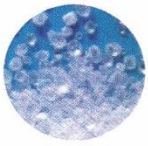
YASMIN TRADING



Fermentation Solution

- Engineering
- Equipment
- Installation
- Commissioning
- Production

Contents

Nowadays, fermentation is widely applied in industry of pharmaceutical, food, energy, chemical, agriculture and environmental protection. The biggest difference between fermentation and other chemical industries is that it is a biochemical reaction carried by organism. Its main features are as follows:

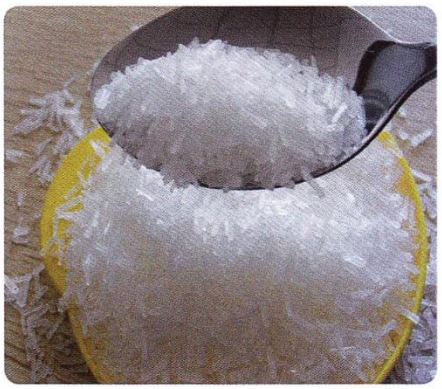
- Generally, the fermentation process is biochemical reaction that proceed at normal temperatures and pressures, with safe reaction and simple condition requirements.

- The raw materials used in fermentation are quite extensive, usually based on starch, molasses and other agricultural products, and the reaction can be proceed by adding a small amout of organic and inorganic nitrogen sources and other nutrients. Because of the different categories, the microorganism can be selectively taken advantage of required nutrition. Based on this feature, it can make use of waste materials etc. as raw materials for the fermentation to renovate and renew of biological resources.

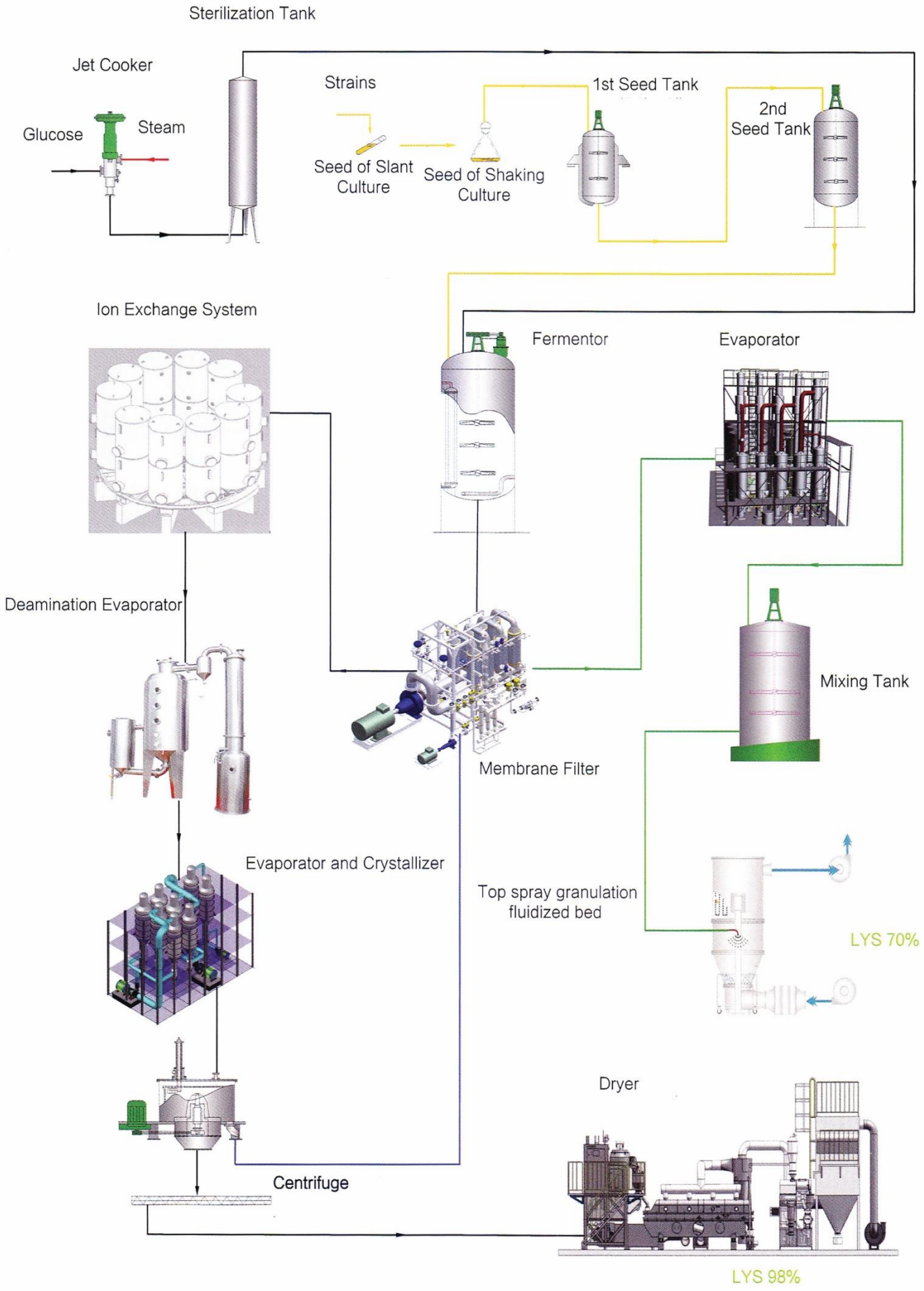
- The fermentation process is performed by the automatic adjustment of the organism, so the reaction specificity is strong and can get more single-metabolites; and it can proceed highly selective chemical conversion reactions to the certain parts of complex compounds, such as oxidation, reduction, etc. and also can produce some more complex polymer compounds.

- The microbial strain is the basic factor of fermentation, through breeding, it can get high yield excellent strain, also can get some products which are difficult to be produced by conventional methods.

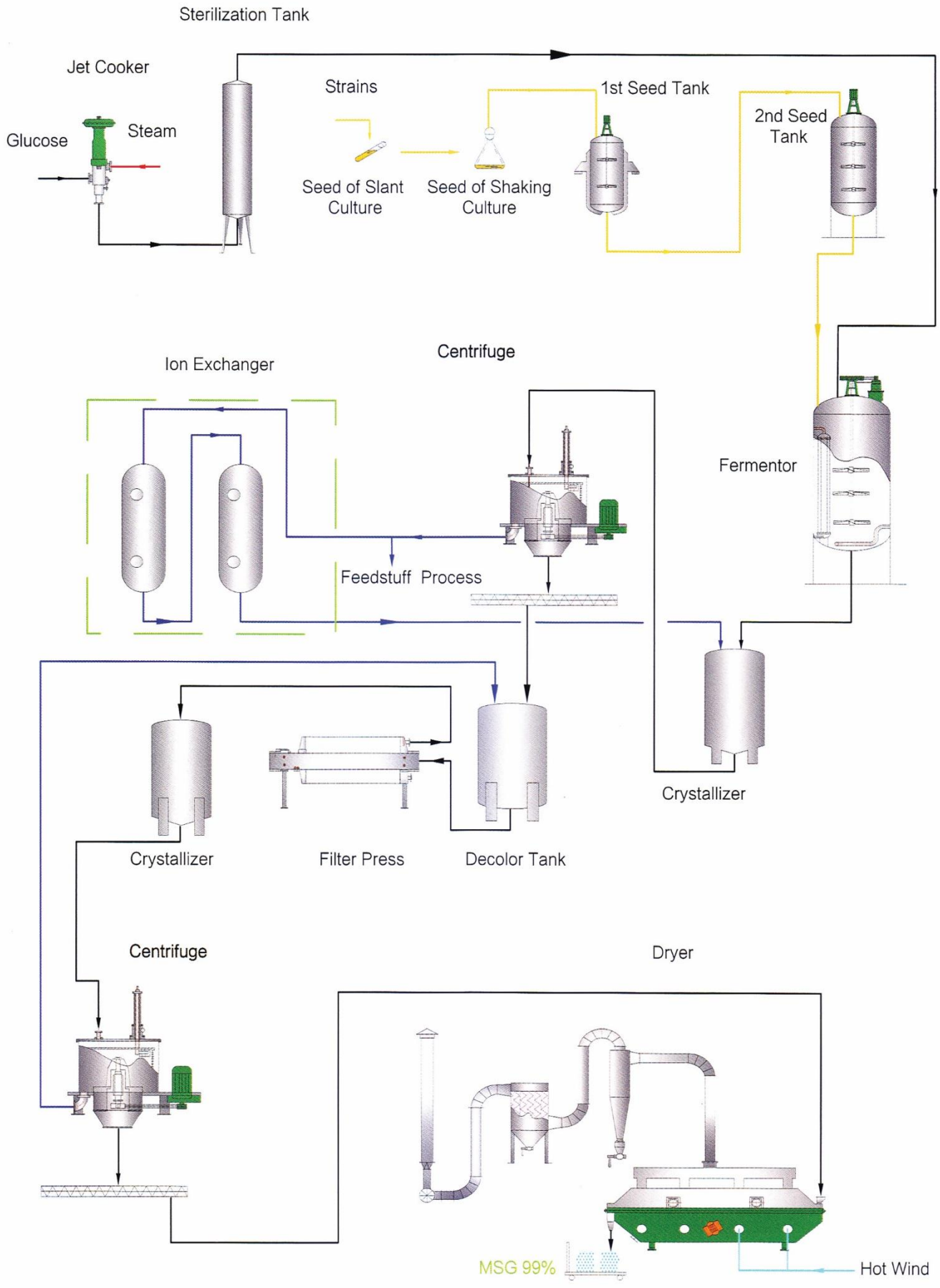
- The fermentation industry has the advantages in certain aspects that other industries cannot replace. Compared with the traditional fermentation, the modern fermentation engineering has its superiority beside the above characteristics. Except the microbes, we can also utilize "engineering bacteria" to react with aid of cells and enzymes of animal and plant. The equipment comprises not only the conventional fermentation tank but also a variety of bioreactors with high automation, so that the fermentation level get greatly improves on the original basis.



