Food Solutions
Your Partner for All Your Separation Needs

Separation Technologies for Quality, Cost, and Sustainability

Separation Technologies for a Better Future™
How can KSS help you?

Over 50 Years of Membrane Experience

Koch Separation Solutions (KSS) is a global leader in innovative membrane filtration technologies. Over our 50-year history, we have developed an extensive portfolio of membrane products, and the expertise to deliver turn-key solutions to the food industry. We manufacture our membrane products in our state-of-the-art facility in the US and we employ them in our systems and treatment solutions worldwide. Our experience and portfolio of products make KSS the ideal partner to develop & supply membrane-based solutions for your most challenging food processing needs.

In addition to providing the most advanced line of spiral, tubular, and hollow fiber products for your process needs, KSS offers a complete suite of market leading water and wastewater solutions. KSS water and wastewater solutions will improve the economics and sustainability of your operation by cost-effectively meeting discharge requirements, or by producing water suitable for reuse within your process.
Major Applications

Gelatin

Gelatin is a colorless and flavorless protein used in many products and applications, including as a gelling agent for myriad food products; an ingredient in the production of pharmaceutical capsules and tablets; and as a moisturizer in cosmetic products. To produce gelatin, collagen is hydrolyzed via an acid or alkali process and gelatin is then extracted. Common raw materials for gelatin production are pig-skin, beef hide, animal bone, or fish skin. The resulting extract is clarified, and then treated with Sani-Pro® ultrafiltration and/or nanofiltration membranes to purify and concentrate the gelatin proteins prior to evaporation and drying.

Utilization of membrane separations in this process provides higher gelatin feed concentrations to the evaporators, offering significant operational savings, as well as improvement of product consistency and quality. KSS Sani-Pro products demonstrate excellent performance and longevity, operating continuously at up to 60°C (140°F). Sani-Pro products for gelatin processing are available in wide membrane pore size selection to effectively process gelatin extracts of different blooms.

KSS gelatin systems were specifically designed to address the gelatin market needs, providing automatically controlled equipment and continuous operation during membrane CIP (Merry-Go-Round design).
Major Applications

**Vinegar**

Vinegar is an aqueous solution of acetic acid and naturally occurring vitamins, minerals, colors and flavors. Vinegar is produced by a two-stage fermentation of a sugar rich raw material with yeast and Acetobacter (acetic acid bacteria). Koch Separation Solutions’ ROMICON® Vinegar hollow fiber ultrafiltration cartridges are used to clarify the resulting vinegar. Vinegar filtered with KSS membranes exhibits excellent clarity with turbidities <1.0 NTU, and enhanced haze stability. Common varieties of vinegar clarified by KSS membranes are Apple Cider, Malt, Red-wine, Rice and White Distilled. The ROMICON vinegar cartridges were designed to hold up well in the acidic conditions required in the process. KSS offers a line of standard systems for vinegar filtration for small, medium and large flow rates.

**Starch and Sugar**

Koch Separation Solutions provides membrane solutions to numerous applications within the starch and sugar market segment. The largest application within this segment is the clarification of dextrose. This process begins with enzymatic liquefaction and saccharification of corn or wheat to produce dextrose. This solution is then clarified at high temperature >75°C (>167°F) using high temperature stable Sani-Pro® Microfiltration spiral wound membranes. After clarification, the purified dextrose is sent to an evaporator and crystallizer. KSS high temperature stable Sani-Pro MF spirals demonstrate excellent performance in the demanding conditions, due to robust design and excellent manufacturing practices. Sugar yield is high, over 95%, and product quality is excellent.
Fermentation

Fermentation is a process used in the manufacturing of many food products and food ingredients. Products within this segment include enzymes, amino acids, vitamins, organic acids and alcohols. In these applications, feedstock is fermented with yeast, algae or bacteria to produce the target product. The fermented solution is then clarified using conventional operating units such as centrifuge, cake filtration, or with modern filtration using KSS Sani-Pro® or ROMICON® Microfiltration membrane products. After clarification, Sani-Pro ultrafiltration membranes can be used to recover, concentrate and purify larger protein or enzyme products. Smaller fermentation products, such as amino or organic acids will pass through the UF membrane. These products can be purified using chromatography and target product concentration can be done using Sani-Pro RO/NF Membranes.

