

Dairy Solutions

Integrated Separation Technologies
for Milk, Whey and Cheese Processing



 **KOVALUS**
Separation Solutions™

The KSS Advantage

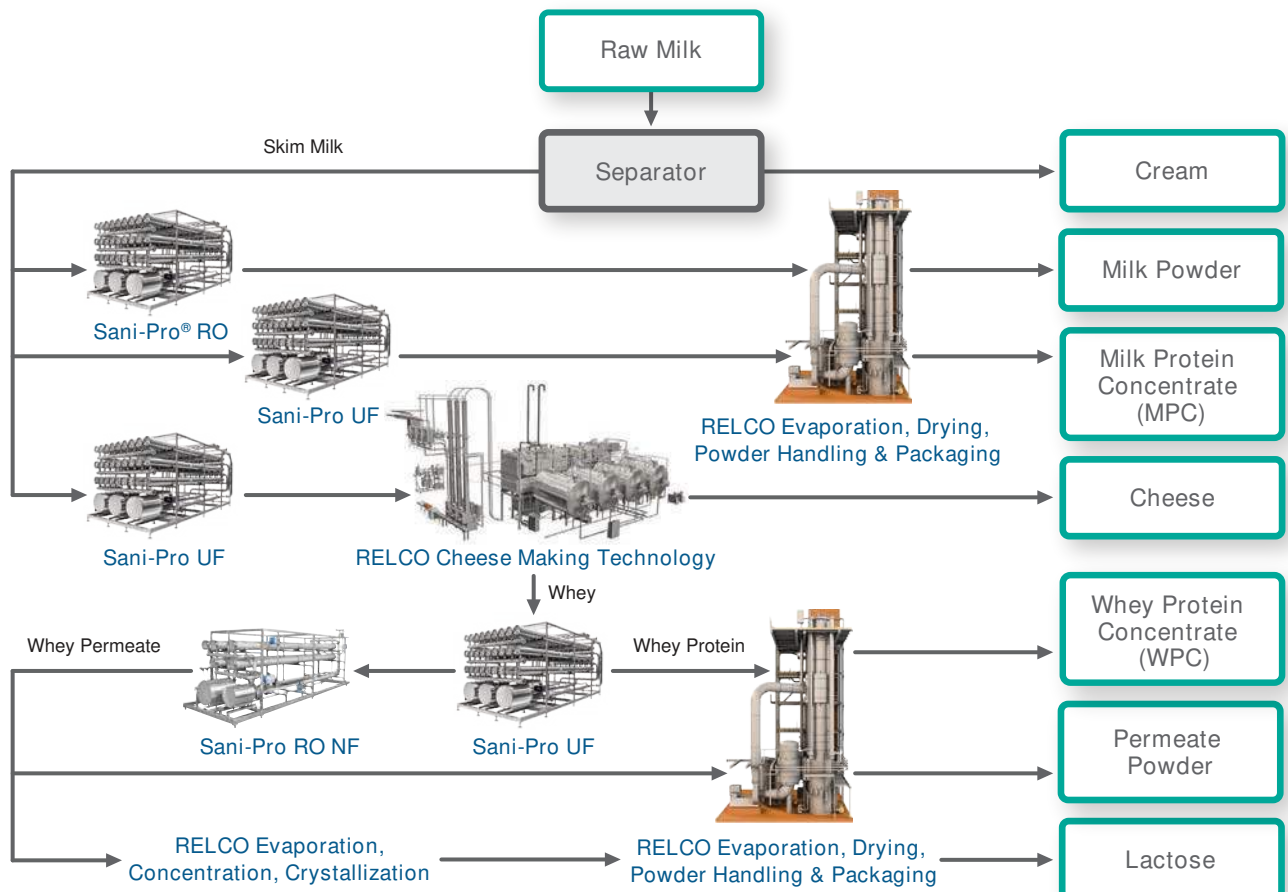
KOVALUS SEPARATION SOLUTIONS™ (KSS) is transforming the landscape of separations by leveraging synergistic technology such as membrane filtration, ion exchange, evaporators, and dryers. Our solutions are tailored to improving product quality, increasing process efficiency, and driving down costs in dairy, food, beverage, life science, and industrial markets around the world.