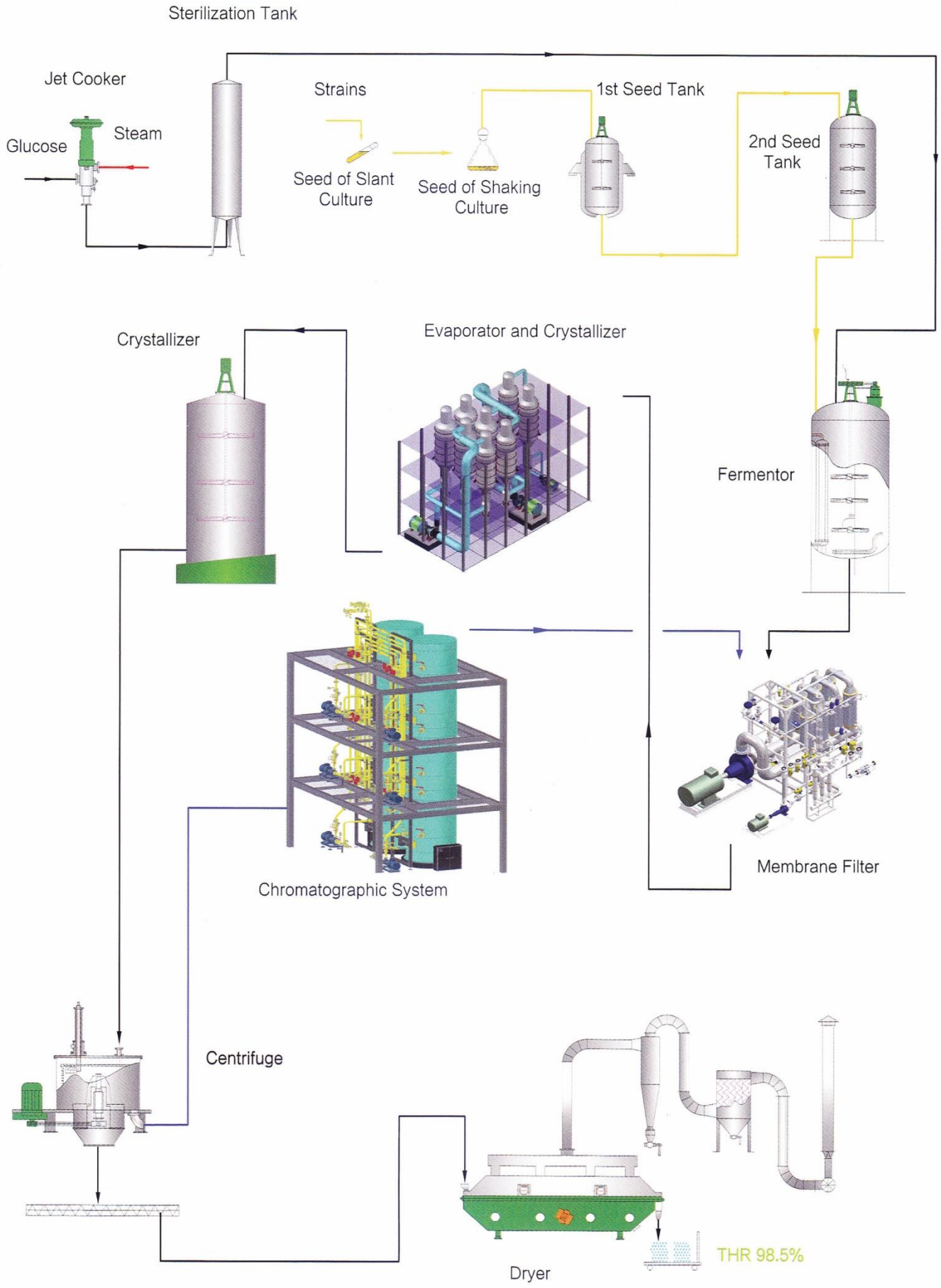
Lysine production process



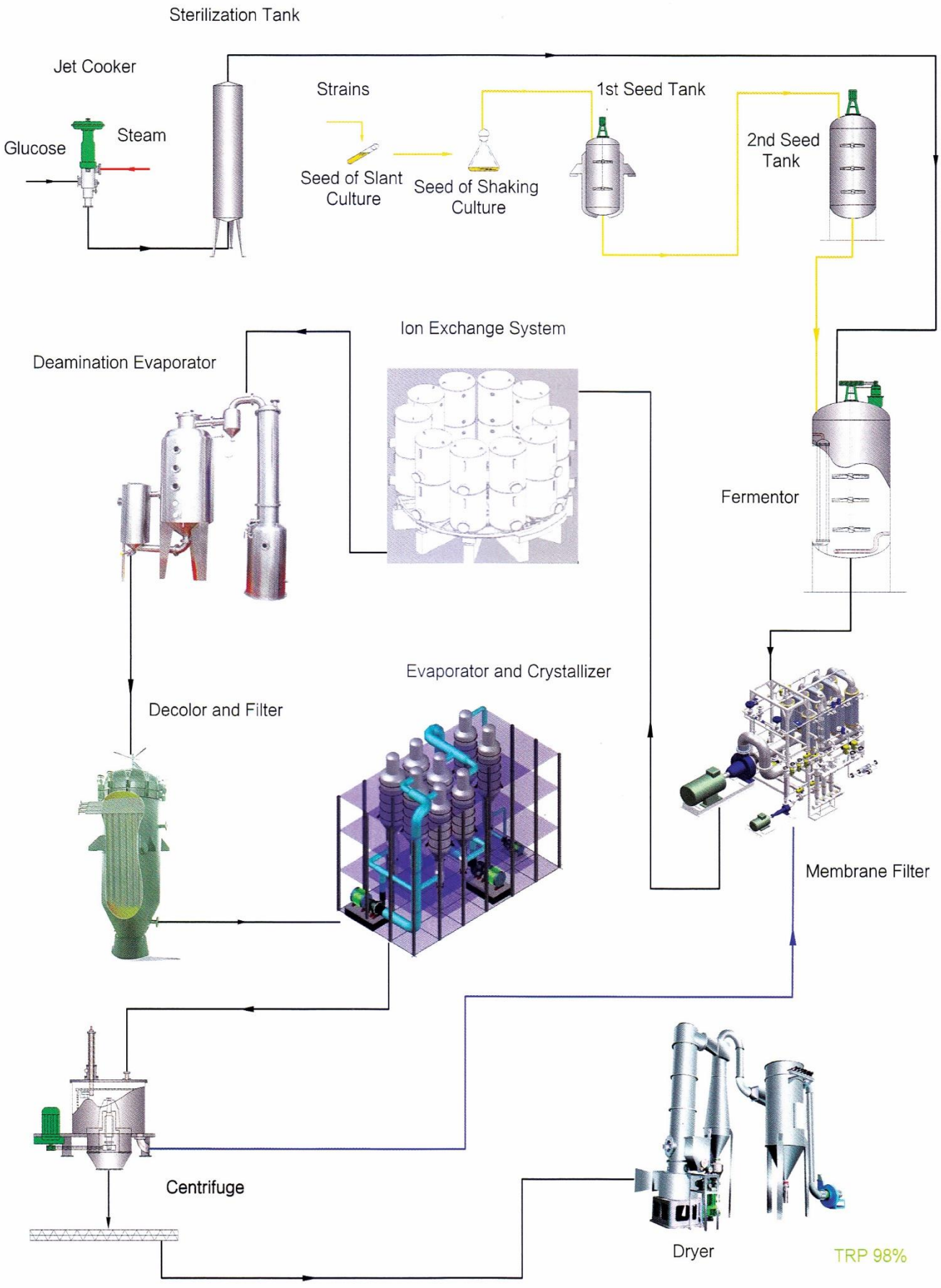
MSG production process



Threonine production process



Tryptophan production process



Citric Acid Fermentation process

Brief introduction of citric acid

Citric acid has a wide range of utilization field in chemical industry, medicine industry, food industry, cosmetics industry and other fields It is well know as the most widely used organic acid. China has entered into the ranks of the world's powerful citric acid producers.

Raw materials

The crops which contain starch , finished industrial products and industrial waste can be used as the raw materials for fermentatior production of citric acid.

- Crops: corn, rice, wheat, cassava, sweet potato, potato, etc.;
- Finished industrial products: starch, glucose, etc.;
- Industrial waste: glucose mother liquor, beet waste, bagasse, etc.

Principle of selecting raw materials

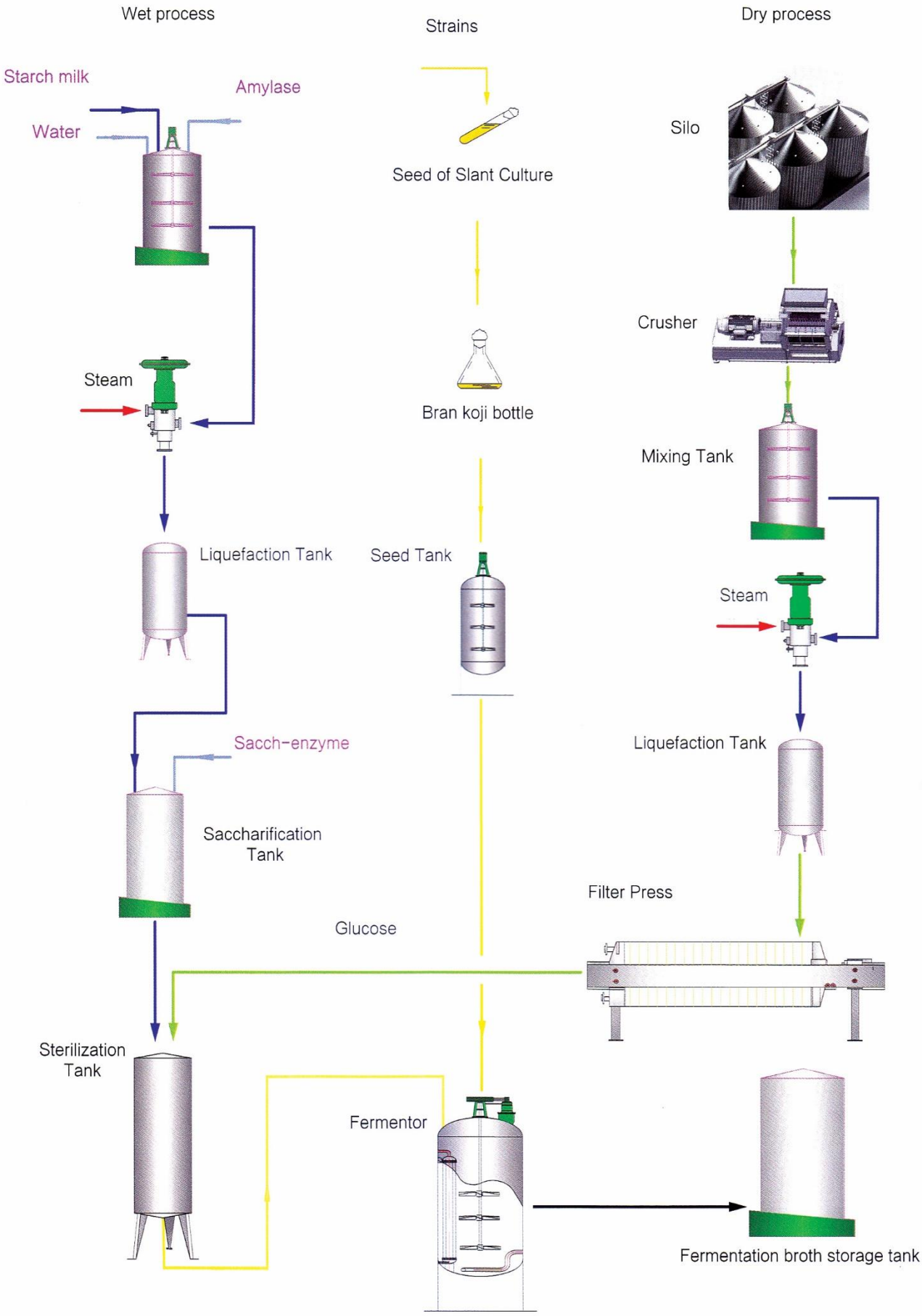
- Availability: plenty of quantity, easy to obtain, cheap, easy to store;
- Processability: good quality, high starch content, simple processing technology;
- Safety: for products which are required to use non-GMO raw materials, it is necessary to avoid the selection of GMO suspectec raw materials.

