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Starch & Derivatives

Starch, Glucose, Maltose, Malto Dextrine, Dextrose & Sorbitol

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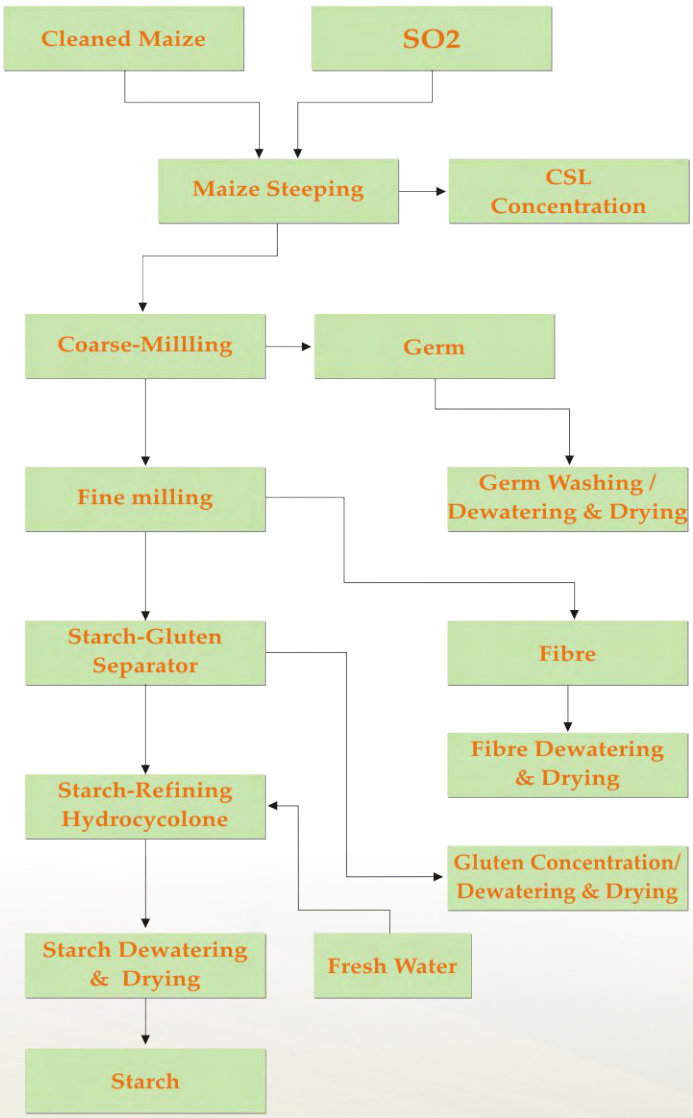
Starch can be produced from various starch containing materials like maize, cassava / Tapioca roots, potatoes, wheat, rice etc. There are different technologies for each raw material for recovery of starch. Starch is mostly used for industrial purposes.

Being a pure renewable natural polymer starch has many applications. Its significance as a polysaccharide being able to breakdown into their monomeric and or oligomeric components leading to production of Dextrose, glucose, fructose, maltose & sorbitol. In fact starch has become an important material for the sweetening industry, which was otherwise relying upon sugar cane and beet sugar.

