

Whey Protein Concentrate and Isolate





Helping Consumers Achieve a Healthy Lifestyle

SPXFLOW FOOD + BEVERAGE

As a global leader in the food and beverage, energy and industrial markets, SPX FLOW helps processors improve the performance and profitability of their manufacturing operations and processes with solutions supported by our in-depth application expertise and a solid customer service and after-sale support network.

SPX FLOW focuses on process safety, energy efficiency, environmental safety, up-time and total cost of ownership for our customers.

- > Anhydro®
- > APV®
- > Waukesha Cherry-Burrell®
- > Gerstenberg Schröder®
- > Seital Separation®

The popularity of sports nutrition products was first driven by high performance athletes looking to build, repair and maintain muscle mass. The category is rapidly expanding into other consumer segments, specifically for those desiring a high protein diet and weight control. It is also used for infant food, ingredients, health food and nutritional products.

Whey protein has a very high nutritional value and is one of the best dietary sources of high-quality protein. It is highly digestible and absorbed quickly compared to other proteins. Because it is satiating (filling), even more so than other types of protein, it is a useful addition to a weight loss diet and stabilizing blood glucose levels.

Consumer Checklist Chart

Consumer check list for a healthy weight product					
✓		High Protein	✓		Natural
✓		Low Fat	✓		Non-GMO
✓		Low Sugar	✓		Convenient
✓		Good Taste	✓		Healthy

SPX FLOW offers nutritional product manufacturers a full range of systems, equipment and experience to meet growing market demand.



Today's consumers and their demands



Food and Infant Food products

Whey Protein Concentrate (WPC) and Whey Protein Isolate (WPI) is a family of dry dairy ingredients used to add concentrated whey protein to food products and infant food products.

Sports and Nutritional products

WPC and WPI are nutrient-dense, high-quality animal-based proteins used for supplementation or fortification. WPC and WPI improve texture, enhance flavour and color, emulsify and stabilize dry mixes, extend shelf-life, and improve the quality of processed dairy and meat products, bakery products, snack foods, beverages, cereal products and are used in special sports and nutritional products.

Health care

Due to its higher protein level, WPC80 contains over twice the amount of BCAAs (Branched Chain Amino Acids) than WPC34. This is beneficial when the goal is to prevent muscle loss and build new lean muscle tissue. It is also important in the development of products with immune enhancing properties. The bioactive components in whey are known to enhance immune health and higher concentrations of protein are often preferred in this type of application. The combination of high BCAA content and easy-to-digest protein makes WPC80 an ideal ingredient from a nutritional perspective.

Core Users

- Body builders and elite athletes
- High-volume consistent, loyal purchasers
- Informed, highly critical consumers

Casual Users

- Recreational athletes
- More attracted to convenience formats
- Drawn to familiar ingredients, clean, free-form labels

Lifestyle Users

- Health and wellness evangelists
- Brand conscious
- Clean label, free-form labels

Mobile Users

- Personalized active lifestyles
- Influenced by social media athletes
- Seeks out whole food ingredients

Whey Protein Concentrate

Whey protein concentrate (WPC) manufacturing converts whey into value added products. Whey proteins have a number of useful nutritional and functional properties that can be utilized in a wide range of products. Whey protein concentrate is obtained by removing sufficient non-protein constituents from whey. It is composed of 80% protein and a small amount of a fat carbohydrate known as lactose. Whey protein concentrate satisfies consumer demands for effectively building and restoring muscles after workouts.

Applications



Nutrition bars



Milk UHT beverages



Powdered shakes



Smoothies

Whey Protein Isolate

Whey protein isolate (WPI) is obtained by refining WPC. The finished product contains at least 90% protein to provide more per serving than WPC. WPI provides the same health benefits of WPC, but is lower in calories and provides a clean taste and mouthfeel.

