TIANTAI

Brewing Equipment Operation Progress

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Focus On Customer

Index

D. Attachment:

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A.Installation and Trial Running

I. Location of equipments:

Fix the equipment location reference to the Plan layout, the process requirements and field conditions.

II. Mashing equipments:

Adjust the space between the tuns, connect the process pipelines, fittings and wort pump; Mount the decorate funnel, a air-replacement device is also needed to ensure the timely venting of indoor gas(steam); Fill the Mash/Lauter tun, Kettle and pipings with tap water, then heat the water by electric/steam/direct fire and turn on the wort pump, then test the leaks, deliver the the steam and check the all the components, and it can be ready for materials feeding when there is no abnormal condition observed.

Special Requirement:

1.Steam heating system:

Steam pressure should be adjusted within 0.15 – 0.2 MPa. The water level in kettle is not permitted to lower the upper limit of the steam jacket.

2.Electric heating system:

Electric heating tube(coils) is good for 220 V/ 50HZ. The liquid/ water level of the kettle is not permitted to lower the highest position of the electric heating tube(coils)

III. Fermenters:

After installation of L-shape pipes(CIP/CO_2 blow-off arm), valves, pressure gauge and attachments, pressurize the tank to 0.18-0.2Mpa with tap water and keep the pressure with 2 hours. It can be cleaned if there is no abnormal condition observed (the materials can be putted in if there is no any pressure relief), and please test/check it one by one.

IV. Cooling Equipments:

The Operator should connect the condenser of chiller with the evaporator (red copper coils) of ice water tank. After making a pressure maintaining test according to the requirement of application work of cooling machine, it can start to vacuumize (the machine is forbidden to use for vacuumize), and then fill in freezing medium(Freon R404A) , turn on compressor, adjust pressure of freezing medium. Note please: before finishing the installation of chiller, the ice tank water is not permitted to add water. After leakage testing and before production, the proportion of liquid in ice tank should be as: 95% alcohol: water = 1:4.

V. Pipelines:

Connect ice water and stuff pipelines (heat exchanger included) according to process requirements (under the guide of Brewmaster). Make tap water leakage checking after the connection, and try feeding when there is no abnormal condition observed (note please: Kettle with steam heating system will need safety valves, the pressure is 0.15 – 0.2 Mpa).

VI. Electrical equipment:

Fix positions of distribution box and instrument box. Close all loaded/signal circuits according to the circuit diagram, and after making sure everything is under the right condition, then connect the power , and debug them one by one.

Note please:

a) the chiller must be installed by a professional stuff.

b) Idle load and reverse running of the wort pump is forbidden.

VII. Auxiliary machine and parts:

Miller should be set at the dustproof room. Check the cutting discs etc. and make sure they are under the good conditions, then can test drive according to the Commissioning requirements of wort pump.

B. Maintenance of the equipment

I.Mash tun

Steam pressure gauge and safety valves must be checked for each batch

and make sure the steam trap without any impedance (Steam heating system). Clean the adhesive on the electric heating tube , and check the solidity of binding post for electric heating tube(Electric heating system) after finishing each saccharification process. It will be forbidden to connect with electric or steam in case the liquor/water is not up to the specified level.

II.Lauter tun

The stirring reducer should be added lubricant regularly according to the product instruction. After grains depositing, the tilling blade (Rake) should work only on and off, and long time continue working is forbidden. Control the wort flow rate and grains liquid level strictly when filtering, and, drawoff of wort in big flow rate is forbidden so as not to damage the false bottom.

III.Fermentation tank

After operation, there will need at least one person for 24 hours duty and make a record. They have to check the sensitivity of pressure meter and thermometer and try to find if they are under the right conditions for every batch. In case any abnormal conditions happened, it must be adjusted in time. When beer is going to be sold out, we have to turn the temperature up by 1 - 2℃ to avoid damaging beer when icing.

IV.Beer storage tank (for selling)

Check the pressure meter and thermometer and try to know if they are under the right conditions. And check the cooling unit as well if the tank is equipped with cooling unit. Any abnormal conditions ask for maintenance immediately. After beer sold out, the tank must be cleaned and disinfected strictly. Only after above works, it can work further, which will help to avoid bacterial breeding and beer rancidity.

V.Refrigeration Equipment

Check the both conditions of high pressure and low pressure and to judge if the cooling effect is under the normal conditions. In case any abnormal conditions happened, the stuff feeding work must be stopped immediately and please ask for technical maintenance staff to repair it. Check the liquid level conditions of inner ice water tank every month. When the liquid level becomes lower and the copper tube is exposed, please check the alcoholicity in time and supplements them to be the required value.