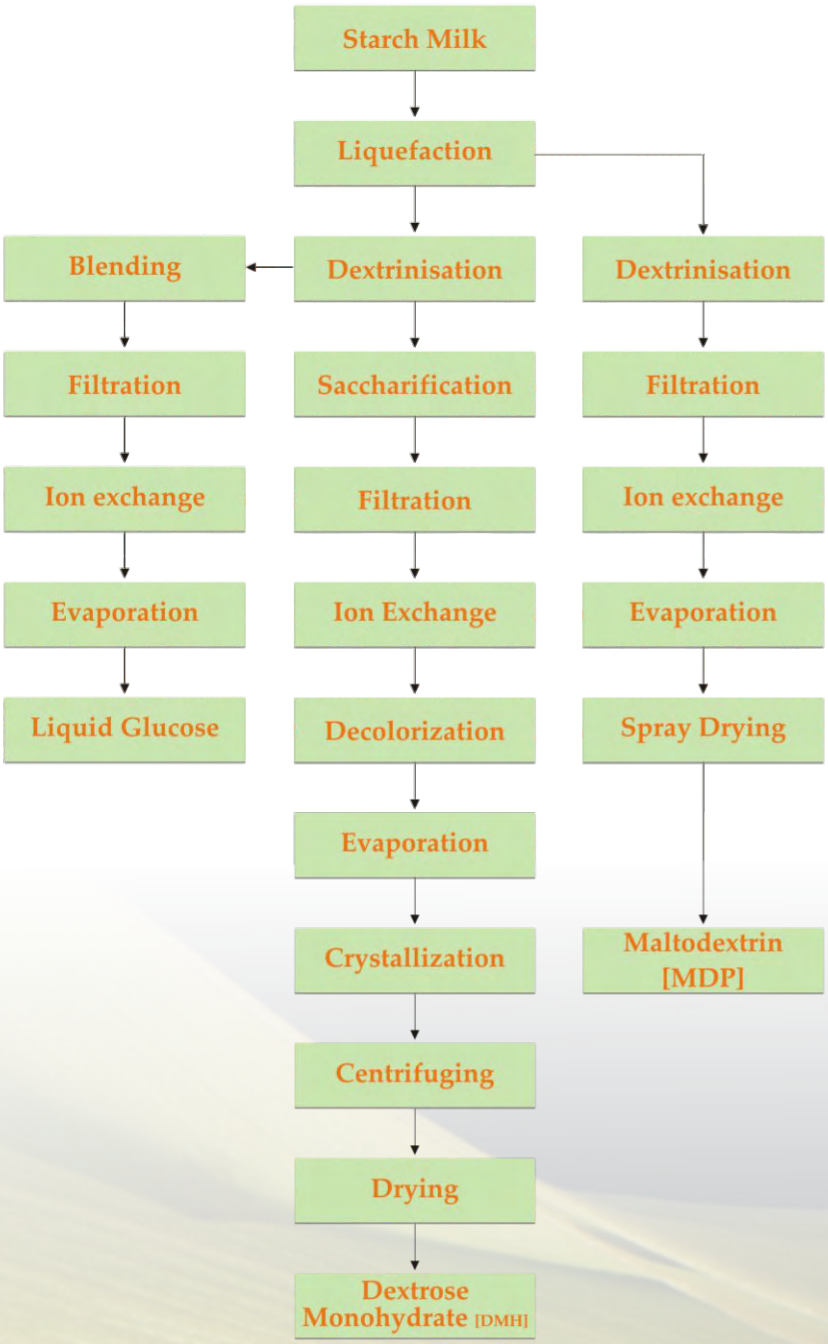
The most common uses of starch is in the following industries:

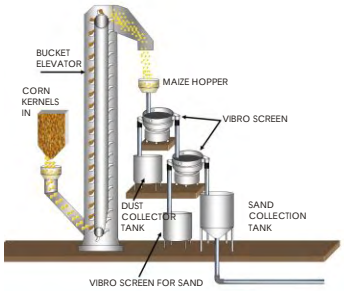
1. Food industries as glucose, dextrose, fructose, sorbitol, maltodextrene as filler and sweetener.
2. Paper industry for sizing, pulp making & surfacing.
3. Textile industry for pointing & finishing.
4. Ceramic Industry as binder.
5. Adhesive & Abrasive industry as major ingredient.
6. Rubber industry as filler.

