

Food Solutions

Complete Solutions for High-Value Food Products



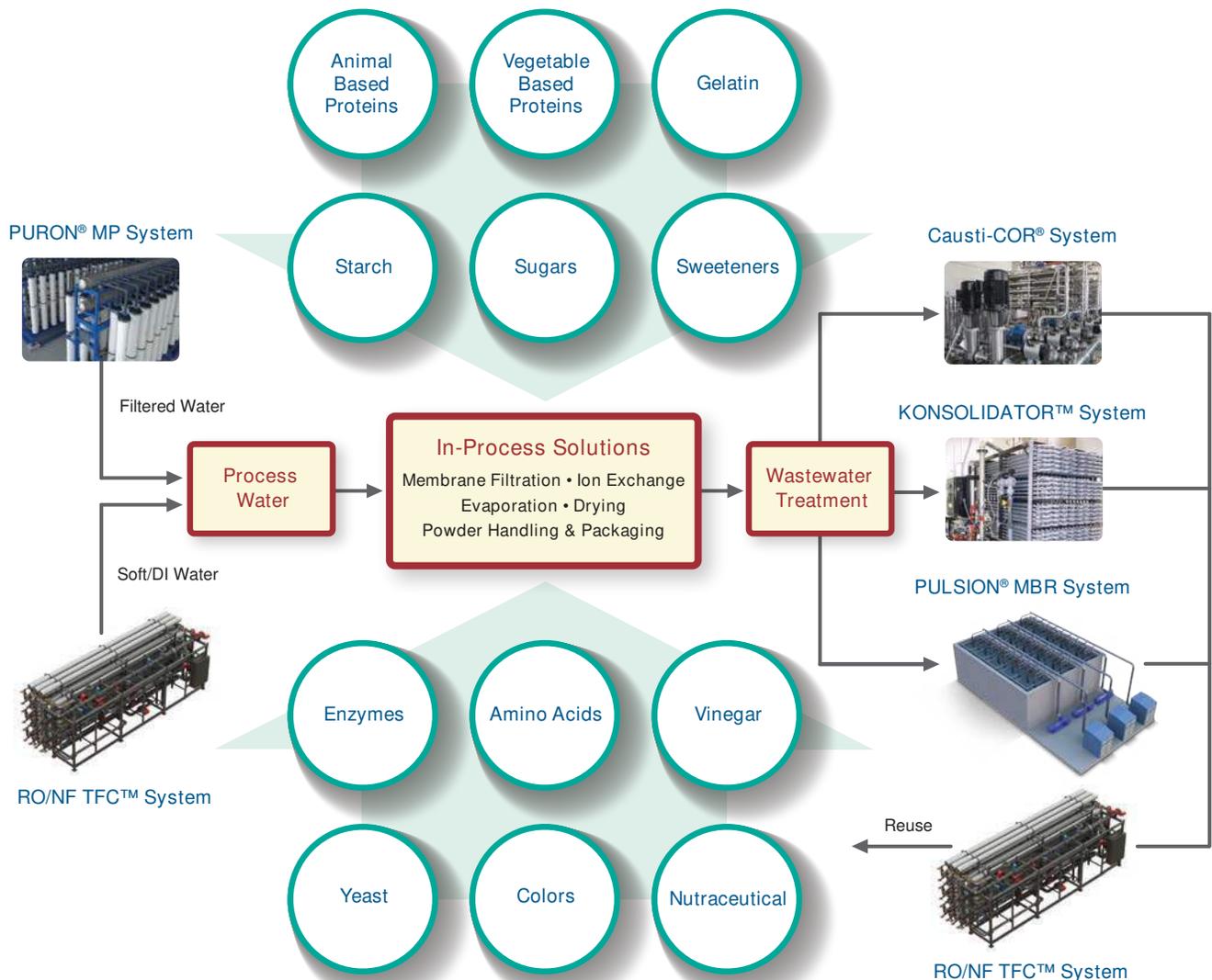
 **KOVALUS**
Separation Solutions™

The KSS Advantage

KOVALUS SEPARATION SOLUTIONS™ (KSS) is transforming the landscape of separations by leveraging synergistic technologies 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.

Driving Innovation Across the Food Industry

By integrating RELCO® thermal separation technologies with KSS membrane filtration, we are able to offer customers a comprehensive, start-to-finish solution for food industry customers. Our combined separations expertise allows us to offer superior concentration and purification technologies to manufacturers of high-quality food products. We also provide industry-leading water and wastewater treatment solutions to promote sustainable operations. KSS is committed to working collaboratively with customers, seeking value-add solutions that best fit their unique processes.