Vegetable or Plant-Based Protein

Consumer demand for healthier and more environmentally sustainable food choices is driving new trends for high quality foods containing plant or vegetable-based proteins. To satisfy this demand, numerous plant-based protein products are produced, including soy, potato, pea, red bean, lupine, and chick pea. The vegetable protein source is washed, mashed and milled. After clarification, Sani-Pro or ROMICON Ultrafiltration membranes are used to concentrate and purify the target protein, offering operational savings and improved product quality and consistency. After concentration, the protein concentrate can be evaporated, spray-dried and packaged. KSS’ product portfolio provides large offering of membranes in different configurations, chemistries and pore sizes, to ensure optimal separation results for different proteins.
Sani-Pro® Spiral Wound Elements

**Longer Operating Life with Improved Productivity and Energy Efficiency**

Sani-Pro® elements combine cutting-edge construction techniques and optimized subcomponents to provide the most advanced cross flow filtration membranes available. These membranes are designed to improve energy efficiency, reduce operating cost, increase productivity and decrease contamination risk. Sani-Pro elements are constructed to tolerate harsh chemical cleaning; extending their operating life in demanding food and beverage membrane processing applications.

### Sani-Pro Technologies
- Microfiltration (MF)
- Ultrafiltration (UF)
- Nanofiltration (NF)
- Reverse Osmosis (RO)

### Benefits of Sani-Pro Products
- High Productivity
- Energy Efficient Operation
- Blister Resistant
- Long Operating Life
- Robust Construction
- FDA, 3-A, EU, and Halal Compliant

### A Sani-Pro for Any Application

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Applications</th>
<th>Membrane Type</th>
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<tbody>
<tr>
<td>MF</td>
<td>• High Temperature Capability up to 85°C (185°F)</td>
<td>• MFK603 (0.1 micron)</td>
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<td>• High Flux</td>
<td>• MFK618 (0.1 micron)</td>
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<td>• BAND-TITE® Construction for Easy Installation and Removal</td>
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<td>• Sugar &amp; Sweetener Clarification</td>
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<td>• Fermentation Broth Clarification</td>
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<tr>
<td>UF</td>
<td>• Increased Throughput up to 15%*</td>
<td>• HFK328 (5k)</td>
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<td>• Lower Energy Consumption by 25%*</td>
<td>• HFK525 (7.5k)</td>
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<td>• Blister Free</td>
<td>• HFK131 (10k)</td>
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<td>• Chlorine Tolerant HpHT</td>
<td>• HFM140 (70k)</td>
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<td>• Plant and Animal-Base Protein Separation</td>
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<td></td>
<td>• Gelatin, Pectin and Polysaccharide Concentration</td>
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<td>• Blood Plasma Processing</td>
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<td>• Extract Purification</td>
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<td>NF</td>
<td>• Lower Energy Consumption by 15%</td>
<td>• SR3D - 200 Da</td>
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<td>• Blister Resistant</td>
<td>• SR4 - 150 Da</td>
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<td>• CIP Temperatures up to 60°C (140°F)</td>
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<td></td>
<td>• BAND-TITE Construction for Easy Installation and Removal</td>
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<td></td>
<td>• Protein, Peptide and Protein Hydrolysate Separation</td>
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<td>• Fermentation Product Concentration and Desalting</td>
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<td>• Product Purification</td>
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<td>RO</td>
<td>• Lower Energy Consumption by 15%</td>
<td>• HRX (99.5% NaCl)</td>
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<td>• Blister Resistant</td>
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<td>• CIP Temperatures up to 60°C (140°F)</td>
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<td>• Pressure Capability up to 800 psi (55 bar)</td>
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<td>• BAND-TITE Construction for Easy Installation and Removal</td>
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<td>• Sugar Concentration</td>
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<td>• Amino Acid and Fermentation Product Concentration</td>
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<td>• UF Permeate Polishing for Water Reuse</td>
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*Not yet available with HpHT elements.*
ROMICON® Series Hollow Fiber MF and UF

Designed upon polysulfone (PS) chemistry, our ROMICON® hollow-fiber cartridges are performance leaders in a variety of food, beverage, and industrial biotechnology. ROMICON cartridges are cross-flow type filters that utilize inside-out fibers and are available in a wide range of pore sizes and fiber diameters. The fiber lumen (inner diameter) and pore size can be selected to best suit the solids loading and separation requirements for each process. These cartridges are used in numerous food and beverage applications including: product clarification, protein fractionation; and color concentration.

In addition to standard cartridges, two special construction variants are available which are suitable for spirit vinegar and citrus clarification.

Benefits of ROMICON Hollow Fiber Products

- Excellent control of TMP for demanding fractionations
- Efficient recovery of high-value product
- Self-supported construction, backwashable construction
- High cleanability
- Long operating life
- Robust construction
- USDA, FDA and 3A, EU, and Halal compliant

ROMICON Technologies

- Hollow Fiber Microfiltration (MF)
- Hollow Fiber Ultrafiltration (UF)
Water Solutions

PURON® MP Systems for Water Treatment

Achieve the highest water quality standards and regulations for your process water with our innovative hollow fiber ultrafiltration technology. Easily installed and serviced, PURON® MP systems are designed for longevity and performance. These water treatment systems offer robust engineering and reliable operation at low cost of ownership and in a small footprint.