With the addition of RELCO® evaporators, dryers, cheesemaking technology, and powder handling and packaging equipment to our portfolio, KSS is able to offer dairy customers a comprehensive, start-to-finish solution. For almost four decades, RELCO has provided hundreds of dairies and cheesemakers with reliable and efficient systems. The addition of RELCO technology to KSS membrane-based solutions positions KSS to bring maximum value for customers around the world.

Piloting & Testing

KSS works with customers to develop best-fit solutions for their unique separation challenges. We offer extensive research and development, bench-scale testing, and piloting capabilities to ensure an optimal process design.

- **Multi-Purpose Test Unit:** Compact, self-contained membrane test unit compatible with spiral, hollow fiber, tubular, and ceramic membrane configurations for small volume testing.
- **Single-Stage Dryer:** Small-scale (2 - 5 kg of water evaporation) and larger-scale (25 - 50 kg of water evaporation) available for rent or purchase. The larger unit comes pre-assembled and delivered in a container for quick and easy commissioning and has a multi-stage option and baghouse option.



Major Applications

Concentration, Clarification, and Demineralization

We specialize in solutions that produce high-quality, purified products. Our membrane filtration, evaporator, and dryer technology allow dairy customers flexibility when customizing their separation processes.

Applications

- **Milk Ingredients:** Dry milk protein concentrate (MPC), native whey, and extraction of higher valued fractions
- **Whey Protein:** Whey protein concentrate (WPC), whey protein isolate (WPI), hydrolyzed whey protein
- **Lactose & Permeate:** Dry lactose, delactosed permeate (DLP), dry whey permeate



Sani-Pro Spiral Membrane Systems

KSS Sani-Pro® spiral membrane systems offer versatile solutions for dairy processing. We provide both standard and custom-designed and engineered systems to meet customers' specific needs. Sani-Pro systems rely on advanced crossflow filtration membranes that combine innovative construction techniques and optimized subcomponents.

Benefits

- High productivity
- Energy efficient operation
- Reduced operating costs and water consumption
- Advanced remote monitoring and control options
- Unparalleled customer service and support through KSS ASSIST™

A Sani-Pro for any Application

	Benefits	Applications	Membrane Type
MF	<ul style="list-style-type: none"> • Cleaner Protein Separation • High Temperature Capability up to 85°C (185°F) • Blister Free • BAND-TITE® Reinforcement Straps for Easy Installation and Removal 	<ul style="list-style-type: none"> • Whey Defatting • Casein Concentration • Brine Clarification • Native Whey, Casein Separation 	<ul style="list-style-type: none"> • MFK-603
UF	<ul style="list-style-type: none"> • Increased Throughput up to 15%* • Lower Energy Consumption by 25%* • Blister Free • Chlorine Tolerant HpHT 	<ul style="list-style-type: none"> • Whey Protein Concentrate • Whey Protein Isolate • Milk Protein Concentrate • Brine Clarification 	<ul style="list-style-type: none"> • HFK-909 (3 kDalton) • HFK-328 (5 kDalton) • HFK-525 (7.5 kDalton) • HFK-131 (10 kDalton)
NF	<ul style="list-style-type: none"> • Lower Energy Consumption by 15% • Blister Resistant • CIP Temperatures up to 60°C (140°F) • BAND-TITE® Reinforcement Straps for Easy Installation and Removal 	<ul style="list-style-type: none"> • Whey Concentration • Whey Demineralization • High Solids Concentrate <ul style="list-style-type: none"> – Whey and Milk Protein Concentrate – Whey Protein Isolate 	<ul style="list-style-type: none"> • SR3D (200 Dalton)
RO	<ul style="list-style-type: none"> • Lower Energy Consumption by 15% • Blister Resistant • CIP Temperatures up to 60°C (140°F) • Pressure Capability up to 800 psi (55 bar) • BAND-TITE Reinforcement Straps for Easy Installation and Removal 	<ul style="list-style-type: none"> • Milk, Whey, and UF Permeate Concentration • NF or RO Permeate Polishing • Evaporator Condensate Polishing 	<ul style="list-style-type: none"> • HRX™ (RO)

* Not yet available with HpHT elements.