The KSS Advantage

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.

Collaborative Innovation

KSS is the ideal partner to plan, develop, and build an effective and long-lasting process. From incoming process water treatment to in-process separations and wastewater treatment, KSS has the experience, technology, and drive to provide a comprehensive solution based on integrated complementary technologies.

We take a collaborative approach with our customers, combining our deep applications knowledge with their unique process expertise to develop the most transformative and value-added solutions. Through this approach and our wide selection of separation technologies, KSS is best positioned to offer customers a complete solution for producing a competitive, high-quality food product without the need to rely on multiple vendors.



EARLY-STAGE DEVELOPMENT

- Understand challenge & identify desired outcomes
- Evaluation of separation properties & bench testing
- Access to Process and R&D experts

FIELD TESTING

- Pilot testing
- Process optimization
- Full scale costing and design recommendation

FULL-SCALE EXECUTION

- Project management & execution of capital projects
- Construction and installation
- Commissioning and operator training

LONG-TERM SUPPORT

- Complete after-sales services
- System troubleshooting
- Performance optimization through remote digital monitoring program

Major Applications

Gelatin

KSS' integrated solutions for gelatin and hydrolyzed collagen feature our ceramic and sanitary membrane filtration products and systems, ion exchange technology, and evaporation and spray drying equipment. Our technologies allow producers to clarify, concentrate, and demineralize gelatin from bovine, porcine, marine, and avian sources. The proteins are processed to meet low and high bloom technical, food, photographic, and pharma grade standards.

Ceramic membranes offer improved cleanability and greater suspended solids and high temperature tolerance for efficient protein clarification at a lower cost. For enhanced concentration, our line of Sani-Pro® sanitary spiral membranes are available in a wide range of molecular weight cutoffs to support our customers' unique



processing requirements. KSS membranes provide higher gelatin feed concentrations to the evaporators and/or dryers, offering significantly reduced operating costs as well as improved product consistency and quality. For enhanced purity, customers can take advantage of our Eco-Tec® ion exchange systems for efficient demineralization of gelatin and hydrolyzed collagen to remove ash and other compounds and eliminate undesirable taste, odors, or colors.

Our team of KSS food industry experts work collaboratively with producers of gelatin and hydrolyzed collagen around the world to provide best-fit solutions for a variety of processing challenges.

Benefits

- Seamless integration between membrane filtration, thermal processing, and ion exchange technologies for a complete and holistic solution
- Improved operating economics and process efficiencies
- Access to a team of industry experts with decades of experience

Major Applications

Starch and Sugar

Crop-based sugars and starches require high temperature clarification in order to be separated from fibrous and proteinaceous impurities and achieve a high-quality consumable product. KSS Sani-Pro® sanitary spiral elements are constructed to tolerate high temperature environments to process dextrose and sucrose solutions and starch and sugar derivatives with exceptional results. Our membranes demonstrate excellent performance in these demanding conditions while leading to a product yield of over 95%.

Our Eco-Tec® ion exchange technology offers demineralization capabilities to enhance product quality and extended shelf lifetime. Purified solutions are further processed with evaporation and crystallization to achieve a highly concentrated final product.



Nutraceuticals

As health food companies experience an increased push to develop new and innovate products, there is a growing need to develop efficient and optimized extraction and purification methods of high-value ingredients. KSS works with customers developing nutrient-rich food products by offering clarification, concentration, evaporation, and spray drying technologies. Our membrane filtration and thermal separation equipment streamline nutraceutical processing at a lower cost for applications involving plant extracts, vitamins, color extracts, and more. Customers maximize the value of their operation by partnering with KSS for a complete and integrated separation solution.

Major Applications

Fermentation

Products including enzymes, amino acids, yeast, organic acids, and vinegar are manufactured using a variety of fermentation processes. To clarify the fermentation solution, KSS offers microfiltration (MF) membrane products and systems in different configurations to meet customers' exact processing specifications. Following clarification, larger protein and enzyme products are further concentrated using our ultrafiltration (UF) membrane technology, while smaller fermentation products – such as amino or organic acids – are better suited for purification via nanofiltration (NF) or reverse osmosis (RO) membranes.