Selection of citric acid liquid deep fermentation process

Meckey can provide a variety of treatment and fermentation process based on different raw materials:

- Continuous fermentation process by using corn/rice;
- Continuous fermentation process by using cassava/sweet potato;
- Continuous fermentation process by using whole syrup from corn wet processing, wheat wet processing as well as glucose mother liquor, etc.

Citric Acid Fermentation process



Citric Acid Extraction process

Brief introduction of citric acid extraction method

The composition of citric acid fermentation liquid is rather complex, which contains a variety of nutrient substances that have not been metabolized and a small amount of non-citric acid substances produced in the metabolic process. To obtain high-quality crystalline citric acid, it is required to conduct extraction process. At present, there are two main extraction processes of citric acid that have achieved industrial production,which are calcium salt method and chromatographic method.

Technological advantages of Meckey

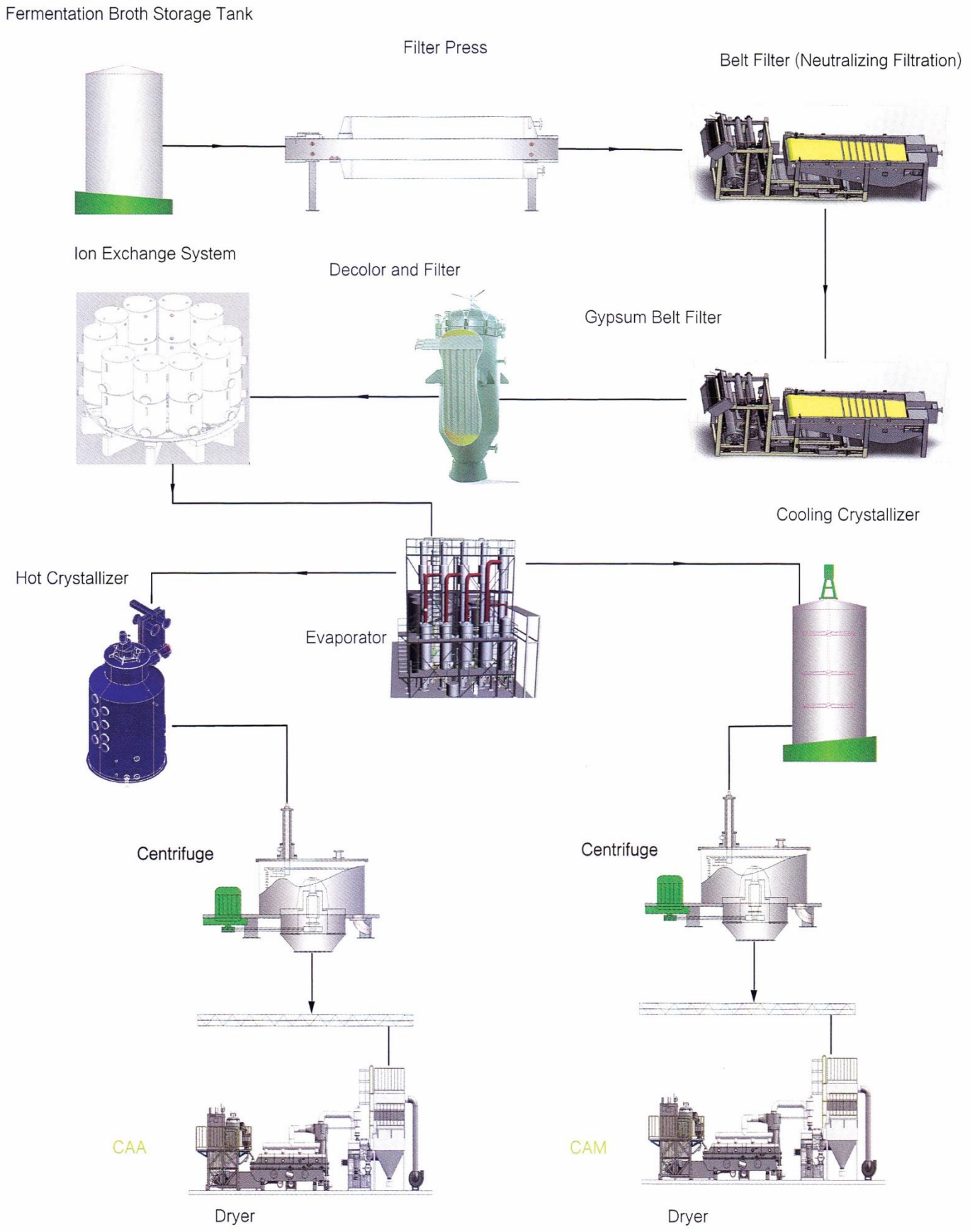
- Mature technonolgy, good and stable product quality, cost effective production.
- Two-step calcium salt method (referred to as CaHCA method) : CaHCA is obtained by the two-step neutralization reaction of citric acid and calcium carbonate (or calcium oxide, calcium hydroxide), then citric acid is obtained by reaction between CaHCA and sulfuric acid. Because there is two-step neutralization reaction, the reaction leads to the result of obtaining CaHCA, it is called two-step calcium salt method (CaHCA).

Design advantages of Meckey

Meckey provides customized and professional design services based on the specific needs of customers. Reasonable design and optimal layout of workshop lead to the less construction investment and equipment investment.

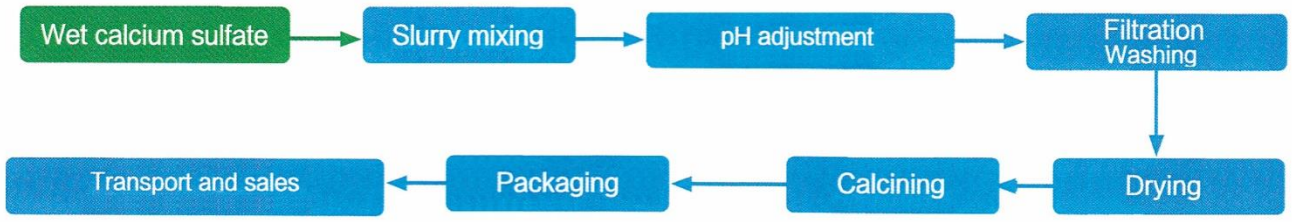
- Meckey`s citric acid production line has a higher level of automation, saves the labor force and improves production capacity.
- Meckey`s citric acid production line can lead to less energy consumption , less water consumption and higher total yield rate of product by optimizing the process, which enhances benefit for customers.

Citric Acid extracation process(Gypsum Method)



Treatment method of gypsum--a byproduct of citric acid production line

Method 1: Production of building materials. Dry and calcine the gypsum from the citric acid production line and sell it as building materials. The specific process is as follows:



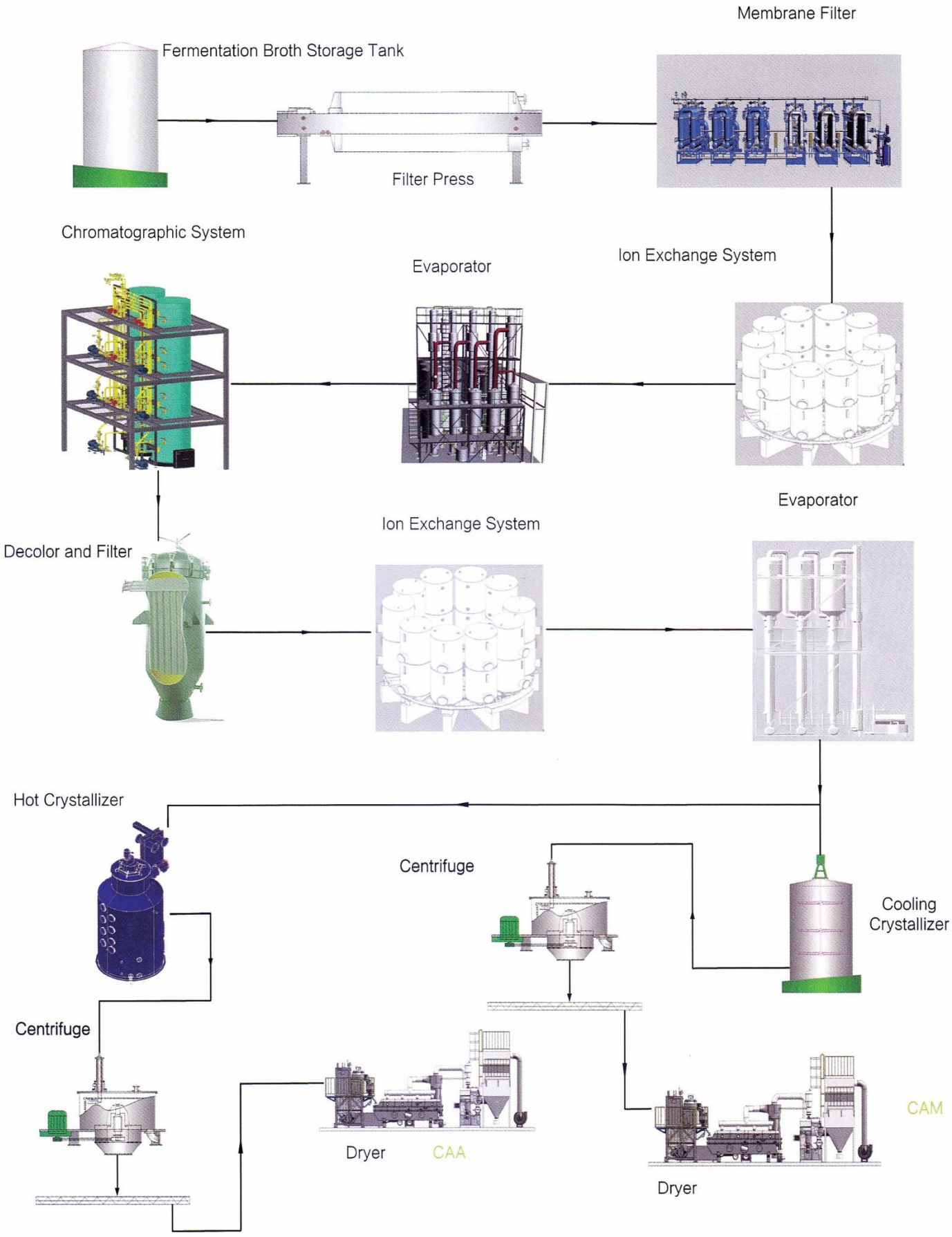
Method 2: As raw material for cement production. Currently, it can be provided to cement plants as cement filler.