Major Applications

Evaporation

RELCO® evaporator systems are designed to treat milk, whey, and permeate to achieve a high-quality product without compromising nutritional value. We provide a range falling film, MVR, and TVR evaporators that are custom designed to meet customers' exact process specifications. Our systems are available in different configurations and can process a range of flow rates for stand-alone processing or be integrated with drying or other functions.

Applications

- Whey protein concentrate & isolate
- Permeate
- Milk protein concentrate & isolate
- Pro-cream
- Non-fat dairy milk powder & whole milk
- Codex Skim
- Buttermilk
- Infant milk formulas



RELCO Evaporators

<p>RELCO Evaporator (6-62% Total Solids)</p>	<ul style="list-style-type: none"> • Evaporates feeds containing 6-24% total solids up to 35-45% total solids • A finisher is used to further concentrate up to 62% total solids • Operating temperatures are controlled to maintain optimum product quality • MVR and/or TVR technology can be used for each stage of evaporation.
<p>Hi-Con Evaporator (60-75% total solids)</p>	<ul style="list-style-type: none"> • Specifically designed for use with the L-TECH™ Permeate Drying System • Concentrates total solids from 55-60% in feed up to 75% • Hi-Con Evaporator utilizes TVR evaporation technology to minimize steam consumption
<p>Sweetened Condensed Milk System (Up to 73% total solids)</p>	<ul style="list-style-type: none"> • Combines standardization of milk with sugar, evaporation, holding, cooling, lactose seeding and crystallization
<p>CrystaLac Crystallizing Evaporator</p>	<ul style="list-style-type: none"> • Controls crystal growth by recirculating a super-saturated lactose solution during evaporation • Significantly improves final lactose yield while reducing process variability for lactose drying systems

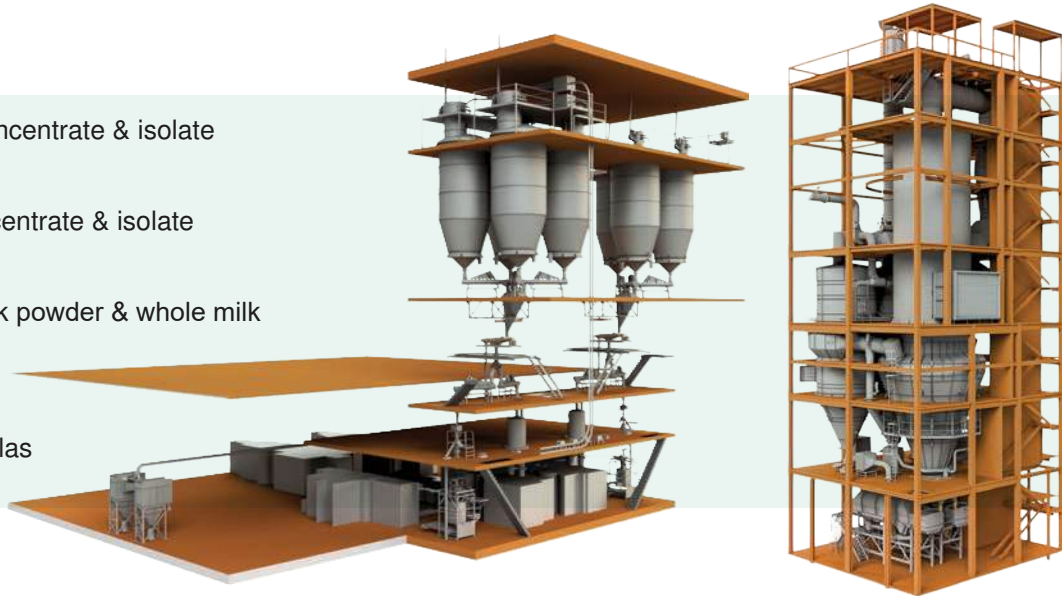
Major Applications

Drying

RELCO® drying technology produces high-quality, non-caking, non-hygroscopic, edible powders. Our systems are versatile and custom-designed to meet exact process specifications.