VI.Pipelines and fittings

Every shift has to check all pipelines and valves and to check if there will be any leakage and damage. Any abnormal conditions happened, please be kind to repair them or exchange them.

VII.Switchboard

Every shift should check the indication conditions of meter on switchboard. Regarding the temperature adjusting for digital temperature control meter, e mercury or alcohol meter can be used to demarcate the temperature to make sure the accuracy of technological parameter.

VIII.Electromechanical equipment

Absolutely ensure the right cable connection and keep the good Grounding.

C. Operation of brewing process

(take 500 L/batch brewing line as an example)

I.Operation of Miller

1. Equipment checking:

check if there are any impurity in the hopper. And make sure the grinding disc, wire and other accessories are under the right condition, then ready for grinding / crashing work.

2. Raw material checking

before milling, should check the appearance quality of malt and make sure there isn't any musty condition. Different beer will ask for different grinding qty. Detail as follows:

- ✧ Barley beer: Barley malt, 80-100 kg (required according to the quality of malt). Caramel malt , 1-2kg
- ✧ Wheat beer: Barley malt, 40-50kg. Wheat malt, 40-50kg
- ✧ Black beer: Barley malt, 80-90 kg, Caramel malt , 10-20kg , Black malt, 5-8kg.

Note please: After grinding, the barley malt should be used immediately and it is not *suitable to long time storage. Overnight barley malt is forbidden to use.*

3. Moist

Before grinding, pre-add right amount tap water into barley malt 5 – 10 minutes ahead, so that reach the grinding requirement as “broken but not crashed as powder”.
Note please: Forbidden to add any water into wheat malt, Caramel malt and black malt when grinding.

4. Proportion of rough grain and granule

During the grinding process, the grinding condition of malt should be sampled and checked from time to time. And should adjust hand wheel and incoming qty of materials according to the thickness of malt powder . The proportion of rough grain and granule(finely milled) will be 1: 2.5.

Note please: Wheat malt, Caramel malt and black malt must be crashed as powder (finely milled)when grinding.

5. After milling

When the grinding is finished, cut off power and recycle the materials left in the interior, and clean the dust on equipments and ground.

II. Saccharification:

1. Equipment checking

Check the boiling tank, lauter tun (the mash tun and boiling tank will be in one unit in small brewing line) , pipe fittings, valves, meters and supply of water, electricity, steam and make sure all of them under the right condition. If there isn’t any abnormal condition, clean them and ready for materials feeding.

2. Producing water

Add tap water of 500 kg into the boiling tank and then heat them. During the heating process the valves of whirlpool and wort pump should be opened for 3 – 5 minutes to help their mixing in more even way. Heat them and make the temperature up to 68℃, then stop heating work. Open the related valves and turn on the wort pump and pumped into the water--290 kg from bottom of lauter tun.

3. Feeding at 55 ℃ (protein decomposition)
Activate the filter tank mixer firstly, feed malt powder into the combined mash/aluter tun, after stirring uniformly then stop it, the Clock start. For wheat beer, barley malt should be put into firstly and then stir them uniformly and after that put into the wheat malt, stir uniformly again. Maintain the temperature as 55 ± 1℃ for 70 minutes;

4. Producing hot water to warm the Moromi
Add water into boiling tank (kettle) up to 500kg sequentially, start heating until up to 100℃ and then stop heating. Open related valves, ready to start the wort pump and and begin to warm the wort.Moromi.

5. Warm up the Moromi to 66℃(saccharification of starch)
Stir the Moromi in the combined mash/lauter tun, meanwhile pump into 100 ℃ hot water from the bottom of combined mash/lauter tun until the Moromi temperature is warmed up to 66 ℃; For brewing black beer, the Caramel/Coke and Black malt powder should be added when the wort temperature is up to 66℃, stirring evenly(3-5 minutes). Maintain that temperature of 66℃ for 80 minutes.

6. Preparation of sparge water
Stop the boiling of how water in the kettle and drain out the incrustation.Pump the sparge water into the mash/lauter tun from the bottom port of it(combined mash/lauter tun). the level should not be over the top head. And then start stirring for 3-5 minutes, then stop for 10-15 minutes; During this time, you can clean the boiling tank(kettle) and ready for filtering.

III.Operation of Wort Filtering

1. Wort reflow
Note please the stillness time, once reach the required time, it must ask for reflow in time. Open the related valves and let wort reflow 5-10 minutes in the lauter system , observing the wort through the sight glass until it is limpid, switch return valve and pump wort into the boiling tank(kettle, copper).
Note please: When using wort pump to draw off the wort in lauter tun, it should be very carefully to control the wort flow rate and keep the stability of reflow.