Method 3: Improve soil. If there are enough sugarcane plantations in the area and calcium sulfate is needed to improve the soil, it can be directly sent to the sugarcane farms for use. Transport by truck to the turnover site, and farmers in need pick it up (factory is responsible for loading) or the factory is responsible for delivering it to the sugarcane field. This method is currently used in citric acid factory in Brazil.

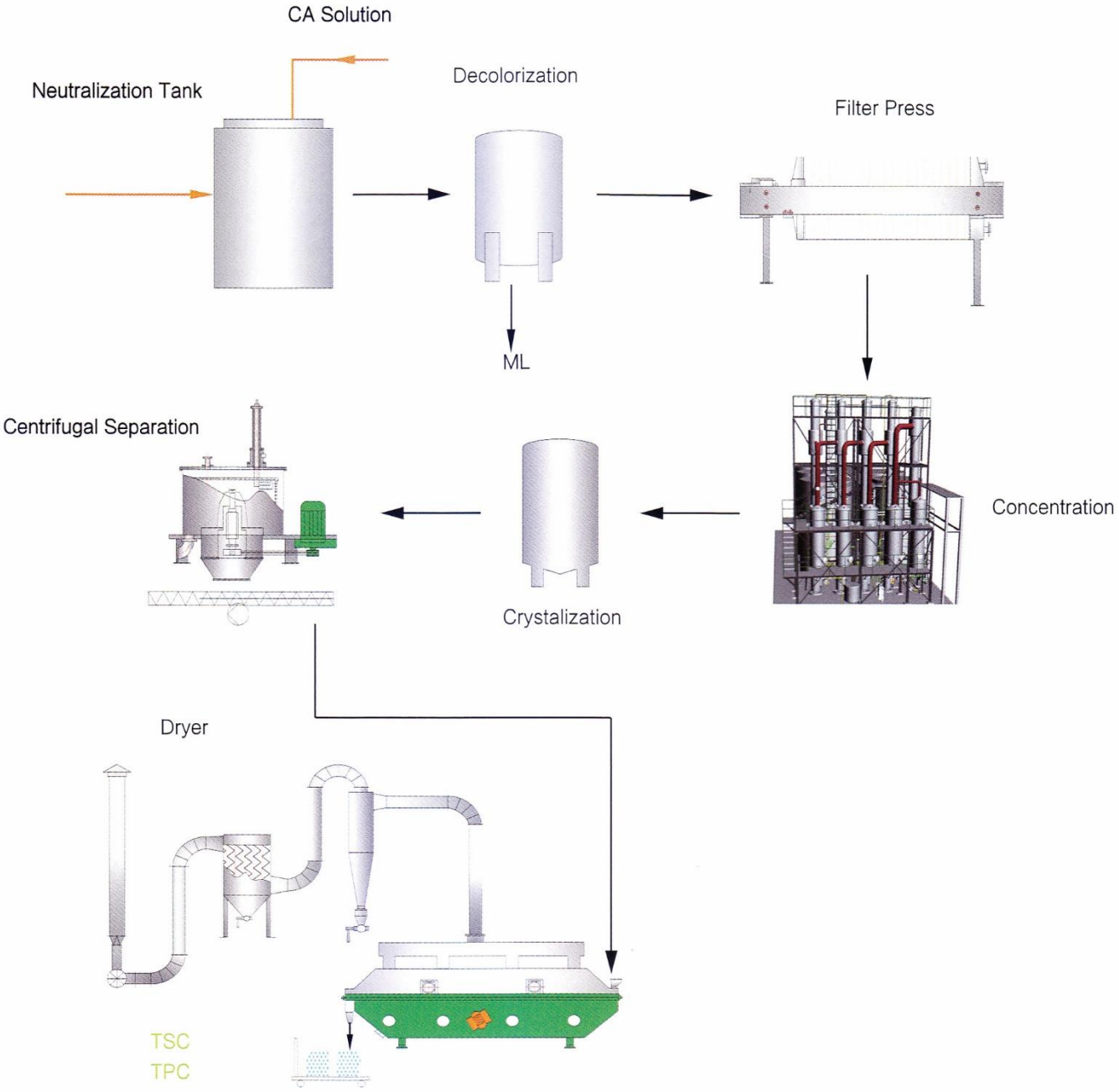
Method 4: Open-air landfill. If there is enough space nearby and gypsum stacking is allowed, the gypsum from the citric acid production line can be directly landfilled in the open air. Wet calcium sulfate is transported to the landfill site by truck and piled by forklift. Over time, it can be used as gypsum raw material after natural maturation.

Method 5: Landfill in abandoned mines. If there are abandoned mines nearby and gypsum filling is allowed, the gypsum from the citric acid production line can be directly poured into the abandoned mines for landfill treatment. The wet calcium sulfate (water content is 30-40%, no fluidity, can be piled up) from the filter outlet of the production line is transported by truck to abandoned mines and then flushed into the mine with water or mixed water.

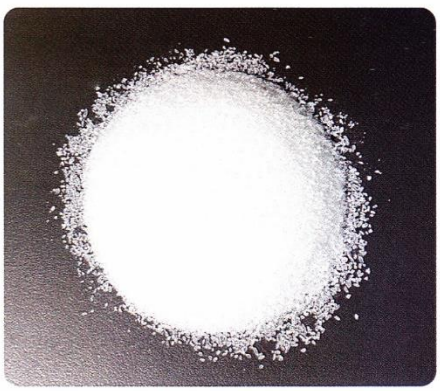
Citric Acid extracation process(Chromatography)



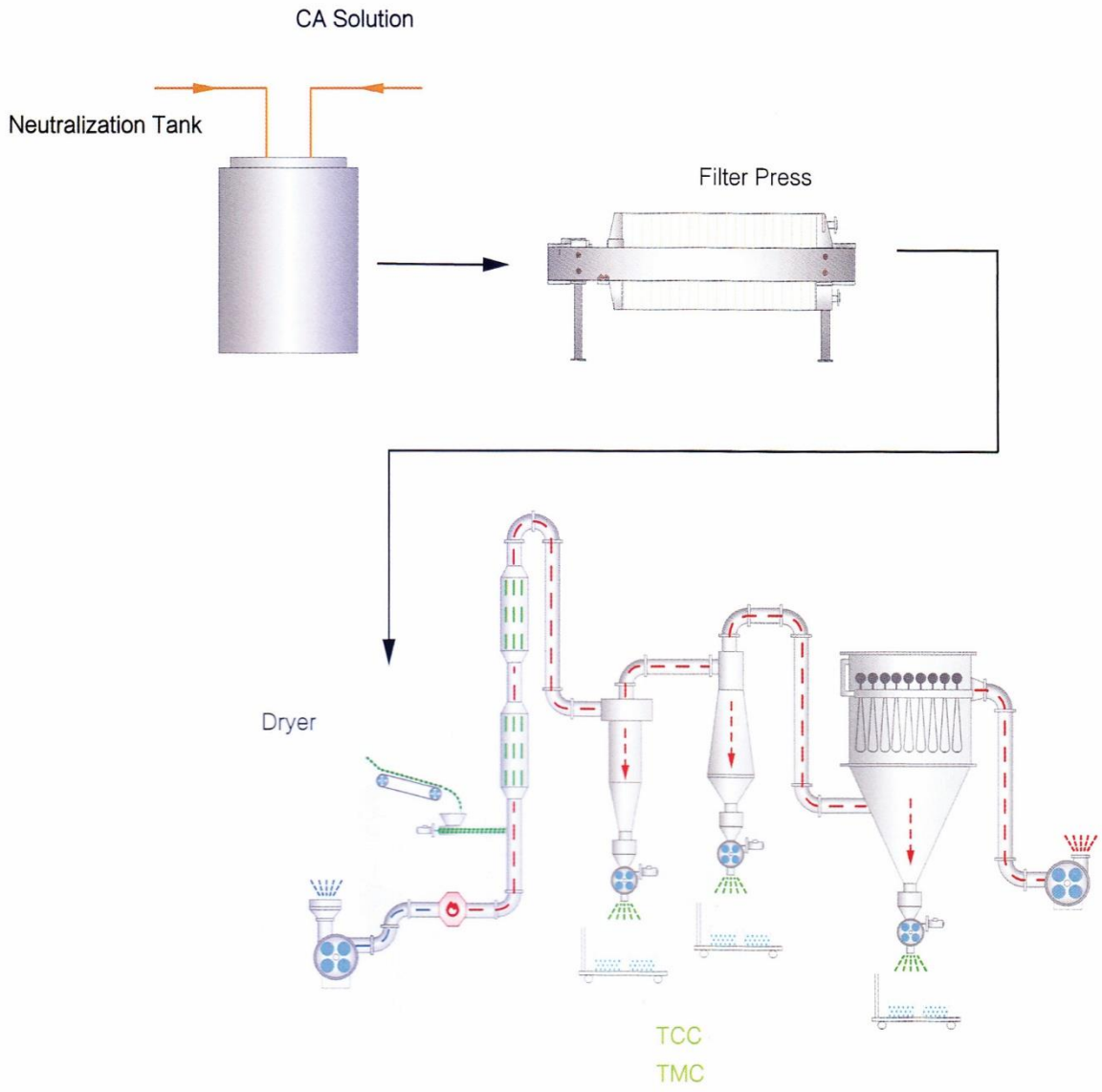
TSC/TPC production process

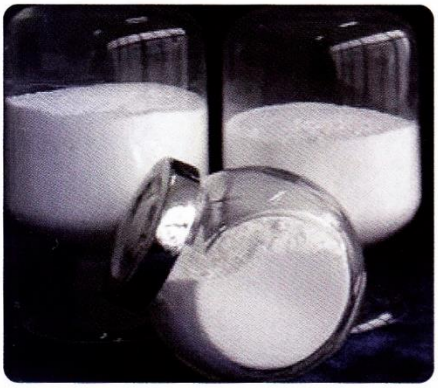


Sodium citrate also known as trisodium citrate, it is a sodium salt of organic acid, one of the basic agents in biological experiments. It can be widely used in the food industry and the construction industry. Sodium citrate also has a preservative effect and is used for long-term storage of some drugs.