Production of **Starch from Maize**



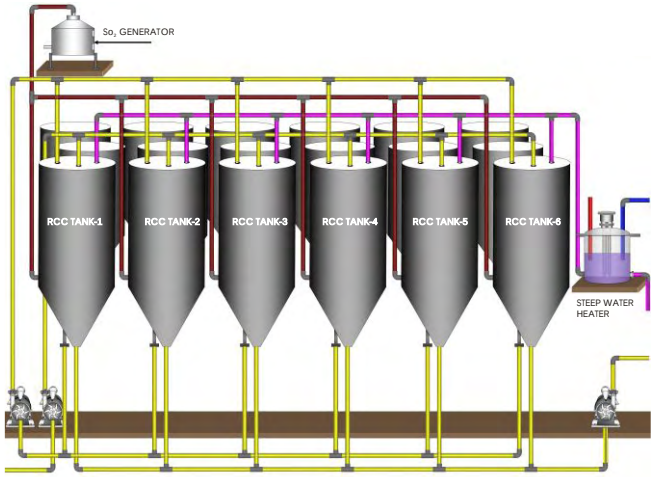
Production Of **Starch Derivatives**





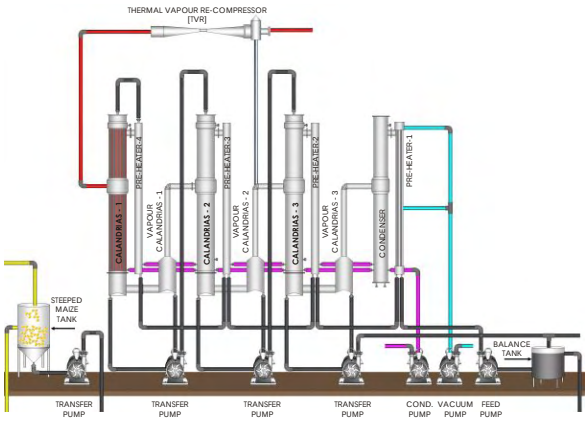
Maize Cleaning

Maize grain is received from farmers or market at the wet milling plant in bulk. It is prepared for milling by screening to remove all large and small pieces of cob, chaff, sand, and other undesirable foreign material. Dust and light chaff are removed by aspiration. Cleaning of the Maize is an important first step in the wet milling process.



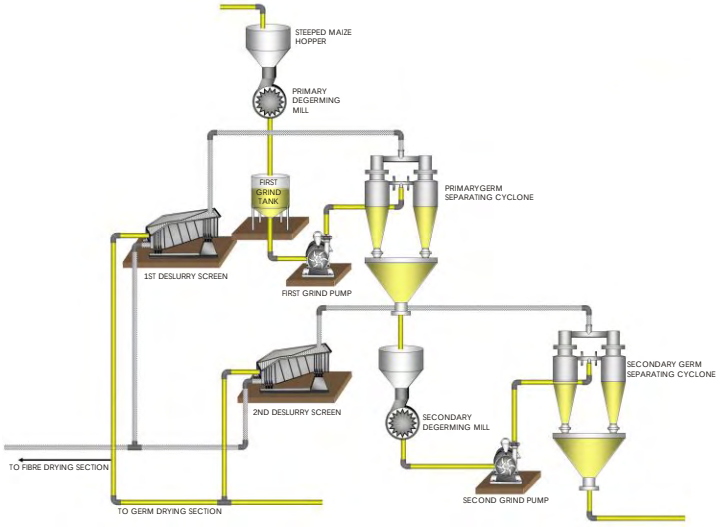
Steeping

Prior to the wet milling, the Maize must be softened by a steeping process developed to produce optimum milling and separation of Maize products. It involves maintaining the correct balance of water flow, temperature, sulfur dioxide concentration, and is normally steeped in between 40 to 60 hours at a temperature of 48° to 52° C. By the end of steeping the Maize should have absorbed water to 38-42% (wet basis), released water about 6.0% of its dry substance as soluble in to steep water, absorbed SO_2 and become sufficiently soft to liberate the Germ easily and free from adhering endosperm/hull. The starch will be readily freed from fiber by fine milling and screening.



