

# RELCO® Drying Systems

Proven Drying Technology for High-Quality Dairy  
and Food Products



**RELCO®**  
A Kovalus Company

# Leading Separation Technology

KOVALUS SEPARATION SOLUTIONS™ (KSS) is transforming the landscape of separations by leveraging a synergistic approach using technologies such as membrane filtration, ion exchange, evaporation, and drying. 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.

The addition of RELCO® drying systems to our portfolio allows KSS to provide dairy and food manufacturers the capability to produce high-quality, non-caking, non-hygroscopic, edible powders. Our systems are versatile and custom-designed to meet exact process specifications for a variety of applications, including:

- Whey protein concentrate and isolate
- Milk protein concentrate and isolate
- Whole whey
- Whey and milk permeate
- Lactose
- Pro-cream
- Non-fat dairy milk powder & whole milk
- Codex skim
- Buttermilk
- Infant milk formulas
- Egg powders
- Protein hydrolysates
- Encapsulated powders
- Yeast
- Blood products
- Plant-based protein and isolate
- Gelatin and hydrolyzed collagen
- Flavor ingredients & food color
- Pet food
- Non-dairy food ingredients



# Innovative and Collaborative Approach

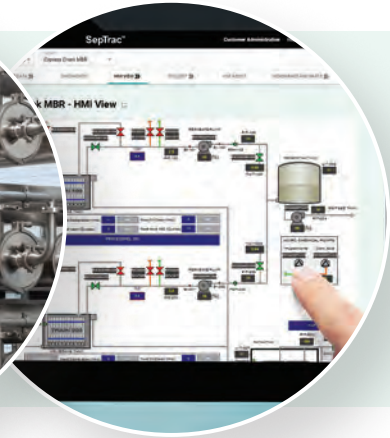
## Complete Process Solutions

KSS is a complete process solutions provider in the dairy and food industries, offering a suite of complementary separation technologies for a range of in-process applications and water and wastewater treatment. Our integrated, start-to-finish capabilities position KSS to be a preferred partner to a variety of manufacturers in these key industries, eliminating the need for multiple vendors. Aside from our leading technologies, customers benefit from long-lasting relationships with our engineering and field service teams for superior aftermarket services to maintain and optimize on their high-performing operations for years to come.



## Collaborative Innovation

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 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

# Drying Technology

## Timing Belt Drying System

The Belt Drying System is designed to dry crystallized feed stock. Crystallized feed stock is fed to a vertical dryer chamber where it is atomized with spray nozzles. Partially dried powder falls to a timing belt conveyor system that promotes secondary crystallization, producing free-flowing, non-caking, non-hygroscopic whey and permeate powders.

The dryer features a vertical air distributor for even air distribution at the nozzle to increase drying efficiency. A variable belt speed allows operators to increase or decrease belt retention time for maximum crystallization and efficiency. Crystallized powder exiting the timing belt drops to an external fluid bed where it is further dried and cooled. Exhaust air from the drying chamber and fluid bed are filtered in a baghouse dust collector before exhausting to the atmosphere. Additional features include:

- Direct fired gas burners or indirect gas fire burners
- Heat recovery systems
- Cyclones or baghouses to reduce belt dryer emissions
- Baghouse emissions systems to identify a leaking bag row
- Dual feed nozzle set for round-the-clock operation
- RELCO Humidity Monitoring and Control System for dryer optimization
- Safety systems for fire and explosion suppression



## Belt Drying System

The Belt Drying System is used for sticky, very difficult to dry, hygroscopic, or thermoplastic products, such as high fat products, fat filled whey and delactosed permeate (DLP). Crystallized or non-crystallized feed stock is fed to a short belt dryer chamber where it is atomized with spray nozzles. High moisture powder falls onto a belt conveyor for after drying, cooling, and potential crystallization followed by milling, producing free-flowing, non-caking, non-hygroscopic whey, permeate, DLP and fat-filled powders.