Applications

- Whey protein concentrate & isolate
- Permeate
- Milk protein concentrate & isolate
- Pro-cream
- Non-fat dairy milk powder & whole milk
- Codex Skim
- Buttermilk
- Infant milk formulas



RELCO Dryers

Timing Belt Drying System

Designed to be used downstream of traditional pre-dryer crystallization, allowing for secondary crystallization to take place on a timing belt conveyor. This two-part crystallization promotes free-flowing, non-caking, non-hygroscopic whey and permeate powders. The tall form bustle dryer and vertical air distributor achieves even air distribution and efficient drying.

Protein Drying System and Milk Drying System

Optimized with a vertical hot air distributor, vibrating well-mixed and plug-flow beds and baghouse, these systems are customizable with additional heating, mixing, and control functionalities for a more robust drying solution. RELCO offers humidity monitoring and control systems to optimize the drying process, ensuring consistent powder product quality.

L-TECH® Lactose and Permeate Drying Systems

Recognized as world-leading lactose and permeate processing technology, our unique design allows operators to achieve a high-quality edible powder at the lowest capital and operating costs in the industry. Each refining and drying step is engineered to maximize yield efficiencies.

Major Applications

Cheesemaking

RELCO® offers complete, integrated solutions and equipment for cheesemaking processes. Our systems allow for a variety of cheeses to be produced at varying levels of hardness and texture and are trusted by top cheesemakers around the world. Types of cheeses produced using RELCO technology include Cheddar, Colby, Gouda, Cottage Cheese, Edam, Jack-styles (including peppers), Havarti, Asiago, and Parmesan.

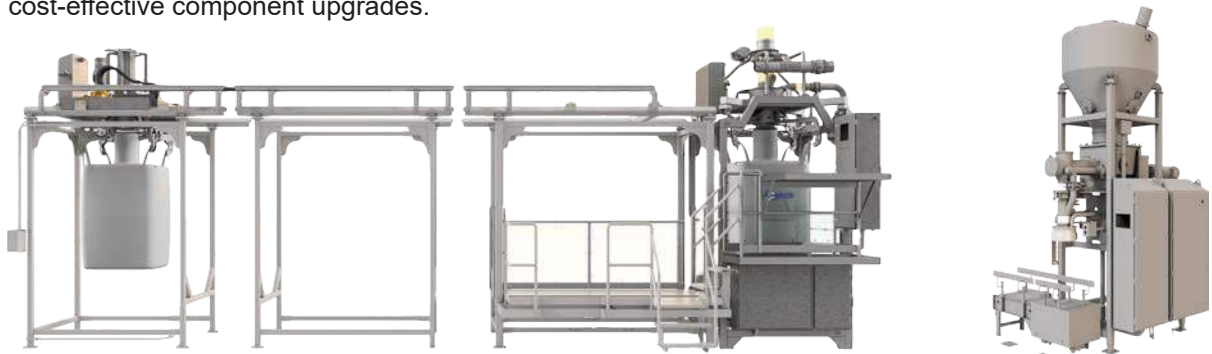
- **Vats:** USDA-approved cheesemaking vats and lab vats – enclosed and open-top – designed with durability, superior performance, and longevity in mind.
- **Draining & Maturation Equipment:** Reliable finishing tables and conveyors such as the TRU-FINISH® Curd Table and Cheese Belt for draining, matting, stirring, and salting. Customized for desired throughput and type of cheese, with either single or multiple belts. Belting is designed for cheese applications with a high degree of customization - including weir design, curd height, retention time and style/number of stirrers.
- **Coagulation Detection:** The OptiSet probe monitors coagulation process in a cheese vat allowing consistent product quality and maximized yields.
- **Blockformer:** The TRU-BLOCK® Blockformer ensures maximum production of many types of cheeses with exceptional block quality. This system offers flexible capacity, supporting 20 – 60 lb (about 9 – 27 kg) block sizes.
- **Material Handling:** Easily operated and maintained material handling and transport equipment for belt or air conveying, bulk handling, or vacuum transfer.



Powder Handling & Packaging

RELCO technology provides efficient and sanitary handling and packaging of various powders. Our powder handling and packaging systems transport, discharge, fill, weigh, blend, and package powders with consistency and reliability.