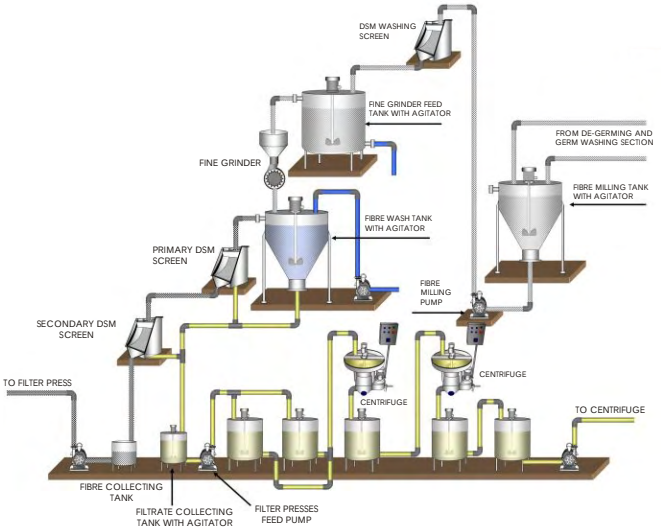
Corn Steeped Liquor (C.S.L.) section

Feed is received in a level controlled balance tank and passed through pre-heaters, calandrias and vapor separators of various effects. The evaporation takes place under vacuum, which is maintained mainly by vacuum system. Steam is supplied as a heating medium to high heater and through thermal vapor recompression (TVR) to the first effect jacket. The concentrated product is having 50% concentration is continuously taken out from the plant.



De –Germing & Germ Washing

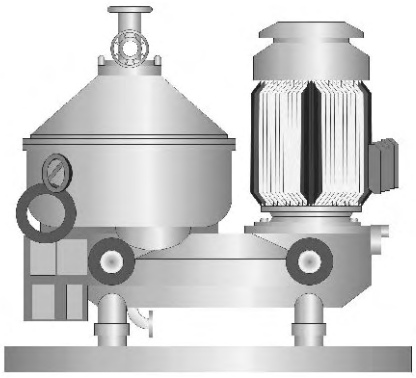
The object of the milling process is to provide optimum separation of components of the maize kernel. After steeping, the Maize is coarsely ground or pulped with water in such a way that the grind will be split into two or three pieces and the Germ portion is liberated with minimum breakage. The De-germing mill will have one rotating and one stationary tooth discs with a pyramidal knobs on the surface. The ground (primary) slurry and pulp is dropped to primary germ separation system. The large difference in density between the germ and the other kernel components results easy separation in the system and the germs are forwarded to germ washing, moisture squeezing, drying and packing for dispatch or for oil extraction.



Fibre Milling Washing and Dewatering Section:

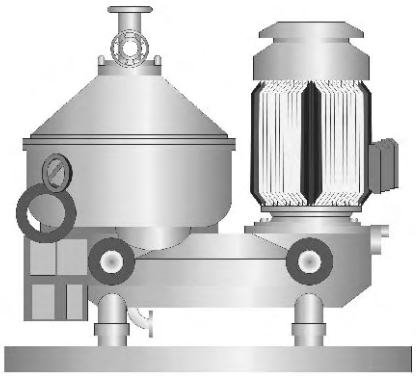
Here the specially designed self-agitating sumps and screens are employed. The water form of slurry carries maximum starch and gluten, and fibres are washed well without any free starch. The slurry is forwarded to millstream tank for preceding step of process. The washed fiber is sent to a collecting tank.

The washed fiber is transferred to the fiber de-watering screw press, in this water is squeezed off from the coarse fiber (60%) and squeezed fiber is blended with concentrated CSL obtained from CSL Evaporator, dried in a Spin Flash Dryer and directly sold as cattle feed to the dairy farm farmers.