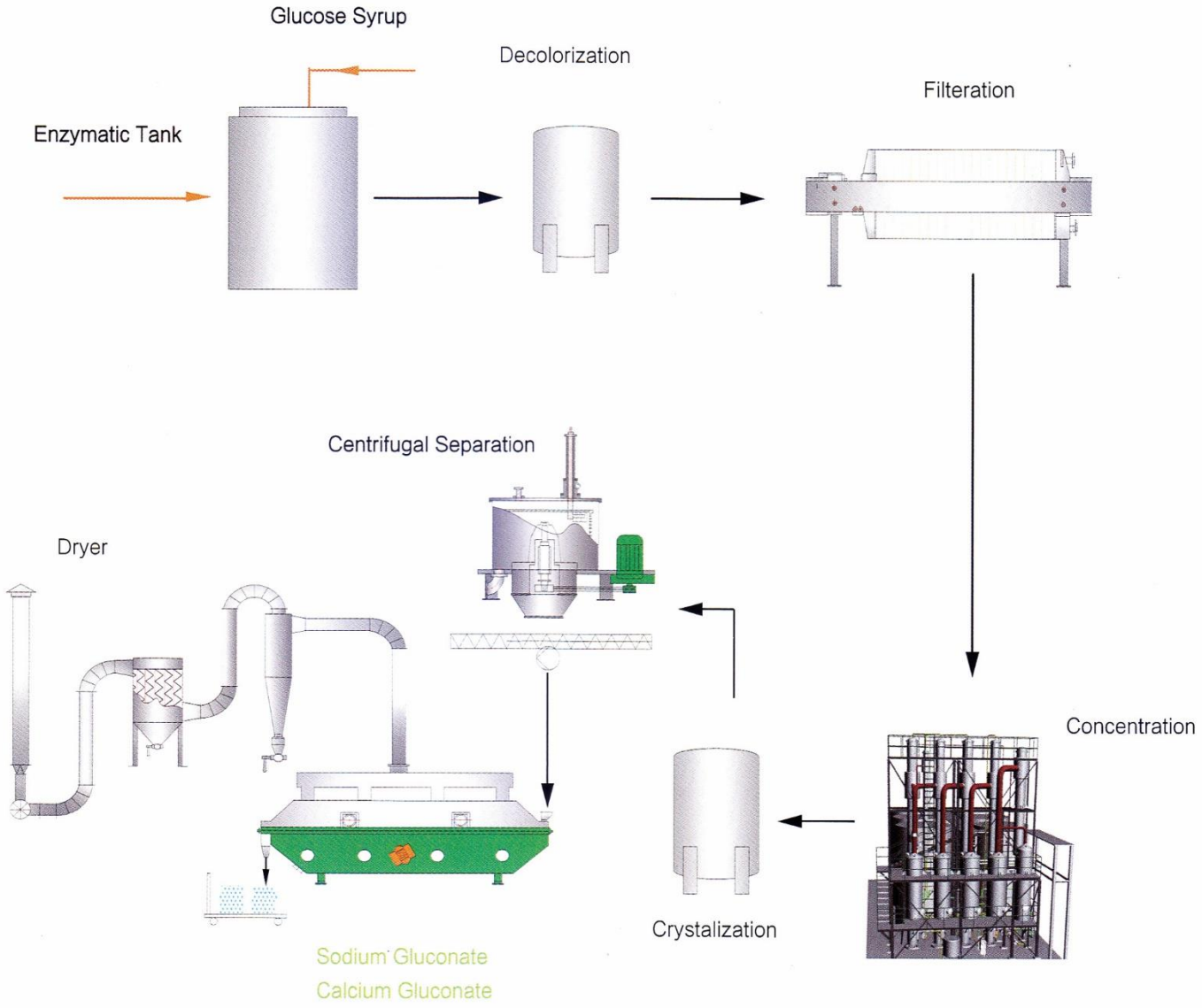
TCC/TMC production process





Calcium citrate is an organic compound, can be widely applied for food fortification.

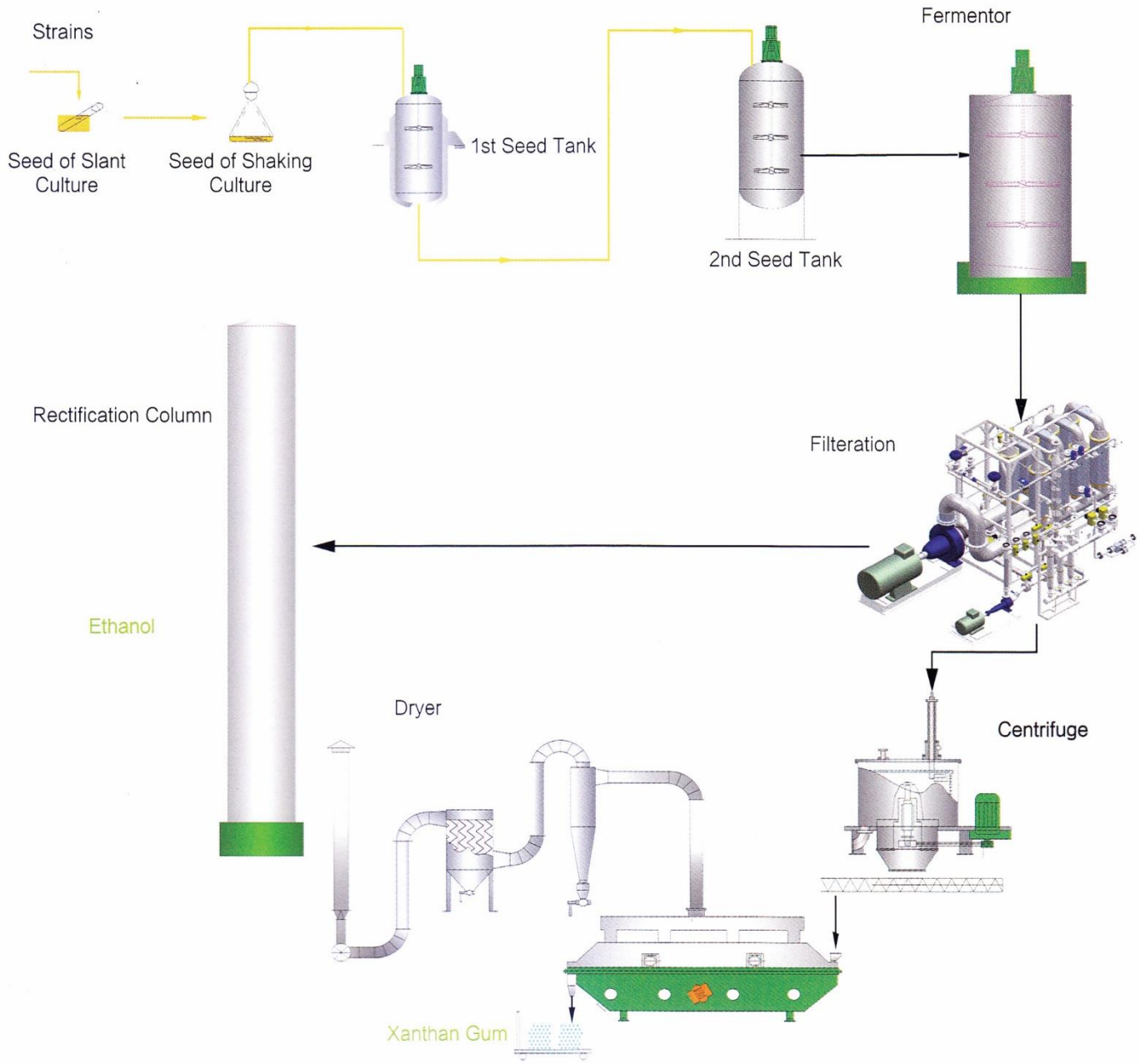
Sodium/Calcium gluconate production process



Calcium Gluconate is a nutritional drug, can reduce capillary permeability, increase density, maintain normal excitability of nerve and muscle, enhance myocardial contractility, contribute to the formation of bone. In the food industry, it is additive of health products, can also be used as compound feed in breeding industry.

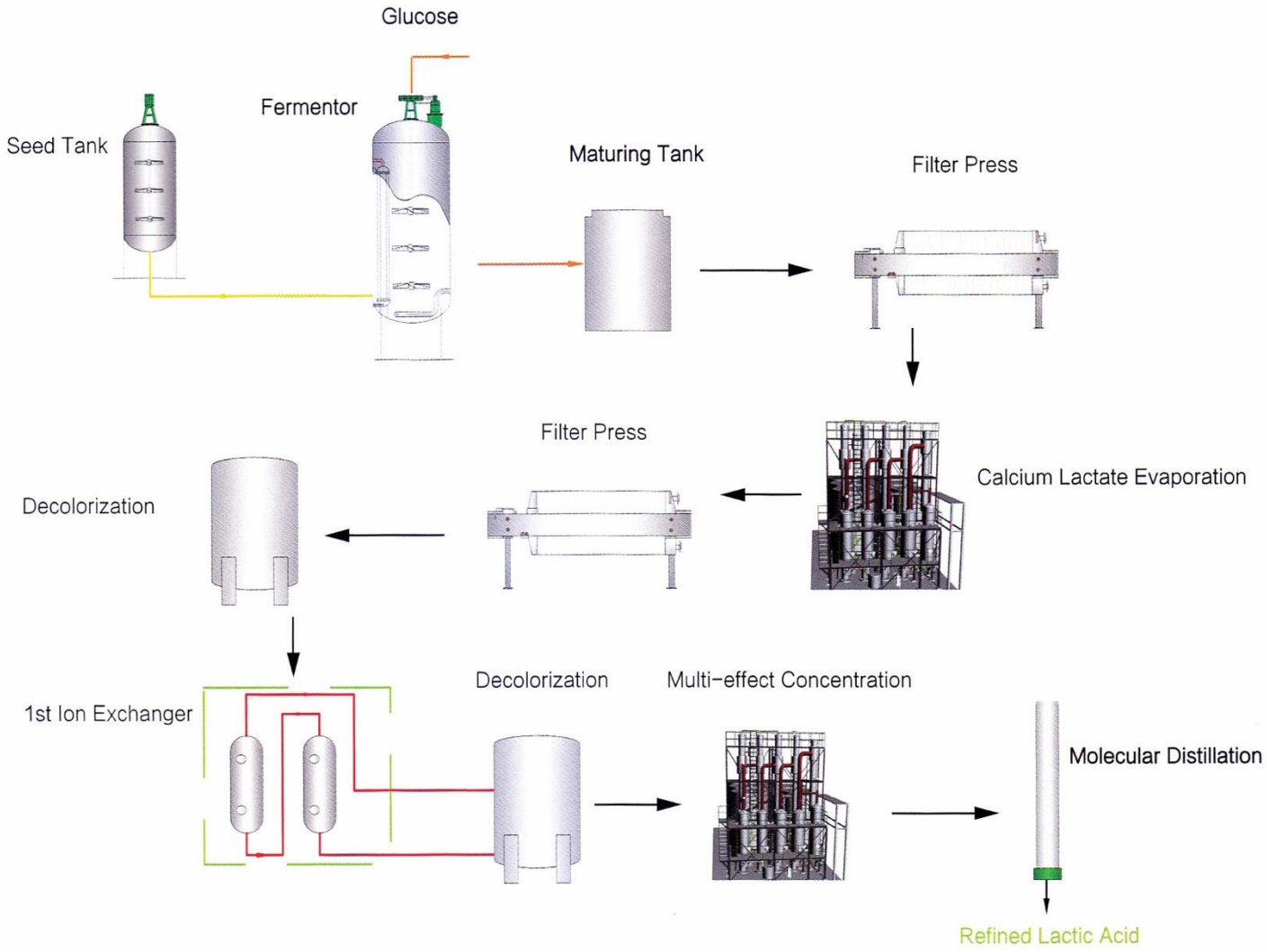
Sodium Gluconate is comprehensive product which is widely applied as retarder in construction industry, PH ajustment in pharmaceutical industry and flavoring agent in food industry.