2. Testing the first wort

after filtering for 20 minutes, pick some samples from the wort to test the wort concentration

1) Hot wort treatment:
take wort (fill up the measuring cylinder glass）from the boiling tank(kettle)，take the measuring cylinder glass into a container filled with tap water to cool it below to 30℃ (other cooling method can be used, but remember not to mix with the tap water), shaking up and setting stably.

2)Sugar content measurements

take one saccharimeter with measuring rage of 10-20 BX, and put the end with mercury into wort slowly. Don't loose your hand until the mercury closes to the estimate reading. Read the data from the wort concave meniscus level after 5 minutes. Pick the saccharimeter slowly and check the wort temperature showed on meter and then find out the correction value of related sugar content, finally get a wort concentration. The accharometer should be very carefully used without fast picking. And after using, it must be cleaned with water, dried and safe kept.

3. Sparging
When the spent grain bed is nearly exposed during lautering, start the sparging. Estimate sparge water qty based on the wort concentration. Pour into the sparge water from the return line on combined mash/lauter tun, make the rake arms work on and off (can't be directly started), after grains is turnup, stirring for 3–5 minutes, and then stopping for 10 –15 minutes. Follows according to a. "Wort reflow " to pick up the second wort. If necessary, a third wort can be gotten with the same method.

4. Mixed concentration
Sparging the spent grain for 1-2 times. Stop filter when mixed wort concentration reach to 9.0-9.5 BX. Draining off the spent grain from the grain chute and cleaning the combine mash/lauter tun..

Note please: During filtration process, if the wort is not limpidity or difficult to filter, please stir mash water and then wait for 10 minutes to re-start reflow until the wort become limpidity.

IV. Operation of wort boiling

1.Heating
Start heating-up when wort level exceeds the top of heating jacket or electric heating coils. During the electric heating process, open the whirlpool valve every 10 minutes and start the wort pump for 1-3 minutes;

2.Wort boiling
Begin to time when wort start to boil. The boiled time is 60 minutes or 90 minutes(this time can be extended， the longer, the darker the beer color). The wort is always kept in boiling condition. Control the final wort concentration as 9.5-10.5 BX when boiling finished. In case

the concentration dose not reach to 9.5 BX at the required time, the boiling time can be added appropriately.

3. Hops adding

Bitter hops and flavor hops are added respectively at 5minutes after start boiling and before finishing boiling. The qty is 200 g (0.04%) and 100 g (0.02%).

Note please:

1) *While boiling, carefully control the electricity and steam source to avoid hot wort -overflow and to prevent scald.*
2) *After weighing hops, the left in the package should be sealed immediately and be kept in refrigerator to avoid oxidation.*

V.Operation of wort whirlpool

Make a wort whirlpool in boiling tank(or kettle, combined boiling/whirlpool tun) for 3-5 minutes, standing settling for 30 minutes, then cooled the wort. Before cooling, drain out the hot concretion.

(Note please : stay away from the nozzle to avoid scald).

VI. Operation of wort cooling

1.Checking:

Check if heat exchanger pipe, valves, meters and the supply of ice water, tap water, oxygen (bottled pure oxygen) are normal, if yes, ready to cooling.

2.Washing:

Connect wort pipes with fermenters in series, disinfect throughly with the “four-steps” the same as the fermenter cleaning.Close the valve for standby application.

Note please: the residual hydrogen peroxide in pipeline and heat exchanger must be drained out absolutely before cooling.

3. Cooling:

Open tap water&ice water valves and the ice water pump, and then open the wort valve, the wort pump, oxygen valve for wort cooling. Temperature controlling: barley malt beer 9.0 ± 0.5 ℃, wheat malt beer 13.0 ± 0.5 ℃;Temperature for adding dry yeast: barley malt beer 11.0 ± 0.5 ℃, wheat malt beer 18.0 ± 0.5 ℃.

4. Drain out residual lotion

At the early time of wort cooling, we must pour into wort to replace the residual lotion in the heat exchanger absolutely, after which the wort can be pumped into fermenters.

5. Oxygenation

The wort is oxygenated continuously while be cooled. The oxygenation amount is 1-2 times than as the wort.

6. Recovery

After the wort cooling, use the oxygen pressure to jack-in the wort from pipeline into fermenters. Then clean the brewhouse, related pipes and heat exchanger with water for 10 minutes.

VII. Operation of Ice Water Tank

1.Inspection

After the chillers is installed, then test. And be ready for the next work when all is normal.

2.Tank washing

Open the drain valves at the tank bottoms. Lead into tap water to clean the inner tanks and evaporator (red copper pipe) by hose. After draining sewage out, close the drain valves.

3.Add ice water

Select industrial alcohol or edible alcohol (dosen't contain CI-) to be diluted with water to 25% concentration (calculate the alcohol content based on the concentration and ice water tank volume). The liquid level shall be at level with the top of the evaporator (red copper pipe).

