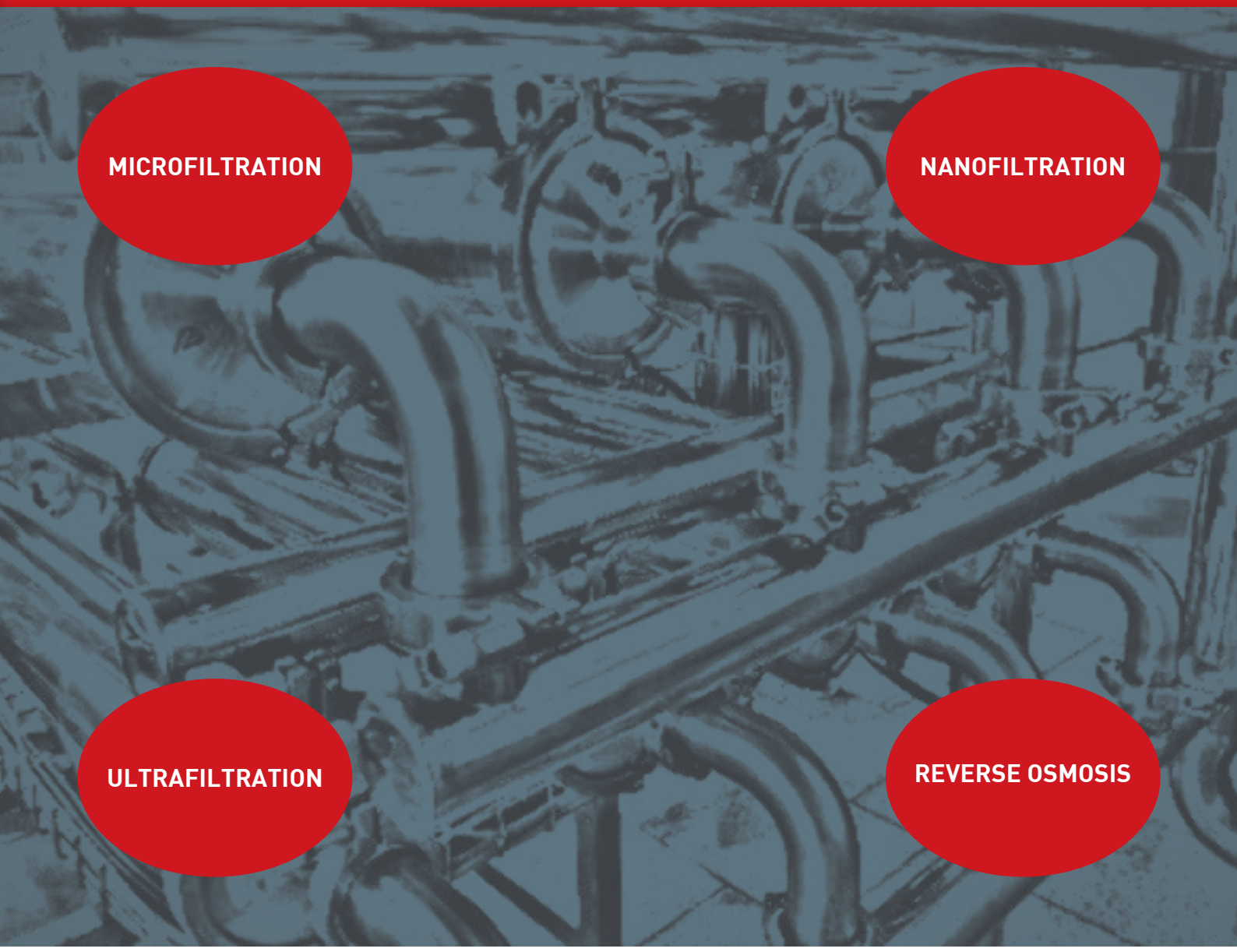
KROMTECH MAKiNA SAN. ve TiC. A.Ş

TECHNICAL SEPARATION SYSTEMS

INNOVATIVE THINKING

MEMBRANE FILTRATION SYSTEMS



ULTRAFILTRATION

The Spiral Wound UF Membrane System (SW)

Ultrafiltration (UF) is a well proven technology offering a wide range of opportunities for modern dairy processing.

The spiral wound (SW) system is characterized by:

- Low plant investment
- Low space requirements
- Easy membrane change
- Optimal for low to medium viscosity products

The SW membrane element has a unique design where a large membrane area is wound into a compact element.