The dryer features a horizontal air distributor for even air distribution at the nozzle to increase drying efficiency. A secondary air flow is affixed to the chamber roof to reduce chamber fouling. A variable belt speed allows operators to increase belt retention time for maximum crystallization, drying, and cooling of the powder. Natural induced agglomeration results in lower bulk densities and coarse powder particles. Additional features include:

- Direct fired gas burners or indirect gas fire burners
- Heat recovery systems
- Cyclones or baghouses to reduce belt dryer emissions
- Baghouse emissions systems to identify a leaking bag row
- Safety systems for fire and explosion suppression



# Drying Technology

## Protein Drying System & Milk Drying System

The Protein Drying System and Milk Drying System are customized to fit a variety of processing requirements for various food and dairy powders. The systems are both optimized with a vertical hot air distributor for even air distribution and efficient drying, vibrating well-mixed and plug-flow fluid beds, and baghouses. The nozzle design promotes easy and safe operator handling and adjustability for agglomeration. Fluid bed designs allow for vigorous mixing, improved moisture control, and better instant properties when applying lecithin. Other features to be added include:

- Direct fired gas burners or indirect gas fire burners
- Cyclones
- Baghouse fines retention bin
- Heat recovery
- Retractable CIP nozzles
- Spray nozzle cameras
- Optional dual feed nozzle for round-the-clock operation
- RELCO® Humidity Monitoring and Control System
- Fire and explosion suppression
- Optional lecithin unit
- Optional parallel fluid beds and powder outlet on fluid beds to reduce system footprint

Protein Drying System	Milk Drying System
<ul style="list-style-type: none"><li>• Whey protein concentrate (34-80)</li><li>• Whey protein isolate</li><li>• Milk protein concentrate (80)</li><li>• Milk protein isolate</li><li>• Microparticulated whey protein concentrate</li><li>• Pro-cream</li></ul>	<ul style="list-style-type: none"><li>• Non-fat dairy milk</li><li>• Codex</li><li>• Whole milk powder</li><li>• Buttermilk</li><li>• Infant milk formulas</li><li>• Encapsulated powders</li><li>• Sweet whey</li></ul>



Protein Drying System



Milk Drying System

# Drying Technology

## L-TECH Lactose Drying System

Recognized as the world leader in lactose processing technology, the L-TECH® Lactose Drying System is designed specifically to process lactose to a high-quality edible powder at the lowest capital and operating costs in the industry. The system is designed to operate at low costs within a small footprint and compact design as each component is optimized for maximum performance. Our control system provides precise equipment operation for each step of the process, minimizing operator duties.

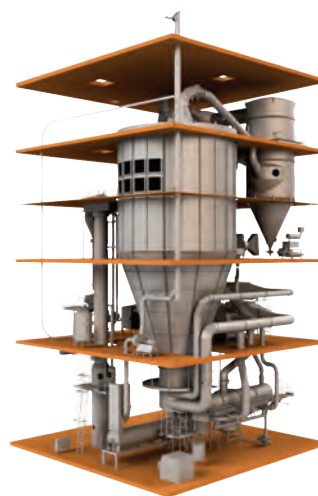


Component	Features
<b>Crystallizer</b>	<ul style="list-style-type: none"><li>• Sized for customer requirements</li><li>• CIP capable</li><li>• Easily operated</li><li>• Automated for optimized crystal development</li></ul>
<b>Refiner</b>	<ul style="list-style-type: none"><li>• Fully automated for easy operation</li><li>• Counter-current washing</li><li>• CIP capable</li><li>• Low-volume water usage</li><li>• Efficient purification process</li></ul>
<b>Attrition Dryer</b>	<ul style="list-style-type: none"><li>• Compact</li><li>• Low air velocity and high air temperature</li><li>• Attrition action breaks up agglomerates into uniform particle size</li><li>• Product inlet is gravity fed from the basket centrifuge</li><li>• Product moves in a heated air stream from the dryer to an interstage cyclone for reduced dust loading on baghouse</li></ul>
<b>Fluid Bed Dryer</b>	<ul style="list-style-type: none"><li>• Efficient final stage drying and cooling</li><li>• CIP capable</li></ul>
<b>Baghouse Collectors</b>	<ul style="list-style-type: none"><li>• Hot and cold baghouses collect fine particles from the attrition and fluid bed dryers</li><li>• Fines removed from bag filters are reintroduced to maximize yield</li><li>• Safety explosion venting</li><li>• Sanitary design</li><li>• Easy top-loading</li></ul>