4.Temperature Control

Push the Control switch of ice water pump to the "automatic" location, set the temperature to -6 ± 0.2 ℃, and then start the control switch refrigerator / cooling machine.

VIII. Operation of beer fermentation process

1. Checking

Check pipe fittings, valves, meters of fermenters and the supply of ice water, oxygen. If no exception, ready to feed.

2. Washing (4 steps)

1)Washing by water

Use tap water to flush / wash the fermenter by intermittent way for 15 minutes before feeding.

Note please: use small amount water with many times(three times, 5 minutes for each time) to wash it. Only when the residual water in tank is absolutely drained out and then the next washing can be done, maintaining a smooth flow in liquor valve.

2)Washing by sodium hydroxide

When the residual water is absolutely drained out, then use the sodium hydroxide of 50 - 80 ℃, 5% concentration for circle cleaning for 20 minutes (it should be timely supplemented when the concentration of the concentrated base is decreasing). After circulation, begin to recycle the alkali liquid.

Note protection - one must be more than careful with the instruments , wearing the protective device, and no direct physical contact with the lye.

3)Washing with water
After the residual lye is absolutely drained out, flush / wash the fermenter with tap water by intermittent way for 15 minutes. Take same way as the step 1)

4)Washing with Hydrogen peroxide
After the residual water is absolutely drained out, then use the hydrogen peroxide (300 - 400 PPm)for circle cleaning for 20 minutes. Take same way as the step(5). After the residual Hydrogen peroxide is absolutely drained out, close the relief valve, material in-outlet valve and racking port (beer outlet) valve.

Note please:
①During the washing, it is necessary to open the racking port(beer outlet)valve.
②It is forbidden to washing fermenters by using hot water, hypochlorite, chlorine and other disinfectants containing the Cl^- for sterilization.

3.Vaccination

Before wort is pumped into fermenters , the yeast sludge should be added firstly with regular dose of 1% of the wort (0.1% of the wort for adding dry yeast).

4.Oxygenation
Meanwhile the wort cooling, the wort must be filled with oxygen incessantly from the oxygenation port. The dose is equal with the wort. which dose will be same as wort. It still need the oxygenation from the feeding port for three times at the first 24 hours. Each time for 1 -3 minutes, maintaining the pressure as 0.03Mpa till to sealed.

5. Impurities discharge
After feeding material,start to discharge / drain the cold sludge from the second day--Open the discharge valve slowly and drain the impurities out. The impurities discharge work should be done one time every day later.

6. Measurement of sugar
After feeding, take samples for sugar measurement from the second day till the tank is sealed. Note please: should check every day before tank sealed.

1)Treatment of fermentation liquid
discharge the impurities in discharge valves,then take the fermentation liquid with a measuring cylinder, repeatedly pouring for 100 times with 2 cups (space between two cups should be not less than 50cm), then pour the liquid back to the measuring cylinder, and place it in stability.

2)Measuring the sugar concentration
Take a saccharimeter of 0-10 BX range and insert the mercury end into the wort slowly. The following steps are the same with the“Sugar content measurements”.

7. Primary fermentation:

1)Yeast mud:
Barley beer: maintain the temperature at 9.0 ± 0.2 ℃, the pressure will be kept as 0.03 Mpa till the tank is sealed, for about 3-4 days.
Wheat beer: maintain the temperature at 13.0 ± 0.2 ℃, rose to 18℃ 24 hours later, the pressure will be kept as 0.03 Mpa till the tank is sealed, for about 2-3days.

2)Dry yeast:
Barley beer: Maintain the temperature at 11.0 ± 0.2 ℃, the pressure will be kept as 0.03 Mpa till the tank is sealed, for about 3-4 days.
Wheat beer: maintain the temperature at 18.0 ± 0.2 ℃, the pressure will be kept as 0.03 Mpa till the tank is sealed, for about 2-3days.

Special Note: In case there are any abnormal conditions of the temperature, pressure(especially their value is lower than the required data), please contact with our company’s technology department to seek remedial measures!

8. Tank sealed (reduction of diacetyl)

1)Barley beer
sugar content dropped to 4.2 ± 0.2BX, temperature naturally warmed up to 12℃,maintain it till to the tank is sealed. Meanwhile increase the pressure up to 0.14 Mpa, and maintain it for 4 days.

2)Wheat beer
sugar content dropped to 4.2 ± 0.2BX, maintain the temperature at 18℃, and at the same time, tank sealed and increase the pressure up to 0.14 Mpa, and maintain it for 4 days.