SW elements are available with:

- Various diameter (3.8-8 inches)
- Various lengths (38-40 inches)
- Various feed spacers (20-130 mil)
- Special design for high pH/high temperature CIP
- Membranes with various MW cut-off (1,000 – 100,000 Da)

The membrane elements are fitted into stainless steel housing to form a module, and a number of modules are built into a plant.

Based on proven, modular components, each plant is customized to fit the individual application. Further, the plant design allows for access to maintenance of all vital parts as well as for future cost effective plant modifications.

UF plants with SW membrane elements can be supplied with any type of process automation ranging from a simple, manual to a fully automatic system, integrated in the overall factory control system.

Typical applications:
-Whey protein concentrate (WPC)
-Whey protein isolate (WPI)
-Milk protein concentrate (MPC)
-Milk protein isolate (MPI)
-Yoghurt
-Cheese: Feta, Domiati, Queso Fresco etc.

Advantages
- Better yield (Whey proteins in the cheese)
- Continuous process
- Closed system (Good bacteriological control)
- Easy to control parameters and composition
- New cheese types easy obtainable
- High nutritional value (Whey proteins)
- Savings in rennet

Disadvantages
The presence of whey proteins results in;
- Slower ripening
- Poor meltability
- Generally softer consistency
- Difficult to obtain controlled eye-formation

PLATE&FRAME SYSTEM M37

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The Plate & Frame Membrane System (P&F)

The plate & frame system has been available for many years in various configurations. The system has been undergoing constant development resulting in improved efficiency and reduced operating costs.

Today, virtually all low viscosity applications are performed on spiral wound membranes, but for a number of high viscosity applications, the plate & frame system still offers the optimal solution both from a technical and economical point of view.

The Plate & Frame system has the following characteristics:

- Handles high viscosity products
- Highly defined flow dynamics
- High temperature resistance
- Possibility of isolation of individual membranes
- High configuration versatility

The robustness of the system and the ability to handle high pressure drops allows handling of high viscosity products without risk of membrane blocking and subsequent need for membrane replacement.

The versatility of the plate & frame system offers numerous possibilities for tailoring the system configuration to each individual application.

Typical Applications;

- Quark
- Cream Cheese
- Labne, Laban
- Soft Cheese
- Strained Yoghurt
- Baker's Cheese, (Mascarpone etc...)

Fermented Cheese Types UF Process Advantages

- Possible to produce all products on the same plant independent of fat content
- Continuous, simple and more flexible process compared to separator process
- Less sensitive to pH variations
- More homogeneous and “spreadable” product
- Higher yield - whey proteins are retained in the product
- Easy to extend UF plant

NANOFILTRATION

Nanofiltration with SW Membrane System

Nanofiltration offer a range of possibilities for concentration and demineralization of different dairy products.
- A bit more open than RO
- Allows monovalent ions to pass
- Rejects divalent and larger ions and most organic components
- MgSO4 rejection → 97%
- Typical operating pressure 5–35 bar

The spiral wound (SW) system is characterized by:

- Low plant investment
- Low space requirements
- Easy membrane change
- Sanitary design

The SW membrane is a unique design, where a large membrane area is wound into a compact element.

SW elements are available with:

- Various diameters (3.8-8 inches)
- Various lengths (38-40 inches)
- Various feed spacers (20-50 mil)
- Special design for high pH/high temperature CIP
- Various salt rejection (NF) and lactose rejection (NF)

A number of membrane elements are fitted into a stainless steel housing to form a module, and a number of modules are built into a plant.

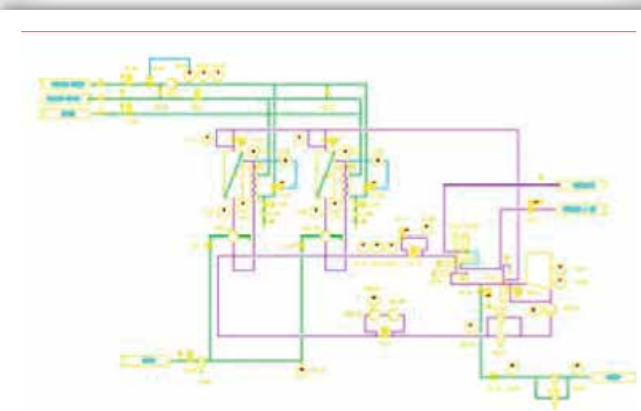
Based on proven, modular components, each plant is customized to fit the individual application. Further, the plant design allows for access to maintenance of all vital parts as well as for future cost effective plant modifications.

NF plants with SW membrane elements can be supplied with any type of process automation ranging from a simple, manual to a fully automatic system, integrated in the overall factory control system.

The optimal membrane should be selected for each process.