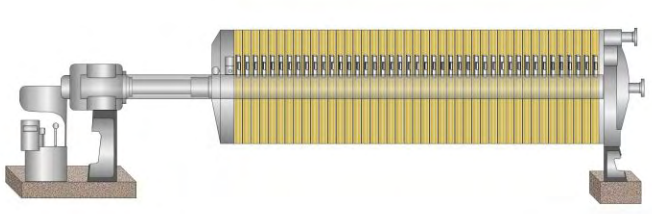
Primary Separation

The main separation of protein from starch takes place at the Primary Separator. This a nozzle-bowl centrifuge equipped for washing, and is operated at a high starch density through the nozzles os that the lighter gluten is dicharged from the overflow.



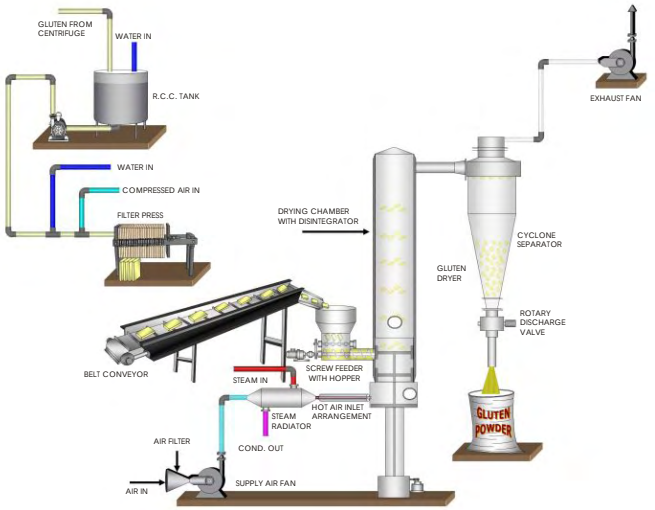
Gluten Thickener

The Gluten from the Primary Separator is subsequently dewatered in a gluten thickener. The concentration of gluten from gluten thickener is of 8 to 12%.



Gluten De-watering

The gluten received from gluten thickener is further de-watered through filter press. Cake received from filter press is having 40 to 45% concentration is dried in powder form in a Spin Flash Dryer.