The PURON MP product innovation starts at the membrane; strong fiber, practically unbreakable, with optimal pore size distribution for reliable bacteria and virus removal. Our superior cartridge design, including efficient air scouring and single potting, improves solids management and brings a low maintenance, cost effective and reliable means of water treatment into your production facility.

Our PURON MP systems are available in small, packaged plants to treat up to 200,000 gallons per day (32 m³/hr), and in larger pre-engineered skidded systems for larger demand.

PURON MP Benefits

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

Applications in a Food Ingredient Factory

- Turbidity and pathogen removal from ingredient water
- Wastewater polishing
FLUID SYSTEMS® is a key component of KSS, complementing the MBR, MF and UF technologies to provide municipal and industrial clients with broad expertise in filtration and purification processes. Our RO and NF products are available in standard 8” FRP hard overwrap configuration (8040) in standard and high area construction. All products have drinking water certification under NSF/ANSI Standards 61 and 372. We offer a wide range of reverse osmosis (RO) and nanofiltration (NF) products to serve in potable water and industrial water applications.

**TFC® HR**
Robust high rejection and low fouling brackish water RO products for consistent operation treating industrial streams and wastewater effluents.

**TFC® SR**
Low energy NF products for water softening and removal of organics.

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**High Recovery RO Packaged Systems**
At KSS we understand that high recovery and reliable RO solutions can make your operations efficient and cost effective. We will provide you with innovative and complete solutions using our pre-engineered or custom designed systems.

**Challenges Associated with Food and Beverage Production**
- Demineralized water for brewing liquor or dilution water
- Steam boiler feed water
- Cooling tower make-up, blow down treatment

**KSS High Recovery RO Systems Benefits**
- Proven performance in the most demanding applications
- Simple to operate, reliable and dependable
- High recovery, up to 95%
- Compact design
Wastewater Solutions

KSS understands the specific wastewater challenges associated with the food and beverage industry. We have the knowledge and expertise to provide you with a comprehensive solution to treat your wastewater economically, while complying with discharge or water reuse limits.

MBR treatment is an effective method for organics and solids removal from your facilities wastewater, allowing for discharge while avoiding expensive disposal surcharges. Because KSS MBR systems utilize an ultrafiltration membrane, the effluent water quality is suitable for further treatment with FLUID SYSTEMS® NF/RO for reuse within your facility. KSS offers both immersed hollow fiber and tubular crossflow MBR, ensuring the optimal system configuration for your wastewater needs. For smaller wastewater flowrates, our tubular KONSOLIDATOR ultrafiltration crossflow membrane system will effectively clarify activated sludge to produce high quality effluent. For larger wastewater flow rate, our PURON submerged technology will provide the optimal solution.

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.

MBR Technology Benefits

• High quality ultrafiltration product
• Minimal footprint
• Efficient and reliable removal of solids and organics from wastewater
• Low maintenance
• Wastewater reuse
**Caustic Recovery**

**How Much Is Your Caustic Really Costing You?**

The KSS Causti-COR® nanofiltration membrane systems offer a cost effective, environmentally friendly way to recover the expensive caustic solutions used in Food and Beverage processing. Causti-COR systems utilize our patented SelRO® nanofiltration 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 between 1 and 15 m$^3$/hr (10,000 gpd - 100,000 gpd) and three larger continuously operated systems for medium and large feed flow rates between 4 and 32 m$^3$/hr (25,000 – 200,000 gpd). Custom systems can be prepared for smaller or larger demands.

**SelRO Membrane**

The SelRO family of spiral wound elements utilize a proprietary membrane developed by KSS using a highly crosslinked polymeric chemistry. They demonstrate long membrane life while treating acids and bases with temperatures up to 70°C (160°F) and concentrations including:

- Sodium and potassium hydroxide up to 20%
- Sulfuric, nitric, hydrochloric, phosphoric acids or blends up to 35%

**Food and Beverage Applications**
- Recovery and reuse of caustic CIP waste
- Recovery and reuse of caustic, or caustic brine from regenerable resin column

**Benefits of Recycling Caustic**
- Lower spending on caustic and acid materials
- Reduced effluent volume
- Reduced waste treatment costs
- Energy recovery
- Lower effluent sodium
KSS will partner with you throughout the life cycle of your membrane filtration system. Our experienced technical team will provide global service and support and will work directly with you to maximize process efficiency. KSS ASSIST®, our service and maintenance program, provides the tools to keep your system operation at the highest level, including:

- Membrane Process Optimization
- Plant Audits
- Data Collection, Analysis & Reporting
- Operator Training
- Telephone Support

Koch Separation Solutions

Koch Separation Solutions (KSS) is a global leader in membrane filtration technologies with over 50 years of membrane experience. With best-in-class domain expertise, technology and systems, KSS is uniquely positioned to help customers purify and recover valuable process streams and achieve sustainability goals.