WHEY
NF concentration up to 20-26% TS desalination approx. 35%

PERMEATE
NF concentration up to 20-22% TS desalination approx. 35%



The optimal membrane should be selected for each process

Typical Apllications;
- Concentration of milk, whey and UF permeate
- Demineralization of milk, whey and UF permeate
- Recovery of product residues and pure water from mixed product/water streams

REVERSE OSMOSIS

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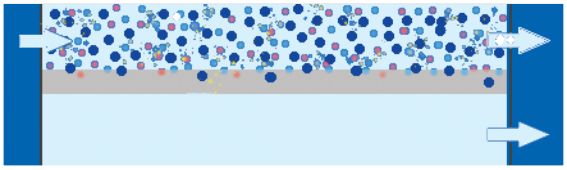
Reverse Osmosis (RO) with Spiral Wound Membrane System (SW)

Reverse Osmosis offer a range of possibilities for concentration and demineralization of different dairy products.

- Only water will pass
- Concentration of liquids with low molecular compounds at low solid levels
- NaCl rejection → 95–96%
- In general operating pressure 15–60 bar



The spiral wound (SW) system is characterized by:

- Low plant investment
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- Easy membrane change
- Sanitary design

The SW membrane is a unique design, where a large membrane area is wound into a compact element.

SW elements are available with:

- Various diameters (3.8-8 inches)
- Various lengths (38-40 inches)
- Various feed spacers (20-50 mil)
- Special design for high pH/high temperature CIP
- Various salt rejection (RO) and lactose rejection (RO)

A number of membrane elements are fitted into a stainless steel housing to form a module, and a number of modules are built into a plant.

Based on proven, modular components, each plant is customized to fit the individual application. Further, the plant design allows for access to maintenance of all vital parts as well as for future cost effective plant modifications.

RO plants with SW membrane elements can be supplied with any type of process automation ranging from a simple, manual to a fully automatic system, integrated in the overall factory control system.

The optimal membrane should be selected for each process.

WHEY
RO concentration up to 20-26% TS desalination approx. 35%

PERMEATE
RO concentration up to 20-22% TS desalination approx. 35%

The optimal membrane should be selected for each process

Typical Apllications;
- Concentration of milk, whey and UF permeate
- Yogurt production (Alternative of Evaporator)
- Recovery of product residues and pure water from mixed product/water streams

MICROFILTRATION

CHEESE BRINE

It has always been hard to use brine in milk industry. High level of salt in it and its way of use open to contamination lead the factors that affect the end product. Today, we use brine by separating it from its bacteria by plate heat exchangers. However, this use does not prevent other risks.

Bacteria, spores, little microorganisms, pathogenic bacteria and small visible and invisible granules increase the risk of contamination when they contact the product.

We present you the Microfiltration system that is a new technology that can increase your profitability and decrease the brine problem. This technology allows you to have hygienic and pure brine by filtration of all materials that physically generate contamination such as undesired bacteria, dead cells in brine. While doing all these processes, it does not harm compounds of brine in it and increases its quality. This system can easily be coupled to the current brine system. It provides direct positive effect to the products produced and to your firm.

Use of Polymeric MF membrane technologies in terms of brine hygiene increases its importance and it shall be more important in near future. The highest level of bacteriologic quality without changing the structure of brine is provided by this system.

Consequently, with the TSS Brine Microfiltration System;

- High quality cheese is provided.
- It directly affects the external view of cheese.
- It increases appetite of cheese to the maximum level.
- It provides losses arising out of quality disorders.
- Bacteria are separated from brine with the rate of 99% and small particles do so with the rate 99,5%.

REASONS OF INVESTMENT and OTHER BENEFITS

- There is no plate exchanges and corrosion
- Long-life system
- No pH change
- No additives
- CIP can be made
- Easy process and flexible process method
- Low investment cost

Cheese Brine
- Removal of bacteria, spores, yeast, mould, and other impurities

Brine for Dough & Ayran
- Removal of bacteria, spores, yeast, mould, and other impuritie

ADVANTAGES
- Minimum water and salt loss
- Clean and bright brine
- No calcium phosphate solution
- No protein denaturation
- No undesired enzymatic activity.
- Separation from bacteria with the rate of 99% and from yeast and particles with the rate of 99,5%
- Maximum cleaning of small particles

MEMBRANE FILTRATION SYSTEM APPLICATIONS

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Milk Filtration P

Microfiltration	Ultrafiltration	RO or NF of milk
• Bacteria removal • Fat separation for MPI 90+ % • Protein fractionation • Casein concentration	• Protein standardization • MPC 50 • MPC 65 • MPC 70 • MPC 80 (diafiltration 30-75 %) • MPC 85 (diafiltration. 100+ %) • MPI 90+	• RO concentration up to 18-22 % TS (21 bar) • Or up 30-32 % TS (35 bar) • NF concentration up to 20-24 % SNF with some desalination