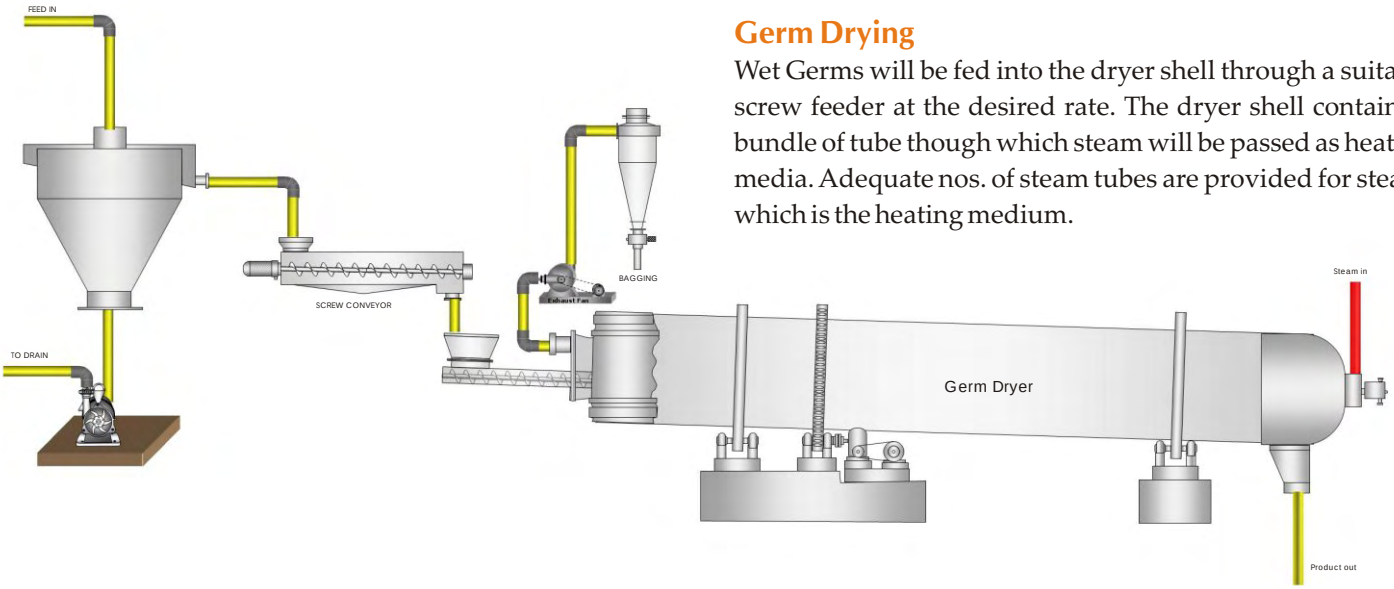


Gluten Drying

Spin flash dryers are used for drying gluten. The hot drying air from the air distributor carries away the dried particles to the cyclonic separator.

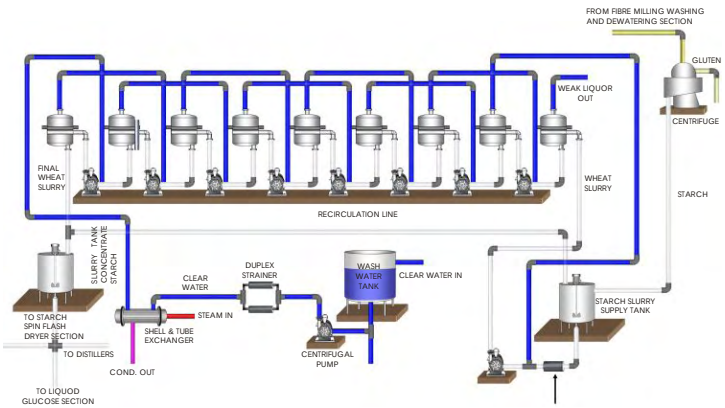
The fresh drying air is taken in and heated in the steam radiator or direct gas fired air heater.

The powder loaded air is taken out at the chamber top, led to the cyclonic separator and separated through the rotary valve. The described process is basic and there are numerous combinations of process flows depending on the actual requirement.



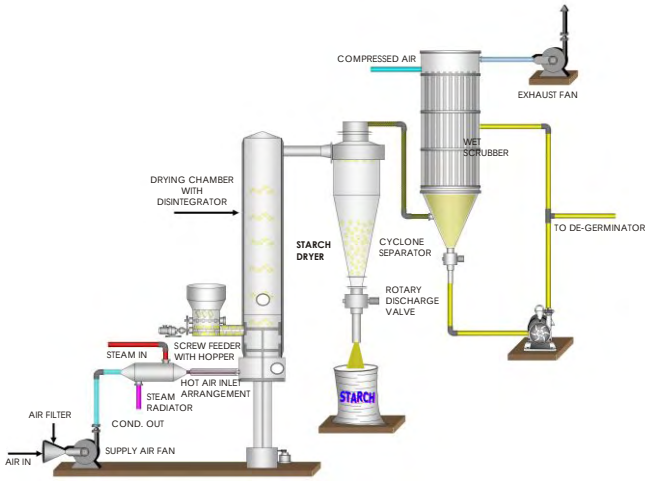
Germ Drying

Wet Germs will be fed into the dryer shell through a suitable screw feeder at the desired rate. The dryer shell contains a bundle of tube though which steam will be passed as heating media. Adequate nos. of steam tubes are provided for steam, which is the heating medium.