# Drying Technology

## L-TECH Permeate Drying System

The L-TECH® Permeate Drying System is specifically designed for drying edible permeate resulting from milk or whey filtration. Solids are concentrated from 60% to 70% through a Hi-Con falling film evaporator, maximizing water removal allowing for reduced size and energy requirements of the dryer. The dryer system's Cooling, Concentrating, and Crystallizing Processor is capable of continuous cooling and crystallizing of high-solids permeate with a counter-current flow, providing further solids concentration to levels near 75%. The air lift dryer is bottom fed for a long retention time, while an integrated circular fluid bed at the bottom of the chamber provides second stage drying and fines agglomeration. The recovered fines are conveyed to the drying chamber for agglomeration. Continuous operation improves the degree of lactose crystallization, reduces stickiness of the powder, and minimizes capital and operating costs.



Component	Features
<b>Hi-Con Evaporator</b>	<ul style="list-style-type: none"> <li>• Low fouling</li> <li>• Compact design</li> <li>• Achieves high solids</li> </ul>
<b>Triple C Processor</b>	<ul style="list-style-type: none"> <li>• Continuous product flow eliminates tanks for crystallization</li> <li>• Concentration occurs with rapid cooling</li> <li>• Inlet feed is non-crystallized material</li> </ul>
<b>Dehumidifier</b>	<ul style="list-style-type: none"> <li>• Easy access for filter replacement</li> <li>• Stainless steel</li> <li>• Horizontal-stacked coils provide compact design</li> <li>• Self-draining</li> </ul>
<b>Baghouse</b>	<ul style="list-style-type: none"> <li>• Easy top-loading bag</li> <li>• Convenient, safe inspection</li> <li>• Designed to extend bag life</li> <li>• Safety explosion venting</li> </ul>
<b>Air Lift Dryer</b>	<ul style="list-style-type: none"> <li>• Bottom air and product inlet allow for two-pass drying</li> <li>• Two-pass drying improves efficiency and cost with a compact chamber design</li> <li>• Safety explosion venting</li> <li>• Integrated fluid bed completes drying and fines agglomeration</li> </ul>

# Drying Technology

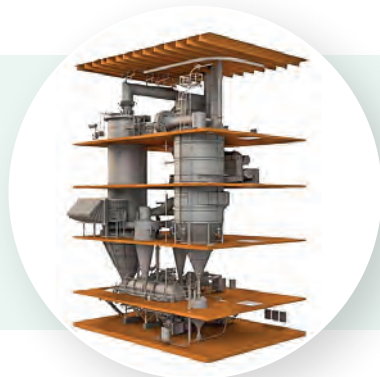
## Tall Form Bustle Dryer & Wide Body Dryer

The Tall Form Bustle Dryer and Wide Body Dryer are customized to fit a variety of processing requirements for various food and dairy powders. The systems are optimized with a vertical hot air distributor for even air distribution and efficient drying, vibrating well-mixed and plug-flow fluid beds, and baghouses. The nozzle design promotes easy and safe operator handling and adjustability for agglomeration. Fluid bed designs allow for vigorous mixing, improved moisture control, and better instant properties when applying lecithin. The Wide Body Dryer is designed with top chamber exhaust ports to allow a reverse air flow to keep the chamber walls clean. Other features to be added include:

- Direct fired gas burners or indirect gas fire burners
- Cyclones
- Baghouse fines retention bin
- Heat recovery
- Retractable CIP nozzles
- Spray nozzle cameras
- Optional dual feed nozzle for round-the-clock operation
- RELCO® Humidity Monitoring and Control System
- Fire and explosion suppression