3)Diacetyl checking
After tank sealed for four days, sampling tasting, and lower the temperature if there is no clear diacetyl flavor. Otherwise,lower the temperature after 1-3 days.

Special Note: If the pressure is becoming low, CO_2 can be added artificially to 0.14 Mpa. Before filling the CO_2, we must use 75% alcohol for cleaning and make disinfection for all inflatable head, hoses, valves that will be used

9. After-fermentation (beer storage,maturation period):

After the reduction, the liquid should be cooled to 0℃ in accordance with the regulations within 24 hours (surface temperature 2℃), and maintain, while maintaining pressure in the tank as 0.14 Mpa. Time: 3-5 days for barley beer, 13 days for wheat Beer.

Special Note: cooling requirements--lower the temperature at a rate of 0.5-0.7℃/ hour before it drop to 5℃, and 0.1 -0.3℃/ hour when it drop to below 5℃;

10. Yeast treatment

the yeast can be recycled for using when is cooled to 2℃. Before using, the yeast that was drained out in early stage shouldn't be recycled. And the yeast which is over six generation will be forbidden to use. When the beer is stored for over 1 week, the yeast should be drained out gradually.

11. Auto-control of fermenters

1)Temperature: It should be set in accordance with the above 3-9 mentioned technological requirements, operation requirements of XMT or PLC control.

2)Pressure: In accordance with technological requirements, promptly set the maximum and minimum levels of pressure gauges to the required value.

IX. Operation manual of beer sales tank

1.Installation and pressure test

Refer to the "III" in the "Installation and Trial Running".

2.Rinsing

Refer to the Item 8, operation manual of fermenters "2.Washing (4 steps)"

3.Beer filling

Close the relief valve on sales tank firstly. Connect the beer outlet of the beer transport tank with the beer inlet of selling tank by the hose. After that, open the outlet valve and inlet valve slowly and begin to fill beer into the sales tank.

4.Add CO2

Maintain CO2 pressure above 0.15 Mpa, meanwhile open the relief valve of beer selling tank slowly (it will produce a lot of foam if too fast)

5.Keep pressure

When beer was all transferred into the selling tank from the transportation tank (or the beer injection was finished), close the inlet valve, relief valve quickly, meanwhile fill CO_2 till up to pressure 0.14-0.12 MPa .

6.Temperature Control

Set the temperature of beer selling tanks as 2 ± 0.2 ℃ (has been adjusted in advance when in factory); Connect the power when there is no problem with the chilling unit.

7.Beer selling

Connect the beer outlet valve of beer selling tank and beer counter (like tower) with the disinfected hose. And make a heat preservation treatment for the Pipelines,open the racking valve (beer outlet valve) and adjust the valve for a beer flow with suitable foam and then beer can be sold.

8.Sanitation requirements

At the end of selling , all valves for beer outlet must be closed . Clean the beer counter(like tower) and its' external hose. After beer was sold out, all related parts must be cleaned based on the "4 steps" before the next filling.

X.The usage and storage of dry yeast (take the French DCL Dry yeast as an example)

1. Usage method

1)Containers

Take a cleaned white plastic barrel (with sealing cap) of 5-10 L or a beer keg and then clean them with water.

2)Vessels disinfection
Reference to the “4- steps“of cleaning fermenters .

3)Yeast activation:
Be in strict accordance with the sterile operating rules in the Cleanrooms (sterile operating room).Use the sterilized scissors to made one snip on the bag contains100 grams dry weight of yeast. Put the dry yeast powder into the plastic barrel (note please: yeast and water ratio is 1:10), then slowly fill 20-26 ℃ sterile water or pure water, and then screw on the sealing cap and shake the plastic barrel slowly about 3 minutes, and let sand for 20 minutes to get the activated yeast mud.

4)Vaccination
Pouring the yeast from the plastic barrel into the feeding hose (note please: before above action must make sure that there isn’t any residual disinfectant), then start cooling wort and fill them into the tank.

Note please: before cooling, must exclude the residual disinfectant in the heat exchanger!

5)Vaccination doses
Dry yeast for the inoculation is 0.1% of wort;

6)Vaccination temperature
S-189 inoculation temperature is 11 ℃, the temperature of reduction diacetyl still be 12 ℃; S-04 main fermentation temperature is 18 ℃, the temperature of reduction diacetyl still be 18 ℃.

7)Usable generations
Dry yeast can be used to the 6 – 8 generations. And the liquid yeast mud should kept at 0-4 ℃.

2.Storage:

1)Storage for the unopened package
Preserved in a cool and dry place; It will be forbidden to use in case there is air into the bags.

2)Storage for opened package
The unused dry yeast left in the opened package should be kept under asepsis, seal and cryopreservation, besides it should be used up within 7 days.