Applications



Nutrition bars



Sparkling drinks

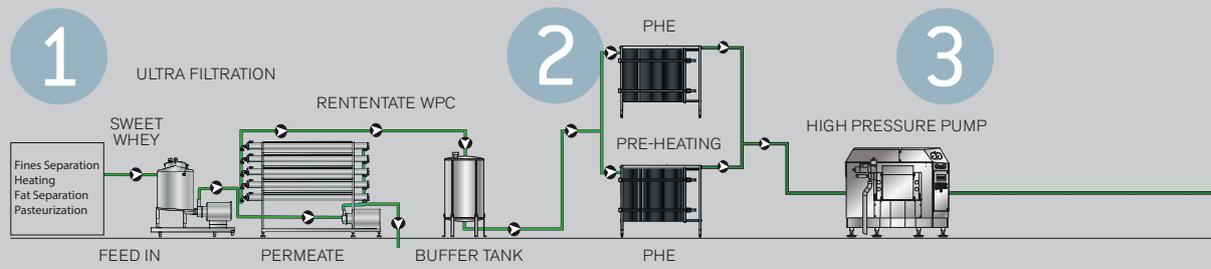


Powdered shakes



Sports gels

Whey Protein Concentrate (WPC)



Understanding the Process

1 Ultrafiltration

SPX FLOW's APV ultrafiltration technology is widely used in the dairy industry to produce the required total solids (TS%) in whey concentrate/isolate. For whey protein concentrate, the product undergoes one ultrafiltration step. Whey protein isolate is further processed using a combination of ultrafiltration, microfiltration and a final ultrafiltration step.

Benefits:

- Proven components and system design
- Extended membrane life
- Efficient utility consumption
- Ease of operation and maintenance

2 Heat Treatment

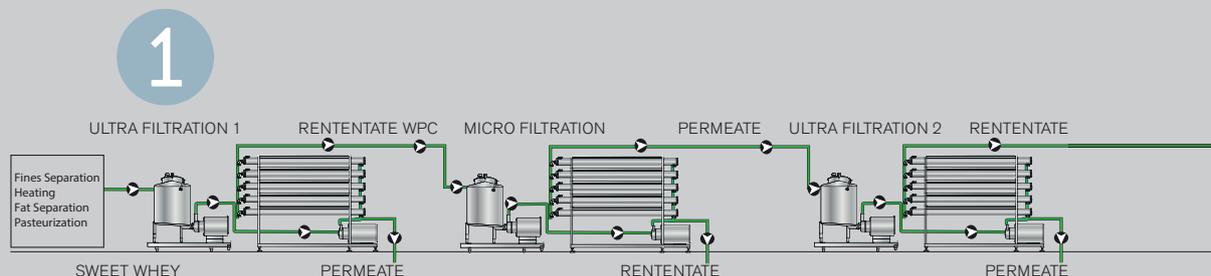
After filtration, the concentrated product is pre-heated using APV plate heat exchangers. A duplex design allows one unit to run while the other is being cleaned to maximize run times. The heating profile is carefully selected to prevent denaturing of the heat sensitive whey proteins, and to achieve the desired viscosity by gentle heat transfer from media to product.

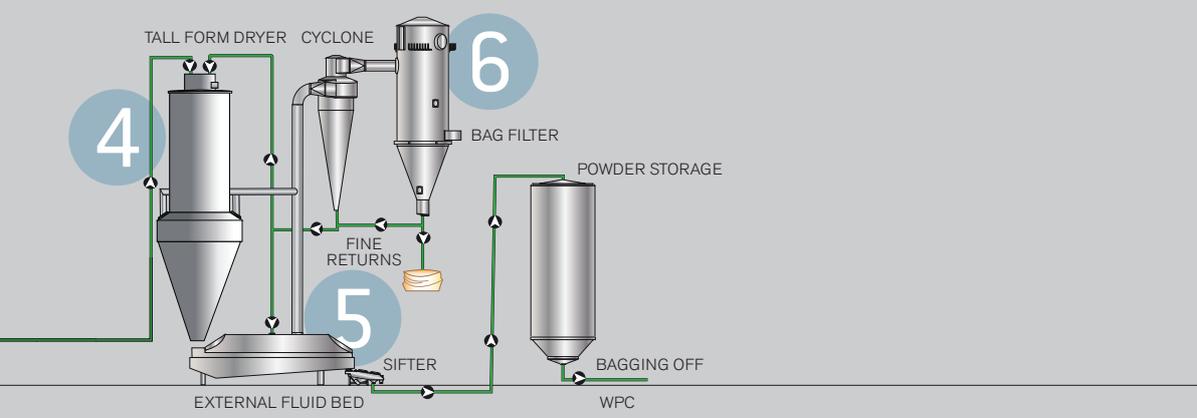
Benefits:

- Decreased viscosity for better atomization
- Increased capacity on spray dryer
- Desired final powder properties



Whey Protein Isolate (WPI)





3 High pressure pump

After preheating to the required temperature, the WPC/WPI product is fed to a high pressure pump to create required feed pressure to atomize with help of nozzle atomizer. SPX FLOW's APV high pressure pump set the standard for optimal product quality and consistency.