Whey Filtration Possibiliti

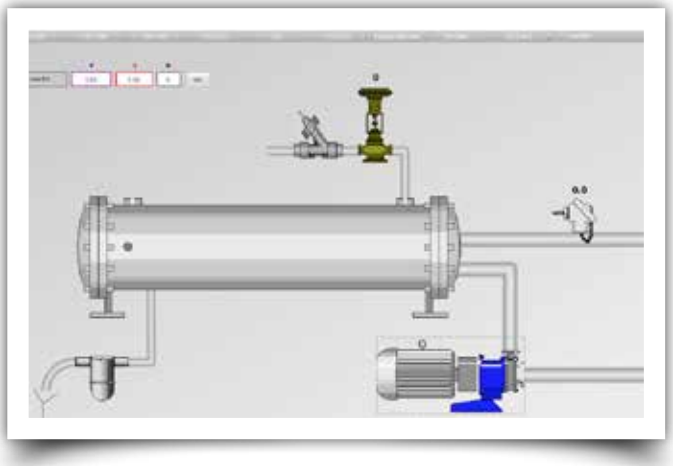
Microfiltration	Ultrafiltration	RO or NF of whey	RO or NF of permeate
• Bacteria removal • Fat separation for WPI 90+ % • Protein fractionation	• WPC 35 (8-10 % TS) • WPC 50-75 (15-25 % TS) • WPC 80-84 (diafiltration 25-30 % TS) • WPI 90+ (diafiltration 25-30 % TS)	• RO concentration up to 18-20 % TS • NF concentra-tion up to 20-26 % TS desalination approx. 35 %	• RO concentration up to 18-20 % TS • NF concentration up to 20-26 % TS desalination approx. 35 %.
Sweet or acid whey	**Sweet or acid whey**	**Sweet or acid whey**	**Sweet or acid Whey**

Applications

Milk	Whey	Permeate	Other
• Pre-concentration • Concentration • Protein standardisation • Casein standardisation • MPC, MPI • Feta, white cheeses • Quark, cream cheese types	• Preconcentration • Concentration • Demineralisation • WPC, WPI	• Pre-concentration (UF permeate) • Concentration (UF permeate) • Demineralisation (UF permeate) • Polishing (RO, NF permeate	• Water and product recovery • Milk Recovery • Cheese brine purification • Condensate polishing

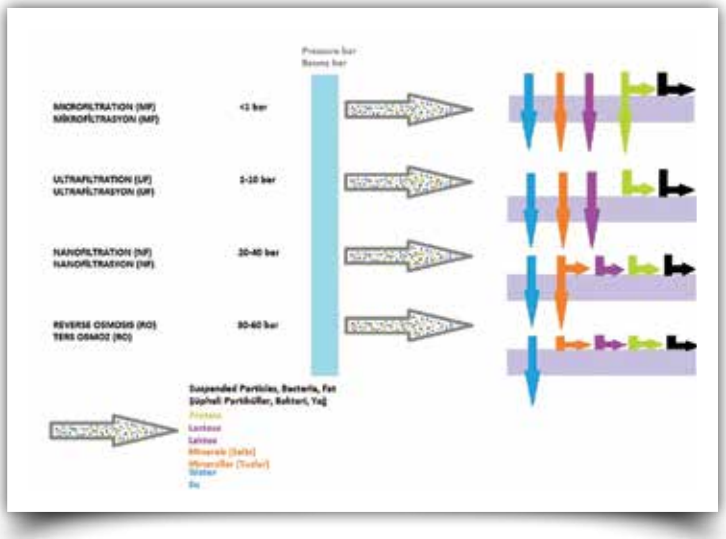
AUTOMATION

TSS Automation customized software designed based on your production needs. TSS uses experimented materials and components for high efficiency. All equipments have better and proven quality in their segment. Our Membrane Filtration Systems, Heat Exchangers, CIP Units, automation and installation materials offer best solutions for all process stages and serve perfect and reliable solution you need.



The Main Expertise of TSS supplying Membrane Filtration Plants

- RO plants for Dairy industry (i.e. for milk/whey concentration, white water recovery)
- NF plants for Dairy industry (i.e. for milk/whey demineralization, CIP recovery)
- SW Ultrafiltration plants for Dairy industry (i.e. for milk/whey concentration)
- P&F UF plants for all types of soft cheese production (i.e. Cream cheese, Labne, Quark, Laban etc.)



Put our services to the test,
contact us for a free consultation today.

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