XI.Attentions

1.Valve fittings: Except for valves which need to be opened, other valves must be closed when complish one process to avoid the wrong operation.

2.Pressure Vessels: Do not exceed the required work pressure of the procedure.

3.Electrical equipment: electrical components and equipment are prohibited by water washed.

D. Attachment：

I. Beer Producing Procedure Flow

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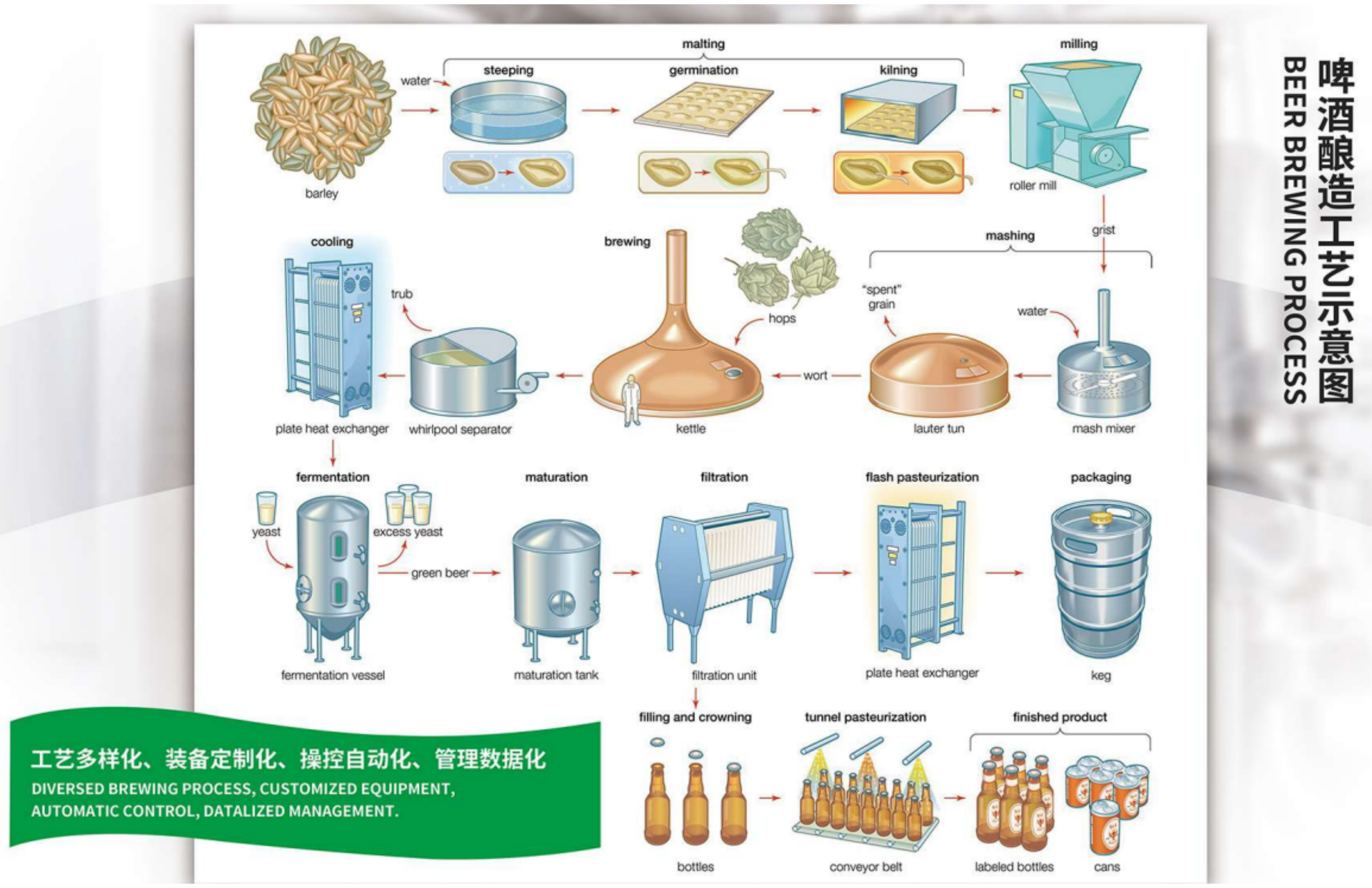
啤酒酿造工艺示意图
BEER BREWING PROCESS
malting
steeping
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roller mill
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cooling
brewing
mashing
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whirlpool separator
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mash mixer
fermentation
maturation
filtration
flash pasteurization
packaging
yeast
excess yeast
green beer
fermentation vessel
maturation tank
filtration unit
plate heat exchanger
keg
filling and crowning
tunnel pasteurization
finished product
bottles
conveyor belt
labeled bottles
cans
工艺多样化、装备定制化、操控自动化、管理数据化
DIVERSED BREWING PROCESS, CUSTOMIZED EQUIPMENT,
AUTOMATIC CONTROL, DATALIZED MANAGEMENT.