KSS provides ROMICON® hollow fiber ultrafiltration membranes specifically designed to achieve excellent clarity with turbidities <math><1.0</math> NTU and enhanced haze stability in vinegar products. Varieties of vinegar including apple cider, malt, red wine, rice, and white distilled are commonly clarified with our membranes designed to operate in these harsh acidic conditions. Our ROMICON hollow fiber membranes are available in a line of standard systems for small, medium, and large flow rates.

Major Applications

Plant-Based Proteins

Consumer demand for healthier and more environmentally sustainable food choices is driving new trends for high quality foods containing plant-based proteins. To help producers meet these demands, KSS provides membrane and thermal technologies to achieve efficient and sustainable operation. Our complete, integrated solutions include clarification to remove starch or bacteria, concentration and purification of target proteins, and spray drying for an optimal powdered protein product.



KSS membranes offer competitive advantages over conventional separation methods in the plant-based protein market. Our Sani-Pro® membranes provide higher protein yields and purity while minimizing protein losses through the selective concentration and enhance protein functionality through gentle processing technologies. KSS membrane systems offer extended equipment lifetime, reduced chemical consumptions, and lower maintenance and repair costs.

Our RELCO® evaporator and spray dryer systems are customized to meet each customer's unique processing needs and provide seamless integration with membrane technology to achieve higher-quality plant-based protein products

Benefits

- Increased sustainability in operations
- Enhanced protein functionality
- Improved equipment lifetime
- Higher protein yield and purity
- Reduced chemical consumption

Advanced Separation Technologies

Sani-Pro Sanitary Spiral Membranes

Sani-Pro® elements combine cutting-edge construction techniques and optimized subcomponents to provide the most advanced crossflow filtration membranes available. These membranes are designed to improve energy efficiency, reduce operating cost, increase productivity, and decrease contamination risk. Sani-Pro elements feature a blister resistant design and are constructed to tolerate harsh chemical cleaning, extending their operating life in demanding food and beverage membrane processing applications. Our sanitary membranes are FDA, 3-A, EU, and Halal compliant to satisfy a variety of food processing requirements.

Benefits of Sani-Pro Systems

- 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™
- Long operating life
- Robust sanitary construction



A Sani-Pro for any Application

	Benefits	Applications	Membrane Type
MF	<ul style="list-style-type: none"> • High Temperature Capability up to 85°C (185°F) • High Flux • BAND-TITE® Construction for Easy Installation and Removal 	<ul style="list-style-type: none"> • Sugar & Sweetener Clarification • Fermentation Broth Clarification 	<ul style="list-style-type: none"> • MFK603 (0.1 micron) • MFK618 (0.1 micron)
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"> • Plant and Animal-Base Protein Separation • Gelatin, Pectin and Polysaccharide Concentration • Blood Plasma Processing • Extract Purification 	<ul style="list-style-type: none"> • HFK 909 (3 kDalton) • HFK-328 (5 kDalton) • HFK-525 (7.5 kDalton) • HFK131 (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 Construction for Easy Installation and Removal 	<ul style="list-style-type: none"> • Protein, Peptide and Protein Hydrolysate Separation • Fermentation Product Concentration and Desalting • Product Purification 	<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 Construction for Easy Installation and Removal 	<ul style="list-style-type: none"> • Sugar Concentration • Juice Concentration • Amino Acid and Fermentation Product Concentration • UF Permeate Polishing for Water Reuse 	<ul style="list-style-type: none"> • HRX™ (RO) (99.5% NaCl)

* Not yet available with HpHT elements.

Advanced Separation Technologies

RELCO Evaporation & Drying Solutions

KSS offers RELCO® evaporation, drying, and powder handling & packaging technology and solutions for the food Industry.



RELCO evaporator systems combine cutting-edge technology with basic thermal concentration principles to provide no-hassle systems and equipment that increase production while using less energy.

- A variety of configurations to meet specific requirements
- Custom systems available for a range of total solids concentrations
- Suitable for stand-alone processing or integrated with drying or other functions
- Operate with high efficiency and produce stable final concentrations



RELCO dryers are ideal for processing high-value products such as protein concentrates, isolates, and hydrolysates made from a variety of sources.

- A variety of dryer types and configurations to meet specific requirements
- Customizable to meet specific quality standards and product properties
- Low capital and operating costs
- Designed with operator safety and feasibility in mind

Applications

- Sugar/ confectionary: Maltodextrin, dextrose, maltose, glucose, sorbitol
- Pet foods: Animal and plant-based proteins
- Flavor, dyes, and scents
- Sugar, alcohol, and yeast
- Meat & fish: Collagen, broth, and fish protein
- Eggs: Egg yolk or egg white products, whole egg powder
- Nutraceutical: Extracts
- Food Ingredients

Powder Handling & Packaging Equipment

For a complete processing solution, we provide conveying systems, packaging systems, bulk bag fillers, powder gassing and blending equipment to fulfill food processing needs.