Xanthan Gum production process



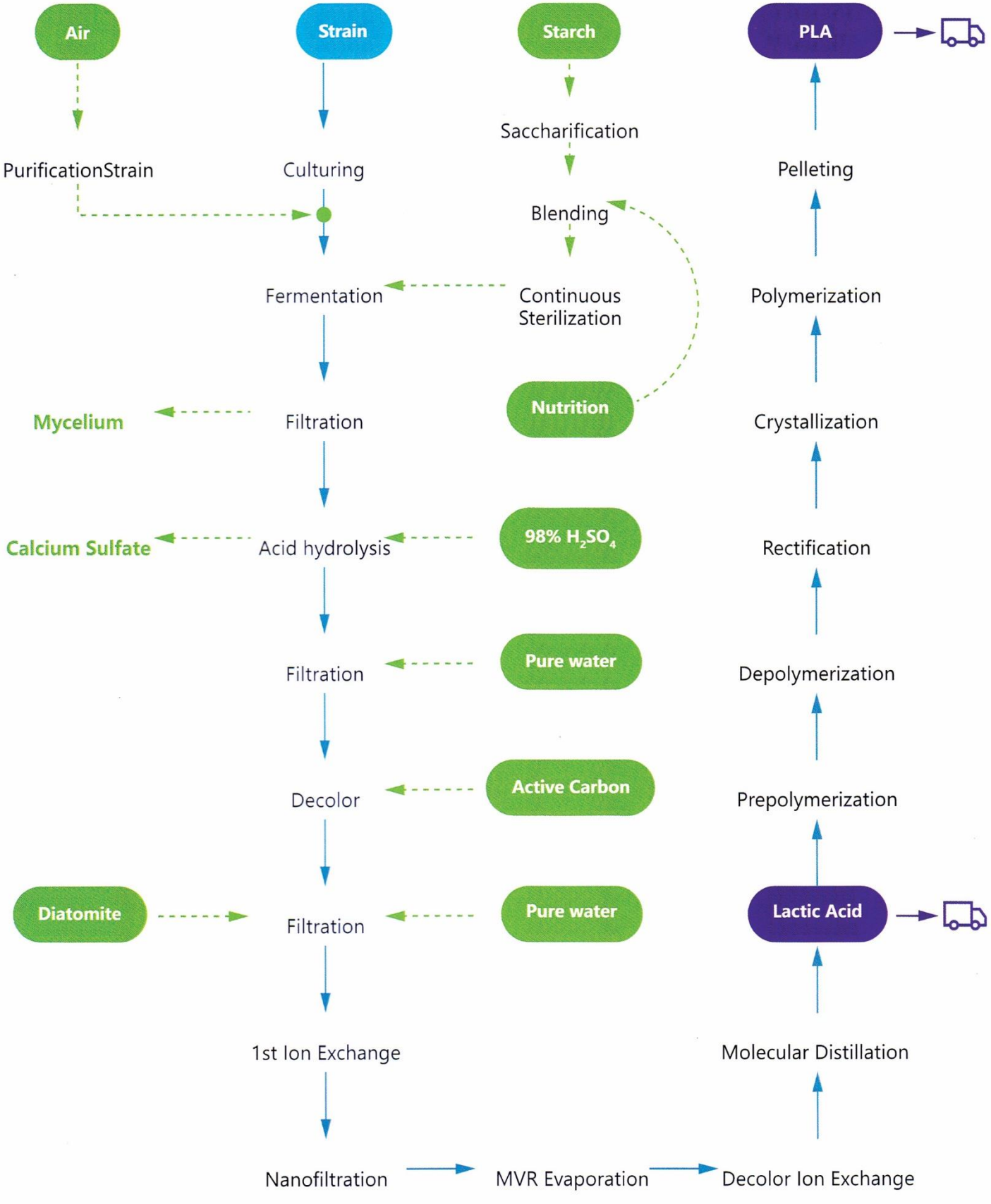
Xanthan gum is a microbial exopolysaccharide with a wide range of functions produced by Xanthomnas campestris through fermentation engineering using carbohydrates as the main raw material (such as corn starch). Xanthan gum can be widely used in 20 industries such as food, petroleum, and medicine. Xanthan gum is currently the largest and most widely used microbial exopolysaccharide in the world.

Lactic Acid production process

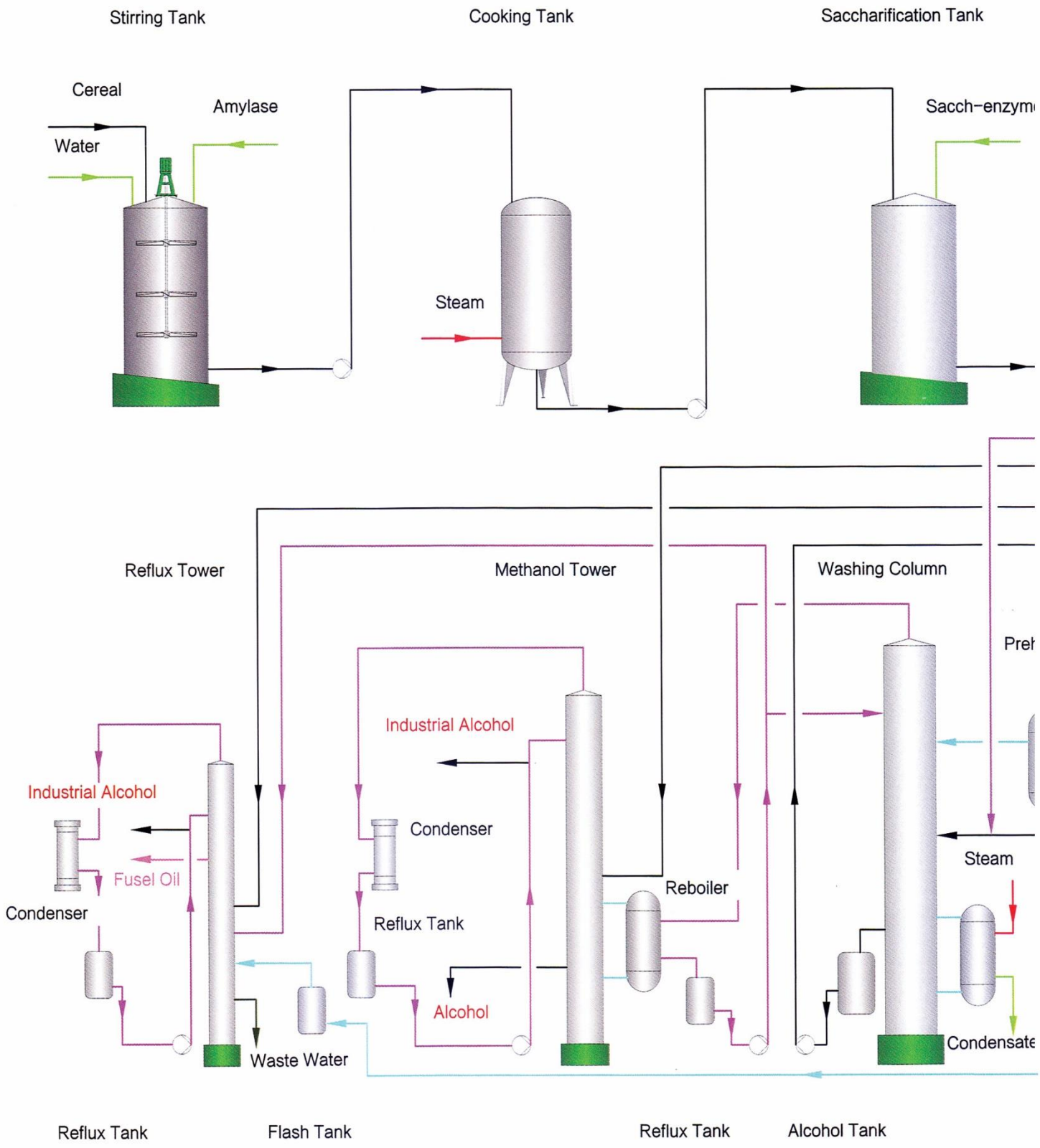


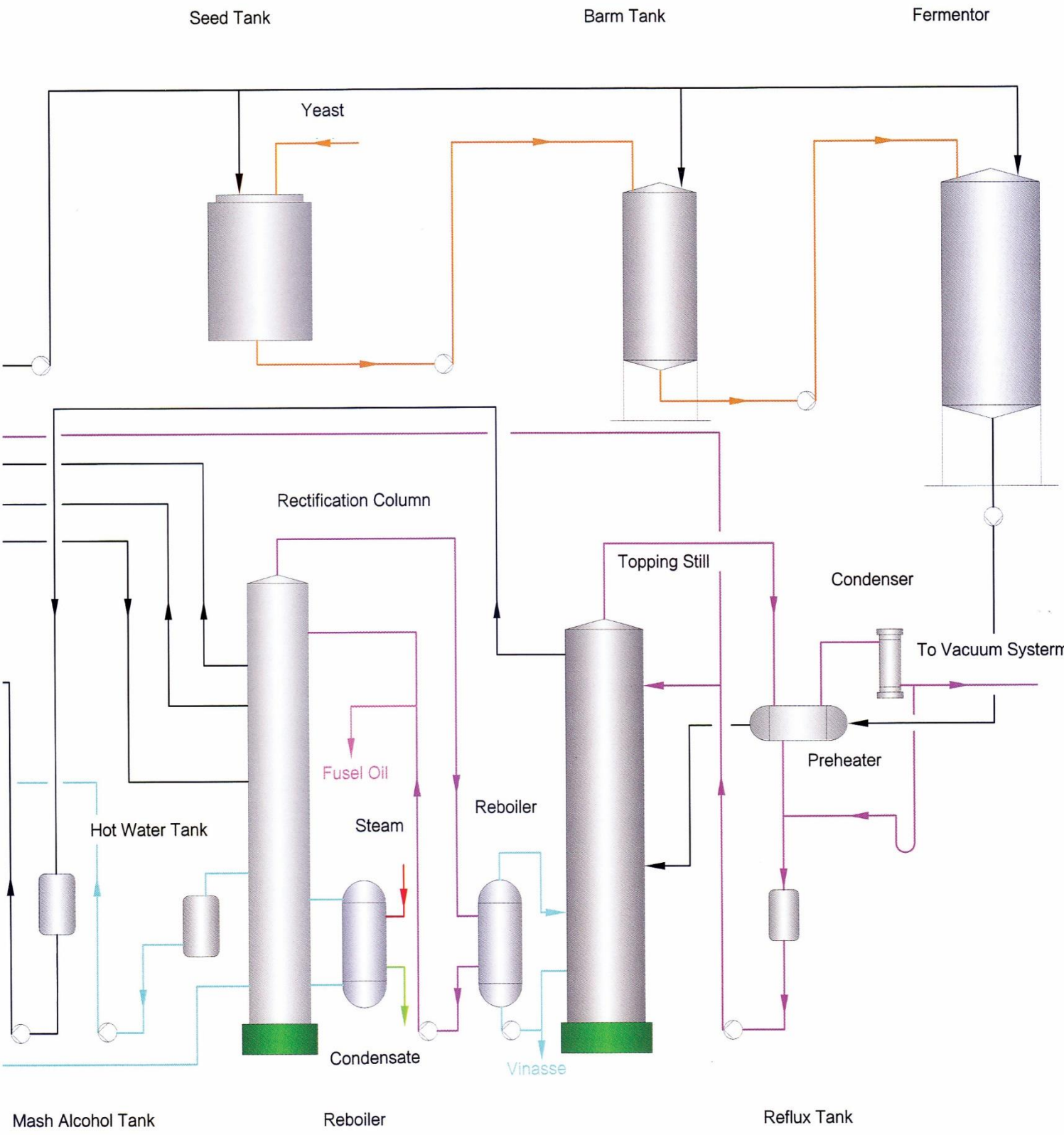
Lactic acid has a strong antiseptic and preservation effect, and also has the functions of adjusting pH value, antibacterial, extending shelf life, seasoning, maintain food color and improve product quality. In medicine, lactic acid is widely used as preservatives, carriers, co-solvents, pharmaceutical preparations, pH regulators, etc. Lactic acid can also be directly formulated into medicines or daily health care products.