## Applications

- Non-fat dairy milk
- Codex skim
- Whole milk powder
- Whey protein concentrate 34-80
- Whey protein isolate
- Buttermilk
- Milk protein concentrate 80
- Milk protein isolate
- Infant milk formulas
- Microparticulated whey protein concentrate
- Pro-cream
- Yeasts
- Encapsulated powders
- Blood products



Tall Form Bustle Dryer



Milk Drying System

## U-Tube Dryer

The U-Tube Dryer is a low-cost, compact dryer for producing regular skim, whey protein concentrate, and milk protein concentrate powders. It features a one-stage drying process with a powder and exhaust air outlet on the bottom leading to the baghouse dust collector. It is built with a compact design and is equipped with powder cooling and a transport system.



## Piloting Capabilities

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

For drying operations, we provide RELCO® pilot dryer systems for a range of applications. The pilot dryers are available to rent or can be purchased as the basis for future expansion. Our team of dedicated experts will advise on the most suitable system capacity based off of specific process parameters and customer requirements. Our pilot dryer offering consists of:

- Single-stage, small-scale dryer for 2 – 5 kg of water evaporation.
- Single-stage dryer with a multi-stage drying option and baghouse option for 25 – 50 kg of water evaporation. This unit comes pre-assembled and delivered in a container for quick and easy commissioning.



# Dryer Components

Component	Features	Features & Benefits
<b>Explosion Suppression</b>	Detects an incipient explosion and suppresses it by injecting an extinguishing agent. Reduces the maximum developed pressure to safe levels and extinguishes the fire.	<ul style="list-style-type: none"> <li>• Dynamic pressure sensors to detect explosions</li> <li>• Extinguishing agent injected in microseconds upon alarm</li> <li>• Extinguishes the explosion and reduces the developed pressure peak to a safe level</li> <li>• Stand-alone control unit</li> <li>• Pressurized bottles with extinguishing agent</li> <li>• No deflection channel to outside wall needed</li> <li>• In compliance with NFPA or Atex</li> </ul>
<b>Explosion Isolation</b>	Prevents the propagation of an explosion from one vessel to another by using suppression in the interconnecting duct. Reduces damage to equipment in case of an explosion.	<ul style="list-style-type: none"> <li>• Dynamic pressure sensors to detect explosions</li> <li>• Option for spark detection</li> <li>• Injects extinguishing agent in the duct upon alarm to stop the propagation of the explosion in that duct</li> <li>• Stand-alone control unit</li> <li>• Pressurized bottles with extinguishing agent</li> <li>• In compliance with NFPA or Atex</li> </ul>
<b>Explosion Rupture Panels</b>	Panels rupture upon explosion and a deflection channel safely leads fire and pressure to an outside wall. The explosion pressure is reduced to a safe level.	<ul style="list-style-type: none"> <li>• Reduces explosion pressure to safe levels by venting</li> <li>• Mechanical rupture panels (no maintenance)</li> <li>• Panel rupture indicators</li> <li>• Explosion deflection channel from panels to outside wall</li> <li>• In compliance with NFPA or Atex</li> </ul>
<b>Fire Deluge</b>	Exhaust air temperature alarms activate the fire deluge. Hard-wired temperature measurements of exhaust air from chamber, fluid bed, and baghouse	<ul style="list-style-type: none"> <li>• Stand-alone RELCO® fire deluge control panel with manual override</li> <li>• Pre-alarms with message on screens, shutdown of burner, or emergency shut down of dryer</li> <li>• Final alarm activates the fire deluge on the chamber, fluid bed, and baghouse</li> <li>• Failsafe valves</li> <li>• Pressure monitoring on deluge water supply and compressed air</li> </ul>
<b>Air-Liquid-Air Heat Recovery</b>	Recovers heat from the dryer exhaust air for pre-heating incoming process air. Uses a water circulation loop for heat exchange.	<ul style="list-style-type: none"> <li>• Up to 45% heat recovery from exhaust air</li> <li>• Exhaust air warms up water in a coil used to pre-heat incoming process air</li> <li>• Exhaust air side coils can be automatically washed</li> <li>• Can be retrofitted to existing dryer</li> <li>• 3A/USDA approved</li> </ul>
<b>Air-Air Heat Recovery</b>	Recovers heat from the dryer exhaust air for pre-heating incoming process air. Air to air heat exchange.	<ul style="list-style-type: none"> <li>• Up to 65% heat recovery from exhaust air</li> <li>• Envelope style with exhaust air on one side and incoming process air on other side</li> <li>• Can be integrated with inlet air filters</li> <li>• Exhaust air side can be automatically washed</li> <li>• 3A/USDA approved</li> </ul>