- High-rate transfer of fragile powders by pressure or vacuum
- Hygienic semi-automatic or automatic powder packaging lines
- Stable and accurate bag filling, simplified bag transport, and robust bag unloading
- Complete mixing, blending, and gassing of powders



Water and Wastewater Solutions

PURON MP Systems for Water Treatment

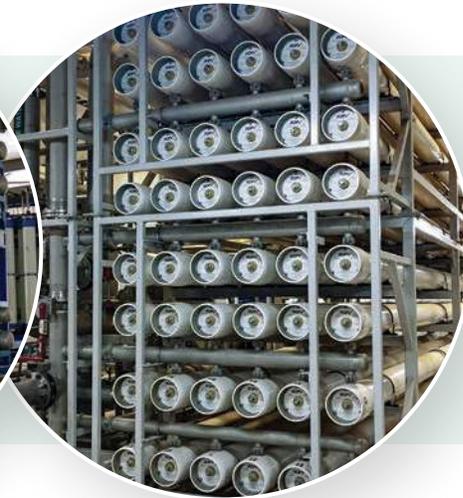
Our PURON® MP systems treat process water to meet high water quality standards and regulations using our innovative ultrafiltration (UF) technology. Featuring a strong, virtually unbreakable hollow fiber membrane with optimal pore size distribution, this system is employed to effectively remove bacteria and viruses. The membrane cartridge is constructed to achieve efficient air scouring in a unique single-potting design that improves solids management and reduces maintenance. The PURON MP offers robust engineering and reliable operation at low cost of ownership and a small footprint. These systems are available in small, packaged plants and in larger pre-engineered skid-mounted systems.

PURON MP Benefits

- Pre-engineered for quick delivery and easy startup
- Robust membrane for extended life & reliability
- Compact design



PURON MP System



FLUID SYSTEMS

FLUID SYSTEMS NF and RO for High-Purity Water

KSS FLUID SYSTEMS® NF and RO systems complement MBR, MF, and UF technologies and achieve high-purity water using high-recovery membrane technology. Our RO and NF spiral membranes effectively remove organics and solids from facility wastewater to make it suitable for reuse within the process. The systems are built to operate at a lower energy and lower cost, are available in pre-engineered or custom designed systems, and have drinking water certifications under NSF/ANSI Standards 61 and 372.

FLUID SYSTEMS NF & RO System Benefits

- Proven performance in the most demanding applications
- Simple to operate, reliable and dependable
- High recovery, up to 95%
- Compact design

Water and Wastewater Solutions

Best-In-Class Wastewater Treatment

To address the wastewater challenges presented in various food manufacturing processes, KSS offers a variety of membrane filtration systems. Our decades of experience in this industry application allows us to provide customers with a best-fit solution and achieve enhanced sustainability in their operation through reuse or compliant discharge.

- **MBR treatment:** The INDU-COR™ HD external MBR features a tubular crossflow membrane for optimized system performance and footprint. For a low-energy operation, our PULSION® immersed MBR features our virtually unbreakable hollow fiber membrane for effective removal of organics and solids.
- **High solids removal:** For smaller wastewater flowrates, our tubular KONSOLIDATOR™ UF crossflow membrane system will effectively clarify activated sludge to produce high quality effluent.
- **Packaged plant:** Our PURON® Plus MBR systems are available as small, packaged plants and as larger modular pre-engineered systems. Due to the innovative membrane, module design, and operation practices, the PURON MBR product has quickly become the technology of choice for companies looking to reduce energy, minimize downtime, and increase flux, all within a small footprint.



PURON MBR System



KONSOLIDATOR System



Causti-COR System

Caustic Recovery

The KSS Causti-COR® NF systems offer a cost-effective, environmentally friendly way to recover the expensive caustic solutions used in food processing. Causti-COR systems utilize our patented SeIRO® NF membranes to recover up to 95% of caustic for reuse by removing organic and inorganic contaminants. The Causti-COR family of systems contains six pre-engineered models, including three batch systems for small and medium flow rates and three continuously operated systems for medium and large feed flow rates. Custom systems can be prepared for smaller or larger demands.



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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