PLA production process



Alcohol production process




Seed Tank
Barm Tank
Fermentor
Yeast
Rectification Column
Topping Still
Condenser
To Vacuum Systerm
Preheater
Fusel Oil
Steam
Reboiler
Hot Water Tank
Condensate
Vinasse
Mash Alcohol Tank
Reboiler
Reflux Tank

Seeding Tank

The seeding tank is a device for expanding the industrial cultivation of microorganisms, widely used in the fermentation industry. I t can achieve heat exchange, ventilation, stirring and other functions, and is a fully enclosed and hygienic fermentation specialized equipment.

Technical Features

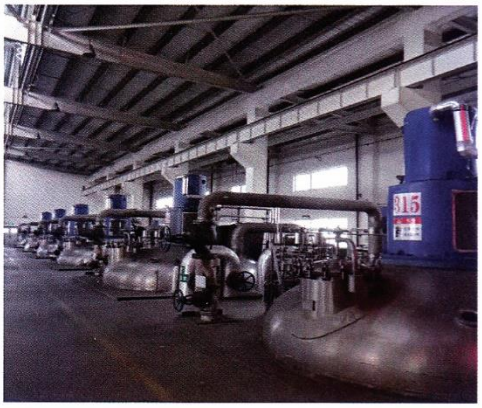
- The sealing performance can ensure sterilization operation.
- Less internal accessory equipment, smooth surface.
- Enough strength and long working life.
- The design pressure：0~0.5MPa
- The design temperature：0~200℃
- Tank material：SS304-316L

Main Technical Specification

Model	Nominal capacity	Diameter	Height	Heat exchange area	Rotation speed	Power
MKSE-50	50	300	700	0.06	300-350	0.37-0.55
MKSE-100	100	400	800	0.12	300-350	0.37-1.1
MKSE-200	200	500	1000	0.24	280-340	0.55-1.5
MKSE-300	300	550	1200	0.36	280-340	0.75-1.5
MKSE-500	500	600	1650	0.6	280-320	1.1-2.2
MKSE-800	800	800	1600	0.96	200-280	1.1-5.5
MKSE-1000	1000	800	1900	1.2	200-280	1.5-5.5
MKSE-1200	1200	900	1800	1.4	200-280	1.1-7.5
MKSE-1500	1500	900	2200	1.8	200-280	1.5-7.5
MKSE-2000	2000	1000	2500	2.4	200-260	2.2-11
MKSE-3000	3000	1200	2600	3.6	200-260	3-11
MKSE-4000	4000	1300	3000	4.8	200-220	4-15
MKSE-5000	5000	1400	3200	6	180-220	7.5-18.5

Fermentor

The fermentor are the main equipment for industrial microbial cultivation.



Technical Features

- The control system is easy to operate and performance is stable.
- The inoculation way is diverse and reliable.
- Sterilizing online, safe and reliable.
- In the course of agitation, the defoaming device keeps no bubble accumulation.
- Through the stirring and uniform mixing to get better fermentation.
- The fully enclosed design can ensure that the materials are always under non-pollution environment.
- Tank material: stainless steel
- The design temperature: 0~200°C
- The design pressure: 0~0.5MPa

Main Technical Specification

Model	Nominal capacity (m^3)	Diameter (mm)	Height (mm)	Heat exchange area (m^2)	Rotation speed (rpm)	Power (kW)
MKFT-10	10	1800	3800	14	60-150	17-22
MKFT-20	20	2200	5000	22	60-150	30-37
MKFT-40	40	2600	7500	45	60-150	55-75
MKFT-60	60	3000	8300	65	60-150	65-115
MKFT-100	100	3600	9400	114	60-150	120-125
MKFT-200	200	4600	11500	220	60-150	215-360
MKFT-400	400	6200	13300	450	60-150	280-360
MKFT-600	600	7200	14800	680	60-150	450-500
MKFT-800	800	8000	16000	960	60-150	500-600

Fermentor Internal Structure

Tube Type Heat Exchanger

Technical Features

- Small occupied area
- Larger volume
- High heat exchange capacity
- No liquid residue after draining
- Less dead point
- Easy to clean
- Easy to check

Agitator

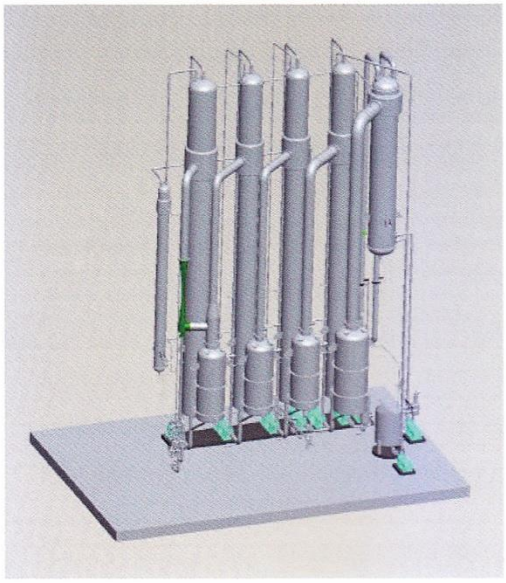
Parabolic disc turbine agitator is applied for biological fermentation project, alumina industry for mixing, gas absorption, mass transfer, heat transfer and other operations. It has the strong ability of radial displacement and dispersion, and can sufficient absorbing, emulsifying, mass transfering etc. for the liquid and air.

Air Filtration System

This system contains one main filter and one ultrafilter to reach technical requirement.

Independently developed precision filtration filter element, with uniform pore distribution and scientific process design combining high precision and high flow rate, can quickly and effectively filter impurities in the filtrate, saving user investment costs.

Tube and Shell Evaporator



MKTE series multi-stage falling film evaporator concentrates the solution by means of vaporizing the thin solution through film-falling principle. It adopts continuous production and its features in high concentration ratio (1/5-1/10), large viscosity scope (> 400CP), good heat-transferring effect, large processing capacity etc. In this case, it can be introduced on vaporizing materials which are high heating sensibility, high concentration, high viscosity and corrosive. Therefore, it is widely used in fermentation, food, milk, alcohol and starch industry. The equipment with a higher heat-transferring ratio, so the temperature difference requested is small. It can be combined into two stage, three stage, four stage, or multi-stage evaporator system on the basis of different material characteristics and evaporating concentration. In addition, it can be used as waste-heat evaporator with the resources of waste steam from bundle dryer or other heating resources with low thermal value such as condensated steam. In this way, raw steam consumption can be greatly reduced for energy saving. It is economically beneficial when waste steam can be completely used and raw steam is saved.

Main Technical Specification

Model	MKTE-3	MKTE-6	MKTE-10	MKTE-15	MKTE-20	MKTE-30	MKTE-40	MKTE-50	MKTE-60
(Kg/h) Max evaporation	3000	6000	10000	15000	20000	30000	40000	50000	60000
Steam pres. (MPa)	0.6~1.0								
(Kg/h) Steam consumption	900	1500	2300	3300	4200	6000	8000	10000	12000

Crystallizer

MKCL Crystallizer is cooling crystallizing equipment. During the work process, crystal slurry with a certain saturation level is injected from the feeding port on the upper part of the crystallizer, gradually cooling down under the action of cooling water, and the crystals gradually grow to complete the crystallization process. It is widely used in the crystallization of chemical products such as glucose solution, MSG, xylose, xylitol, and salts in the chemical industry.

Technical Features

- Customized design to meet various customers' demands
- Compact structure, steady running, high efficiency, low noise
- Reliable mechanical seal
- Small gap between helical band and cylinder body, uniform agitation, no blocking
- Circulating cooling water system, advanced design, good cooling efffect, and high production efficiency
- Stainless steel inner cylinder body, corrosion resisting, long service life.

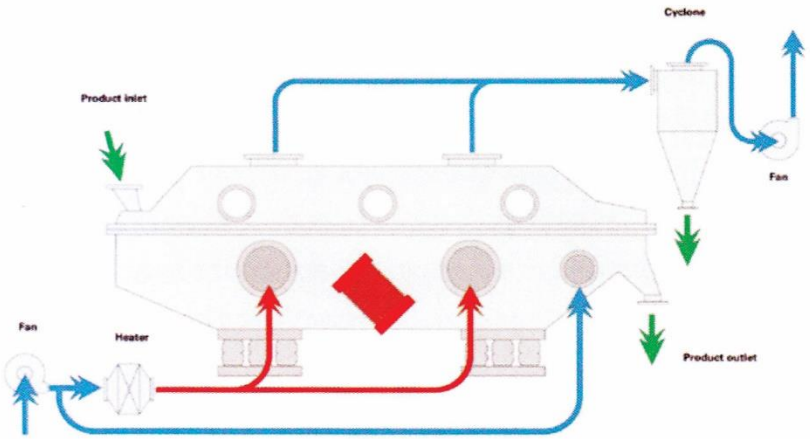
Main Technical Specification

Model	(m^3) Volume	(Bx) Feeding brix	(kW) Main motor power	(rpm) Agitator rotation speed	(mm) Overall dimension	(Kg) Weight
MKCL-10	10	70%~75%	7.5	2~10	3905x2600x3145	8610
MKCL-20	20	70%~75%	3	0.5~0.8	5905x2600x3145	9960
MKCL-30	30	70%~75%	4	0.5~0.8	6680x2980x3545	15200
MKCL-36	36	70%~75%	5.5	0.5~0.8	7165x3250x3833	16230
MKCL-40	40	70%~75%	5.5	0.5~0.8	6305x3600x4045	17100
MKCL-45	45	70%~75%	7.5	0.5~0.8	6805x3600x4045	18420
MKCL-50	50	70%~75%	5.5	0.5~0.8	7305x3600x4045	19750

The dryer is widely applied in chemical industry, light industry, pharmaceutical, food, plastic, oil, slag, salt, sugar etc. for drying, cooling and humidifying of powder particle materials.