- **Pneumatic Conveying Systems:** Dense phase vacuum conveying and dense phase pressure conveying gently transfer fragile powders. These systems achieve a high rate of transfer.
- **Packaging Systems:** Available with either semi-automatic or fully automatic operation. The automatic packaging system is designed to fill 15-25 kg bags and offers flexibility through cost-effective component upgrades.
- **Bulk Bag Fillers:** Bulk bag fillers, with an integrated palletizing system, bag break stations, and bulk bag unloaders for a complete and efficient operation.
- **Powder Gassing & Blending:** Our powder gassing hopper reduces oxygen to below 0.05%, extends shelf-life, and preserves taste. The powder blending system allows for the mixing of various powders and spray-in liquid for aroma.

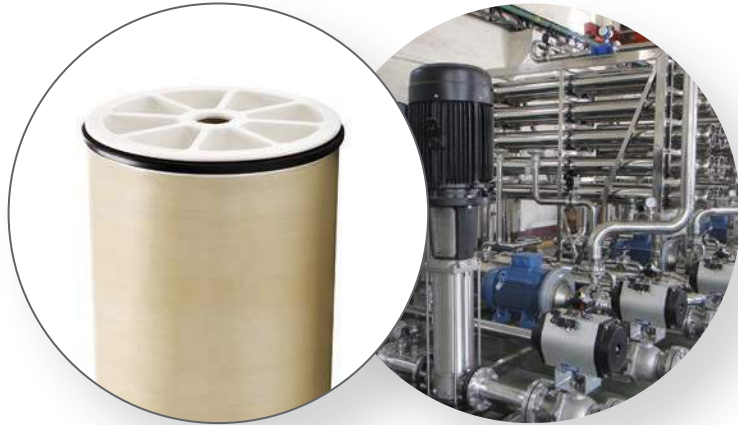


Major Applications

Caustic Recovery

The KSS Causti-COR[®] Nanofiltration Membrane System offers a cost-effective, environmentally friendly way to recover the expensive caustic solutions used in dairy processing. Causti-COR systems utilize our proprietary SelRO[®] nanofiltration membranes to recover up to 95% of caustic for reuse by removing organic and inorganic contaminants. Caustic recovered using our membranes is of a higher quality compared to caustic recovered by conventional methods, all at lower cost.

- Causti-COR systems available in six pre-engineered models or customized design for smaller or larger demands
- Batch systems for small to medium flow rates (10,000 – 100,000 gpd/ 1 – 15 m³)
- Continuously operated systems for medium and large flow rates (25,000 – 200,000 gpd/ 4 – 23 m³)



Water & Wastewater Treatment

KSS is an industry leader in membrane filtration for water and wastewater treatment. We offer a wide range of hollow fiber, spiral, and tubular membrane products and systems that achieve high-quality process water, treat difficult wastewater streams, and even promote wastewater reuse for a sustainable solution.

PURON[®] MP Systems for Water Treatment

- Strong, virtually unbreakable hollow fiber membrane with optimal pore size distribution
- Superior cartridge design with efficient air scouring and single potting
- Low maintenance, cost-effective, and reliable water treatment

Best-In-Class Wastewater Treatment

- INDU-COR[™] HD external MBR featuring tubular crossflow membranes achieves high solids and chemical tolerance
- Low-energy PULSION[®] immersed MBR featuring virtually unbreakable hollow fiber membrane for effective removal of organics and solids

FLUID SYSTEMS[®] NF and RO for High-Purity Water

- Complements MBR, MF, and UF technologies
- High-recovery membranes in pre-engineered or custom-designed systems
- MBR treatment for effective organics and solids removal from facility wastewater





KOVALUS SEPARATION SOLUTIONS

KOVALUS SEPARATION SOLUTIONS™ (KSS) is a global leader in separation technologies.

With best-in-class domain expertise, technologies and systems, KSS is uniquely positioned to help customers purify and recover valuable process streams and achieve sustainability goals across food and beverage, life science, and general industrial markets.

Services & Support

After-Sales Services & Maintenance Programs • SepTrac™ Smart System



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KOVALUS
Separation Solutions™

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