Benefits:

- Low maintenance costs
- Environmentally friendly design
- Easy to operate and maintain
- Can be fitted with homogenization block, if dryer needs to run whole milk powder

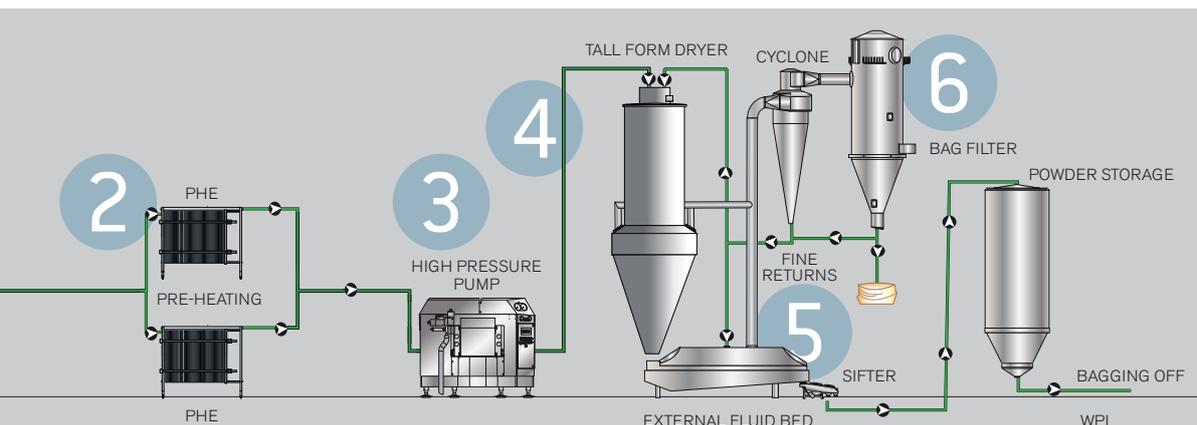
4 Spray Drying

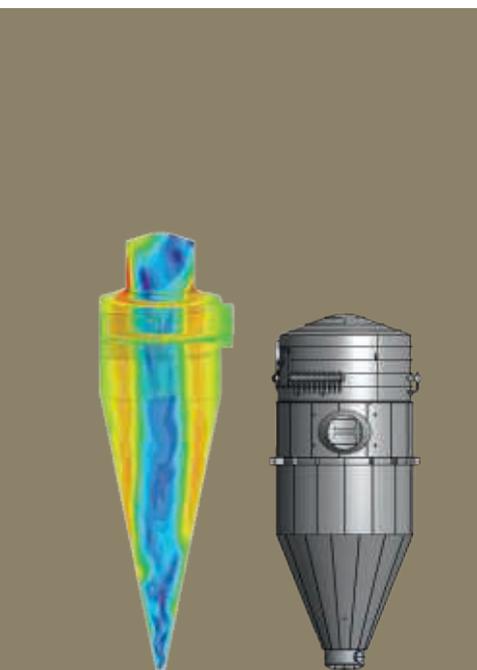
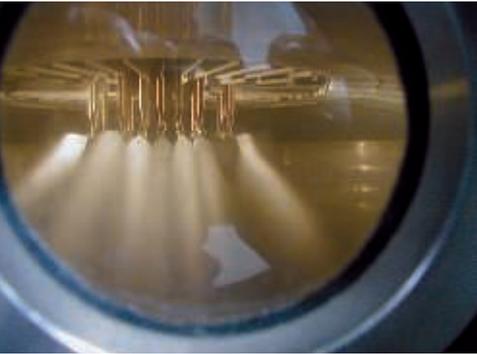


The optimal choice for drying of whey protein concentrate and isolate is SPX FLOW's Anhydro Tall Form spray dryer, designed with a cylinder and a cone with bustle, to deliver optimal conditions for gentle drying of proteins. The air distributor is customized for optimal performance and the dryer is equipped with an external fluid bed. The dryer is designed with the latest safety equipment to comply with legal and industrial standards.