II.Sanitary standard of beer production

1.Conscientiously study and strictly implement the "Food Sanitation Law" and relevant food hygiene rules and regulations, improve producing environmental health.

2. Sanitation of environment:
The work shop and its around should be cleaned both in the morning before work and afternoon after work. No garbage, no dead angle; at least 2-3 times air sterilization each week (by formaldehyde and hydrogen peroxide).

3.Sanitation of Production
clean the equipment, walls, floors and sewerage to guarantee their sanitary before/after work. There should be no fly and other harmful substances indoor. Spray air disinfectant regularly.

4.Personal cleanliness
the work clothes and caps of the brewers(and those who stay in the brewery)must be cleaned and tidy. The operators must washes their hands and cutting the nails industriously, and any decoration is forbidden to wear during producing beer.

5.Sanitation for equipment and process:

1)Sanitation of equipments:

① Alternate the hot water and hot lye to rinse, disinfect the brewhouse, heat exchanger and delivery parts (pumps, pipes etc.)

② Propagation of yeast: alternate the water→lye→water→hydrogen peroxide to rinse and disinfect for at least over 4 times.

③ For the fermenting procedure: alternate the water→lye→water→hydrogen peroxide to rinse and disinfect for 4 times.

2)Tools cleaning:

①All production tools must be cleaned with hydrogen peroxide.

② The Pipelines and pumps should be cleaned with the same disinfection means it's related equipments adopted.

6.Sanitation for materials and product

1).Store the materials on a wooden plate base from the ground 150 mm, and from the wall 400 mm; the warehouse must be well-ventilated.

2).Beer storage must meet the technical requirements of beer, under a certain CO2 pressure, sealed and low-temperature preserved in the storage tanks (or in dual-use for both fermentation and storage tanks)

7. Sanitation for package
The keg(barrels/cask)should stay or be stored separately and be cleaned with the same disinfection method as the fermentation/storage tanks. Any uncleaned kegs will be forbidden to fill into any beer.

III.Shift System in workshop

1.Before 15 minutes of shift, the related staffs should make a good record.

2.Staff who on duty must have a high responsibility and professional ethics. They should complete their work in seriously.

3.The person when on duty must keep their attention on the job and control the temperature of fermentation liquid and pressure of tanks based on the strict processing requirements. In case errors in operation, the staff should take timely corrective measures. In case resulting in losses, the appropriate punishment should be given depending on their circumstances .

4.The sanitary work for a good staff include cleaning of ground and pipelines. And timely indoor disinfectant sterilization to keep the air clean.

5.Clean fermenters in time according to the washing procedure and make a good record of cleaning.

IV.Essentials of beer producing

1.Control the degree of milling. Try to keep the skin broken but not breaking as powders. The Coarse grain and fine grain should be evenly proportioned. It won't be helpful to saccharification when milled too coarsely or too finely. Clean the milling room after the milling work.

2.Clean the pipelines, heat exchanger and tanks strictly according to the cleaning requirement every time before feeding.

3.Accurately control the liquid temperature and each temperature rest. The temperature should be warmed in uniform rate, meanwhile observing the saccharification effects, trying to acquire the most fermentable sugar.

4.Ensuring the quality of the wort, minimize the filtering time meanwhile. Measuring the first wort concentration and quantity, based which to determine the quantity of sparge water(the sugar should be measured within the required temperature, and ensure the reading accuracy of the saccharimeter.)

5.Try to make the wort seethe to condense the protein. Control the right time of adding hops and whole wort boiling time, an ensure a certain boiling intensity.

6.Guarantee the sterile status of wort before into the tanks and control the time of oxygenation well, control the temperature and pressure in strict accordance with the fermentation process.

7.Check the sugar dropped condition every day to observe whether the fermentation is under the normal condition or not.

8.When sugar dropped to the required value, please pay attention to the tank-sealing operation and maintain the pressure and allow it have a naturally temperature rise.

9.Note please: it must be operated according to the fermentation process strictly.

10.Uniform rate to cool down, beer storage temperature should keep at 2 ℃, pressure should keep at 0.12-0.14 MPa;

V.Cleaning and disinfection for keg:

1.The cleaning and disinfection jobs for keg should adhere to the "health first" principle.

1)For the kegs in use, the washing should take three steps:
①Firstly washed by water.
② Then disinfected with hydrogen peroxide. After filled and sealed, inverted for 30-60 minutes.
③Recycle the hydrogen peroxide. And after the dumping completely, sealed immediately and waiting for further use.

