghurt → healthier products



Ausgangszustand



Einsatz von Molkenpulver



Einsatz von Molkenproteinaggregaten

## Benefits of Leancreme™ in Icecreme's

- LeanCreme less expensive than skim milk concentrate
- Low fat product of high quality
- More healthy ice cream, lower fat%, far more essential amino acids
- LeanCreme suitable for all types of ice cream.
- Possible to make ice cream with lower TS level
- Melting down is delayed
- Less stabilisers necessary



- Dressings
- Sauces and Mayonaises
- Chocolate and Confectionary
- Nutraceuticals and Powder Ingrediens
- Bakery Products
- Meat
- Etc. Etc.

- Superior accuracy in particle size distribution and high reproducibility
- Flexible particle sizes > Tailor made LeanCreme for different products
  - Examples: Yoghurt and Ice cream 1 to 2 micron and 5 micron for cheeses
- Recovery of LeanCreme in cheese is 80 - 82 % - Unmatched yield
- Optimal degree of denaturation > high recovery degree and functionality
- Unmatched plant performance with 6 to 8 hours between CIP > short down time
- Extra yield of 6 % and up to more than 10 % in low fat cheese
- Excellent texture and taste in low fat and full fat cheese after maturation
- Excellent meltability
- Unmatched customer satisfaction > Reference visit to confirm
- Unmatched reference list > 21 commercial plants and 7 MP pilot plants

A large, stylized grey arrow graphic is positioned on the left side of the slide, pointing towards the right. It is composed of several overlapping, semi-transparent layers of the same arrow shape, creating a sense of depth and movement.

# Contact Details

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS



- HOME
- ABOUT US
- BRANDS
- PRODUCTS
- INDUSTRIES
- NEWS AND EVENTS
- DOWNLOADS
- CONTACT US
- CAREERS@

## SPX Flow Technology

### Driven by Innovation

A global leader in the food & beverage, energy, and industrial markets worldwide, SPX Flow Technology helps customers improve the performance and profitability of their manufacturing operations and processes with solutions enriched by in-depth application expertise and a finely meshed customer service and spare parts network.

### Key Markets

SPX Flow Technology serves a wide range of industries, including food, dairy, beverage; biotechnology, pharmaceutical and personal care; HVAC; power generation, oil and gas and compressed air. From engineered components like pumps, valves, heat exchangers and dryers to complete packaged systems, our products feature uncompromising design and quality, while offering long service life, production efficiency and cost-effective performance.

### Customer Focused



Visit us at; [www.spxft.com](http://www.spxft.com)

# SPX Membrane Filtration

- Dairy Technology Specialists



- Dedicated team of specialists in innovation, engineering, sales and service
- 3 decades > 1200 references
- Strong Know-how platform build up
- Pioneers in innovative Dairy applications and Engineering solutions
- Test Centers and Pilot plant service
- Excellent customer service
- World wide experts and local contacts





Thank You for Your Attention!



Any Questions??