Benefits:

- Gentle drying for proteins
- Reduced recirculation of proteins back in the hot zone as fines are taken out from bustle
- Nozzle camera for spray nozzles
- Hot room or air gap insulation for the drying chamber
- Recuperations for heat energy recovery
- Option to choose cyclone with or without bag filter for exhaust system
- Flexible layout options





Nozzle Atomizer

Next, the whey concentrate/isolate is fed to a nozzle atomizer which converts the liquid into multiple droplets in the atomization zone of the chamber. Our experts can help you choose the right design to ensure thorough atomization which is key to the drying process.

Benefits:

- No moving parts, simple and robust design
- Easily accessible and removable for maintenance – light weight
- Low cost of spares and minimum inventory costs compared to centrifugal atomizers
- Able to shut off a nozzle, while others keep the plant running
- Able to change degree of agglomeration by changing nozzle angle
- Uniform spray-drying air contact
- Nozzle camera allows visual observation of spray operation

5 External Fluid Bed

To ensure that the powder is dried and cooled to the desired moisture and temperature, the powder is further conditioned in an Anhydro external fluid bed. The external fluid bed has features to add a Lecithination Process to make instant WPC/WPI powders. Lecithination can be oil or water based as required.

Benefits:

- Energy efficient drying and cooling – vibrating fluid bed
- Self-emptying
- Compact in design due to an all uni-directional hole plate
- Hygienic design – fully welded construction; retractable CIP nozzles
- Optimal powder conditioning – unique air stream program

6 Exhaust System

Cyclones

Fines can be separated by means of a cyclone, bag filter or a combination of both. Our innovative Anhydro cyclones are designed to efficiently retain fine powder released to the atmosphere or bag filter when air and entrained fines leave the chamber. SPX FLOW regularly tests and upgrades cyclone designs to meet our customers' product requirements through the use of Computational Flow Dynamics (CFD) analysis.

Benefits:

- Highly efficient design
- Longer cone for high fines retention
- Reduced product loss
- Compact layout

Bag Filter

SPX Flow's Anhydro bag filters ensure the longevity of the filter bags and provide efficient filtration before the exhaust air is released to the atmosphere. CFD analysis of the bag filters predict mechanical stress and determines mitigation measures. The use of bag filters minimizes loss of powders to the atmosphere.

Benefits:

- Walk in plenum
- Cleaning in place
- Suppression or rupture disc for safety

Testing Capabilities

The SPX FLOW Innovation Centres leverage the extensive industry experience and expertise of a permanent staff of food technologists, process engineers, and production engineers – together with knowledge gained over many years to contribute actively to development, testing, and application of SPX FLOW equipment, systems, and processing lines.

All facilities and services are designed to provide added value by minimizing waste and energy requirements, or by converting commodity ingredients into new, competitive products.

Important elements of the SPX FLOW Innovation Centres are innovation, optimum plant dimensioning, high quality products, and up-to-date knowledge of market requirements.



Dryer Explosion Safety

Spray drying plants are the core of dairy industries which turn liquid product into powders. To reduce risk to personnel and minimize damage to valuable assets, equipment with built-in safety protection is required.

Our dryers comply with the industry standards and are equipped with certain safety measures, including warning signals, alarm signals and CO detection systems – all aimed at reducing the risk of explosion. We also design our dryers to comply with the requirements of the VDI 2263 standard system for minimizing explosion risks in drying plants. The safety system is designed as per ATEX zoning. Each area of the spray dryer is classified to determine where the risk of explosion is highest and required safety measures are employed as mentioned below:



Warning:

Alarm signals and CO detection system



Prevention:

Fire extinguishing nozzles, suppression system and cooling system for atomizer



Protection:

Ruptured disc and venting



Optimized Process Control

SPX FLOW's automated process control system optimizes key process settings such as feed rate, temperature, pressure, holding times, particle size and moisture content.

Anhydro spray drying plants are controlled from a number of operator stations, providing the operator with end-to-end monitoring of all production parameters.

SPX FLOW control systems deliver plant performance optimization, rapid troubleshooting and real time recording of critical process data

providing complete traceability. Process data can be accessed through a local network or a remote computer with a dedicated connection.



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