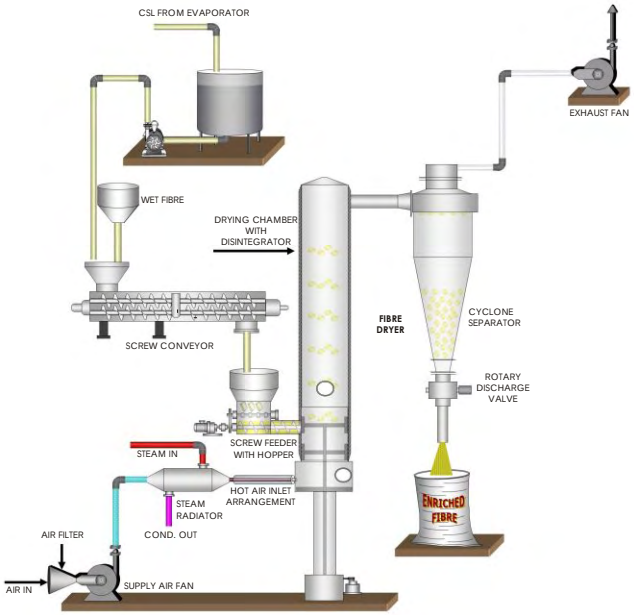
Hydro Cyclone

To make quality starch it is necessary to remove the soluble and insoluble remained in the starch slurry that comes from primary separator. Starch from the primary separator has 2-4% protein and 12-17 grams/litre of soluble impurities, depending on the amount of wash water used. Further purification is achieved by multistage counter-current washing. The commonest arrangement uses 9-15 stages of small diameter hydrocyclones, eachstage containing many hydrocyclones in parallel.



Starch Drying

Spin flash dryers are used for starch drying. The wet product is introduced in the feed hopper in the form of wet cake from peeler centrifuge. The incoming feed is partially grated, homogenized and forced down into the screw feeder. The powder loaded air is taken out at the chamber top, led to the cyclone separator and separated through the rotary valve. The exhaust air is then pass through wet scrubber which will arrest fine particles from exhaust air. Fine particles get dissolved into water and recycled to milling section.



Enriched Fibre Dryer

Spin flash dryers are used for drying Enriched Fibre obtained by mixing of concentrated CSL (Corn Steeped Liquor) with Fibre. The hot drying air from the air distributor carries away the dried particles to the cyclonic separator.

The fresh drying air is taken in and heated in the steam radiator or direct gas fired air heater.

The powder loaded air is taken out at the chamber top, led to the cyclonic separator and separated through the rotary valve. The described process is basic and there are numerous combinations of process flows depending on the actual requirement.

Malto-dextrine Section

Maltodextrins are starch hydrolysis products of less than 25 D.E, produced by hydrolysis of Corn starch by enzyme technique. A typical total enzyme process uses Bacterial-Alpha-Amylase hydrolysis followed by additional conversion to get the desired D.E. They are then refined using clarification, carbon treatment and ion exchange. The final product is spray dried to a moisture level of 3% to 5%.