Technical Features

- It is stable in operation and convenient in maintenance, low noise, long service life.
- Easy to regulate, width, thickness of raw material layer, moving speed and amplitude can be adjusted.



- Less damage to the surface of material. It can be used for drying material that is easy to broken. The work effect will not be affected by irregular material shape.
- Clean operation site. It is effectively prevent the cross pollution between raw material and air because the equipment adapts fully closed structure.
- It has the characteristics of high mechanical efficiency, high thermal efficiency and good energy saving effect. Compared with ordinary dryer, the energy can be saved about 30 ~ 40%.

Main Technical Specification

Model	(m^2) Area of fluidized-bed	(℃) Temp. of air inlet	(℃) Temp. of air outlet	(Kg/h) Evaporation capacity	(kW) Motor power
MKFB-30	0.9	20-140	20-70	20-35	0.75x2
MKFB-40	1.35	20-140	20-70	35-50	0.75x2
MKFB-60	2.025	20-140	20-70	50-70	1.1x2
MKFB-80	2.7	20-140	20-70	70-90	1.1x2
MKFB-120	3.6	20-140	20-70	100-130	1.5x2
MKFB-140	4.5	20-140	20-70	120-170	1.5x2
MKFB-160	5.625	20-140	20-70	150-180	3.0x2
MKFB-190	6.75	20-140	20-70	160-210	3.0x2
MKFB-240	9.6	20-140	20-70	200-280	3.7x2
MKFB-280	11.25	20-140	20-70	230-330	3.7x2
MKFB-400	14.4	20-140	20-70	290-420	5.5x2

Jet Cooker

MKJC series full automatic liquefaction jet cooker is a new type of liquefaction injector, which stands a leading level of the similar products. There is no rusting, no jamming in it. In the steam pressure over than 0.5MPa, the starch can be liquefied by the jet cooker completely, high liquefied substrate concentration, high steam thermal efficiency and high conversion rate of starch .

Technical Features

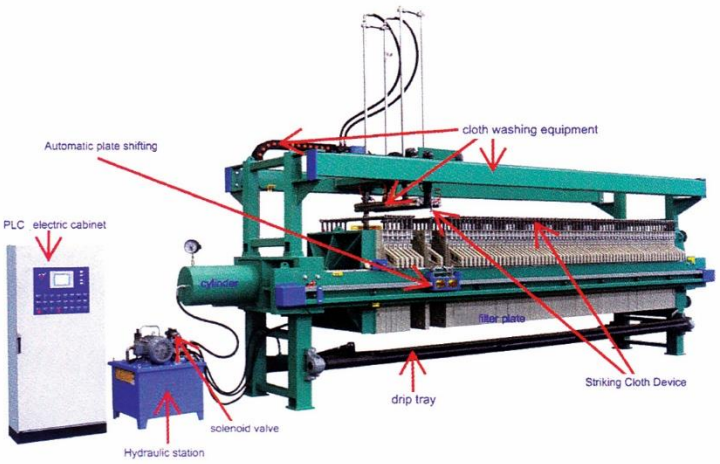
- Heat is transferred from steam to liquid instantly to avoid vibrating and steam punching.
- It can precisely control the flow rate of the steam by regulating the sectional area between the steam stem and nozzle.
- Mixing tube is adjustable, the pressure and flow rate are continuously adjustable, which can achieve vibration free operation.
- It can control the temperature precisely, because there is no obstacle of heat transferring in it and lag responding time.
- It can fully make use of all the sensible heat and latent heat, so as to get almost 100% heat-transfer.

Main Technical Specification

Model	(m^3/h) Capacity	Inlet size	Outlet size	Control mode	
				Automatic	Manual
MKJC-03	3-5	DN32	DN25	√	√
MKJC-06	6-10	DN50	DN40	√	√
MKJC-10	10-15	DN65	DN50	√	√
MKJC-15	15-20	DN80	DN65	√	√
MKJC-20	20-30	DN100	DN80	√	√
MKJC-30	30-40	DN100	DN80	√	√
MKJC-40	40-50	DN125	DN100	√	√
MKJC-50	50-60	DN125	DN100	√	√
MKJC-80	60-80	DN150	DN125	√	√
MKJC-100	80-120	DN200	DN150	√	√

Plate Filter Press

MKFP series plate filter press is usually used for solid-liquid separation in coal, oil, chemical, textile, food, pharmacy, metallurgy industries etc.. In the fermentation industry, it is used to filter the suspended solid in the fermentation broth. On the basis of several patented technologies, the shaping effect of polypropylene has been enhanced, it features in smooth surface, high intensity, light weight, corrosive proof, innocuous and odorless. The hydraulic device is employed for pressing and releasing the frames and plates. The electrical contact pressure gauge is available to automatically maintain pressure. The whole support frame is made by welded steel with high intensity, so it is able to suffer from high pressure, which provides the machine with stable performance and long life. The equipment can be equipped with PLC, relay control and many other safety-guarding devices, therefore the operation will be automatic and easy to control, and the operator will work safely. Girder is equipped with abrasion-proof nonmetallic tracks, which are formed in one piece. It adopts bridge-type flexible frame. Maximum pressure is 22MPa.



Main Technical Specification

Model	(m^2) Filter area	(mm) Plate size	(pcs) Chamber qty.	(mm) Cake thickness	(L) Chamber volume	(kW) Motor power
MKFP-30	30	720x720	39	30	452	2.2
MKFP-40	40	720x720	51	30	595	2.2
MKFP-50	50	800x800	50	30	756	2.2
MKFP-60	60	800x800	60	30	907	2.2
MKFP-70	70	800x800	70	30	1059	2.2
MKFP-80	80	900x900	63	30/32	1190/1270	2.2
MKFP-100	100	1000x1000	62	30/35/40	1480/1740/1940	2.2
MKFP-120	120	1000x1000	75	30/35/40	1800/2100/2340	2.2
MKFP-150	150	1250x1250	58	30/35/40	2260/2640/3020	4
MKFP-200	200	1250x1250	77	30/35/40	3020/3520/4020	4
MKFP-250	250	1250x1250	95	30/35/40	3730/4350/4970	4
MKFP-300	300	1500x1500	77	32/35/40	4760/5220/5960	5.5
MKFP-400	400	1500x1500	103	32/35/40	6390/7000/8000	5.5
MKFP-500	500	1500x1500	128	32/35/40	7960/8720/9960	5.5

Sterile-diaphragm-stop Valve

Manual

Inner structure

Automatic

Technical Features

Complete air isolation
No dead corner
Easy to clean
Good sealing performance
High temperature durablity
Long working life
Easy to install & maintain
Low maintenance cost

This valve can work in an environment of 150°C. The valve core is made of 4F/PTFE and body is made of SS316L. The working life of this valve is 1.5 years under extreme condition, no need to exchange gaskets. Automatic/Manual adjustment are available.

Connection ways: welding / quick coupler / flange
Connection size: DN8 / DN10 / DN15 / DN20 / DN25 / DN32 / DN40 / DN50 / DN65 / DN80 / DN100 / DN150 / DN200

Top-suspending Centrifuge

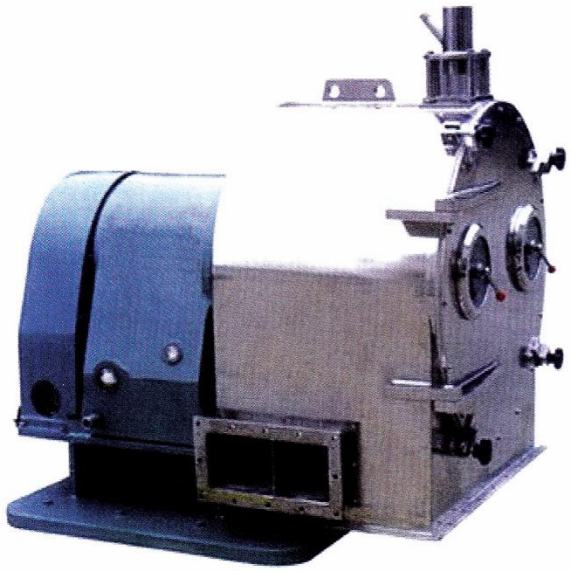
MKTC full-automatic suspended centrifuge is a fully automatic mechanical unloading centrifuge. The material for all parts contacting with material and water, steam pipe line are stainless steel or corrosion resistant material to ensure the cleaning of the product. Pneumatic mechanical scraper gives the safe discharge, suitable for the separating crystal suspensions containning medium and fine particles, which is beneficial for protecting the interfrity of crystals. MKTC type centrifuge is used for the solid-liquid separation of crystalline glucose massecuite or similar high viscosity and high concentration crystalline material in the sugar industry.

Main Technical Specification

Model	Drum dia. (mm)	Max. loading (sugar cane) (Kg)	Max. cycle index (h-1)	Sieve basket rotary speed (r/min)	Max. separation factor-Fr	Main motor power (kW)	Overall dimension L*W*H (mm)
MKTC-1400	1400	1300	10	1300	1275	75	2508*1900*5364
MKTC-1600	1600	1750	24	1100	1083	200	2230*2140*5100
MKTC-1700	1680	2500	20	1100	1183	315	2300*2860*6058

Horizontal Screw Discharge Filtering Centrifuge

Horizontal screw discharge filtering centrifuge is a filtering centrifuge with stable running, good washing effect, high handling capacity, and high economic efficiency. It also can carry out continuous feeding, washing, dehydrating and discharging of suspensions when running at full speed. It is a efficient separation equipment for solid-liquid separation. The machine is suitable for solid-liquid separation of suspensions containing 10%-80% and solid particles (linear or crystalline) with granularity of 0.13-5mm (better effect for 0.2-2mm) in chemical industry, pharmacy, food, metallurry, mining etc..



Technical Features

- Continuous operation with the highest handling capacity
- Wide application for various types of bowls and spiral rollers
- Reasonable power configuration with low energy consumption
- Parts that contact materials are made of austenitic stainless steel
- The closed shell can protect the operator and site environment
- Small size and convenient installation
- Safe and reliable operation

Main Technical Specification

Model	(m^3/h) Feed quantity	(kW) Power	(r/min) Speed	(ω^2r/g) Separation coeffivent	(mm) Overall dimension
MKFC-15	1.5	3.0	4350	2110	700x880x570
MKFC-35	3.5	5.5	3700	1913	910x1050x800
MKFC-70	7.0	7.5	3300	1950	940x1165x950
MKFC-100	10	11	2800	1530	1170x1360x1085
MKFC-150	15	15	2900	1880	1150x1500x1150
MKFC-200	20	22	2500	1570	1390x1500x1315
MKFC-250	25	30	2200	1406	1480x1920x1470
MKFC-350	35	37	2200	1623	1560x2000x1470
MKFC-500	50	55	1800	1400	2150x2100x1650
MKFC-1000	100	90	1600	1400	2600x2700x2600

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