# Dryer Components

Component	Features	Features & Benefits
<b>Desiccant Dehumidifier</b>	Reduces humidity using a desiccating adsorption wheel for powder cooling and transport to prevent increased moisture in powder.	<ul style="list-style-type: none"> <li>• Low or no cold-water usage, no dew water</li> <li>• Low air humidity, down to 20 grain/pound</li> <li>• Suitable for use as main drying air when drying very sticky products or to increase dryer capacity</li> <li>• Nontoxic, food-grade desiccant material</li> <li>• Desiccant wheel is regenerated with hot air</li> </ul>
<b>Dehumidifier</b>	Reduces humidity using chilled water for powder cooling or transport to prevent increased moisture in powder.	<ul style="list-style-type: none"> <li>• Chilled water cools air below dew point</li> <li>• Separation of water droplets from the air</li> <li>• Re-heating of dehumidified air to reduce relative humidity of air</li> <li>• Vertical air flows for compact design</li> <li>• Can be equipped with stand-alone warm water or chilled water unit</li> </ul>
<b>Indirect Gas Burner Shell-in-Shell Style</b> (only available in Europe)	An indirect gas burner (natural or propane gas) for heating the main drying air.	<ul style="list-style-type: none"> <li>• Process air and combustion gasses separated by plates</li> <li>• No contamination of process air with flue gasses</li> <li>• 85% efficiency, with additional flue gas heat recovery up to 90%</li> <li>• Compact design with vertical lay-out needing little footprint</li> </ul>
<b>Indirect Gas Burner Envelope Style</b>	An indirect gas burner (natural or propane gas) for heating the main drying air.	<ul style="list-style-type: none"> <li>• Process air and combustion gasses separated by plates</li> <li>• No contamination of process air with flue gasses</li> <li>• Low-NO<sub>x</sub> values</li> <li>• 85% efficiency</li> <li>• 3A/USDA acceptable</li> <li>• Option for dual gas use</li> </ul>
<b>Direct Burner</b>	A direct gas burner (natural or propane gas) for heating the main drying air.	<ul style="list-style-type: none"> <li>• 100% efficiency</li> <li>• Low-NO<sub>x</sub> values</li> <li>• Process air mixed with combustion gasses, flue gasses in direct contact with powder (nitrites)</li> <li>• Compact and low cost</li> </ul>
<b>Traditional Baghouse</b>	Filter baghouse to separate powder from exhaust air. Recovers powder and meets regulatory emission values.	<ul style="list-style-type: none"> <li>• RELCO® pulse venturi for optimum cleaning of bags</li> <li>• Clean air walk-in plenum for easy &amp; clean inspection and replacement of bags</li> <li>• CIP blank-off on air inlet &amp; outlet</li> <li>• Baghouse Emissions Systems identifies a leaking bag row</li> <li>• Not CIP-capable</li> </ul>
<b>CIP-Capable Baghouse</b>	Filter baghouse to separate powder from exhaust air. Recovers powder and meets regulatory emission values.	<ul style="list-style-type: none"> <li>• Fluid bottom for directing powder to outlet</li> <li>• Double venturi pulsing to increase pulse volume flow</li> <li>• Removable lid to replace bags</li> <li>• Baghouse Emissions Systems identifies a leaking bag row</li> <li>• Not 3A/USDA acceptable</li> </ul>



## 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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