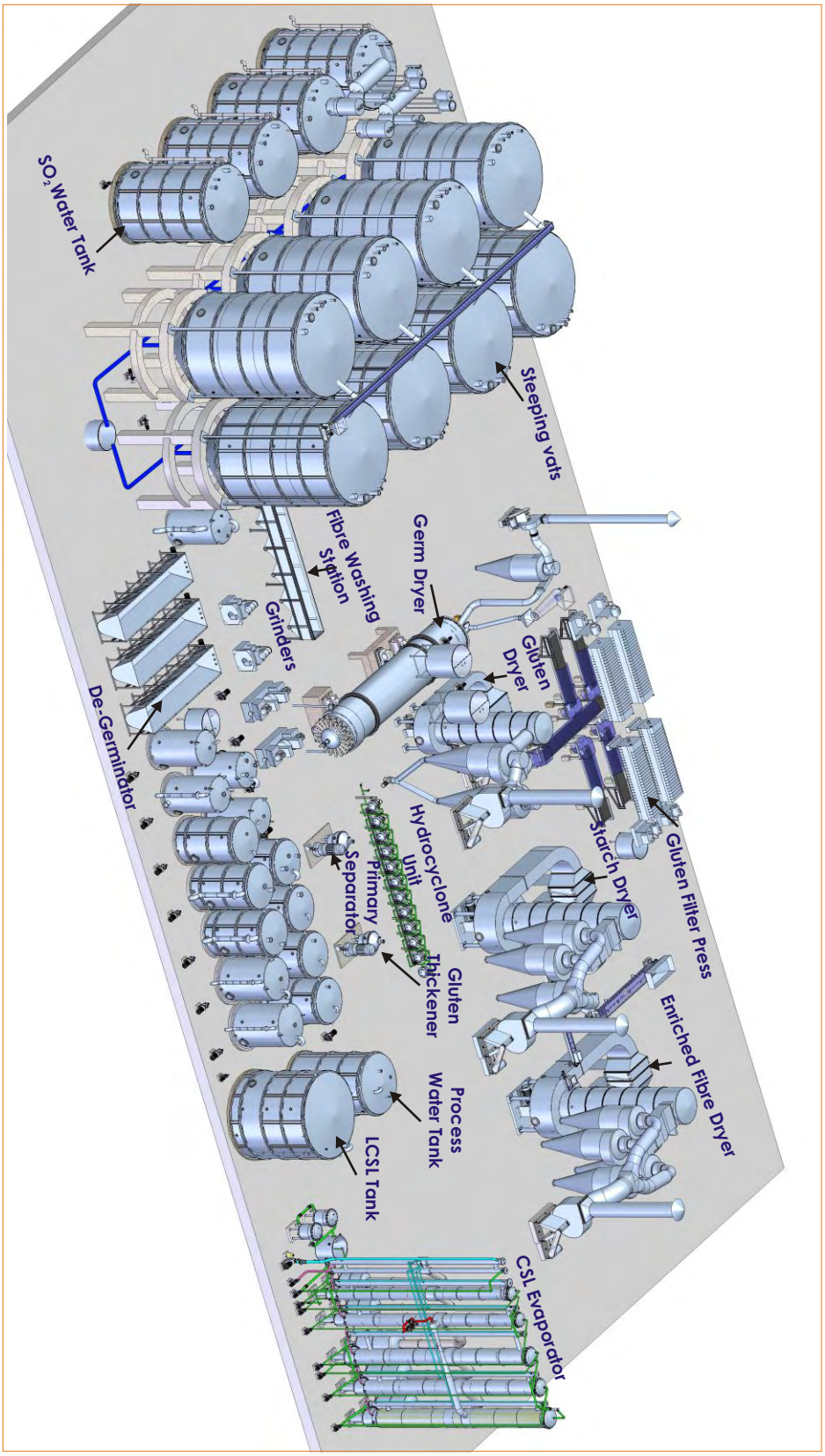
Dextrose Monohydrate Section

Dextrose is the trivial name given to crystalline D-Glucose. It is a Monosaccharide sugar and is widely distributed in the plant Kingdom. It is largely manufactured by Enzyme-Enzyme hydrolysis of starch; usually corn starch. Dextrose is available in the Monohydrate and Anhydrous form.

Liquid Glucose Section

Commonly known as Glucose or Corn Syrup, this is perhaps the most visible substitute of cane sugar. Liquid Glucose is an aqueous solution of several compounds. These are principally Dextrose, Dextrins and Maltose. The most common method of manufacturing Liquid Glucose is by the incomplete acidic or enzymatic hydrolysis of starch followed by refining (filtration and ion exchange) & evaporation.

CORN WET MILLING PLANT



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