2) For the kegs without disinfection, which will be stored for a long time, should take the following disinfection methods:

①At first, cleaned with the brush, then clean with water for 3 times, after that added 50^0C(5%concentration) of caustic soda liquid for immersion for 40-60 minutes.

②Cleaned by water, then added hydrogen peroxide, inverted for immersion 30-60 minutes.

③Recycle the hydrogen peroxide, after dumped completely, then sealed immediately and waiting for the further use.

2.Storage of the keg.

1) For kegs that will be used immediately, the cap, pipes and beer outlet must be cleaned before filling.

2) For kegs that won't be used immediately or stored for a emergency use, the inner should be always soaked by filling into the hydrogen peroxide(liquid) till using.

3.Kegs when in and out of the workshop

1) Kegs without disinfection treatment are prohibited into the workshop and must be sent to the disinfection room.

2) Sterile kegs must be inspected specially before enter the workshop and using

VI. Record List

Operation record of beer saccharification

Date: **Type:** **Batch No:** **Tank No.:**

<table>
<tr><td colspan="2">Time
Item</td><td>Start</td><td colspan="2">End</td><td>Time
Item</td><td>Start</td><td colspan="2">End</td></tr>
<tr><td colspan="2">Malt milling</td><td></td><td colspan="2"></td><td>Mashing water</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">Material feeding</td><td></td><td colspan="2"></td><td>55 ℃</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">100℃ water</td><td></td><td colspan="2"></td><td>Making mash liquid</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">66℃</td><td></td><td colspan="2"></td><td>Sterilization</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">Refluence</td><td></td><td colspan="2"></td><td>Filtration of the first wort</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">Sparging</td><td></td><td colspan="2"></td><td>Boiling</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">whirlpool</td><td></td><td colspan="2"></td><td>Cooling</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2" rowspan="2">Adding hops at the first time</td><td>time</td><td colspan="2">qty(g)</td><td rowspan="2">Adding hops at the second time</td><td>time</td><td colspan="2">qty(g)</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="2">Concentration of wort</td><td></td><td colspan="2">Concentration of wort after boiling</td><td></td><td>End boiling qty (liter)</td><td colspan="2"></td></tr>
<tr><td colspan="2">Barley malt</td><td></td><td>Wheat malt</td><td></td><td>Empyreumatic malt</td><td></td><td>Black malt</td><td></td></tr>
<tr><td colspan="9">Remarks:</td></tr>
</table>

Operator signature:

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Beer fermentation technology parameters record

Date： **Type：** **Batch No：** **Tank No.：**

Date	Time	Temperature	Pressure	Operator	Remarks

Operator signature：

E. Safety matters need attention

I.The saccharification process of producing wort should be operated under the high temperature. When operating the operators should be very carefully to avoid scald. And refuse to any visitation during the operation.

II.Steam heating brewhouse should be paid more attention to avoid scald. The steam pressure is strictly forbidden to be over 0.15Mpa.

III.Electrical heating brewhouse should have ground protection to avoid of getting an electric stock.

IV.Fermenters' pressure control system should be often checked . The inner pressure of the tanks is strictly forbidden to be over 0.15Mpa.

V.Strictly prohibits the open fire when disinfect the the laboratory with alcohol.

VI.The persons must be aked for wearing the antisepticise latex gloves when they use disinfector.

VII.Non specialized maintenance staffs are forbidden to open the electrical control box at will.

VIII.Non Specialized staffs are forbidden to disassemble the cooling machine at will.

F. Instruction of Maintenance

Installation & Training should client need

a.) The seller will send one engineer to install the machinery.

b.) Buyer is responsible for finding a translator locally for easy understanding.

c.) The customer will be asked to provide room, board, round-trip transportation.

d.) The customer will be responsible for the fare of the visa.

e.) The installation period is about 30 days including assembling equipments and training the operator. It is free of charge within 30 days. The buyer will be charged USD100 per day for each engineer for the extended installation. A possible delay of the installation period will be additionally invoiced.

Service&Guarantee

a.) Free consultation service before, during, and after sales;

b.) Project planning and design services;

c.) Free debugging instruction of equipment until everything is functional;

d.) Management of equipments' long distance shipping from seller's factory to named port or station by buyer;

e.) Training of equipment maintenance and operating personally;

f.) New production techniques;

g.) Provide 36 months complete warrantee for main parts and life-time maintenance service; In case the main parts occurred any errors within warranty, please feel easy to inform our sales. We will according to customers' record / file and the detailed Fault Conditions to help them deal with their problems together. If it is a quality problem within warranty after checking, we will send one professional technical staff to client's location to assist repairing for no charge until it is solved or adopt other agreed method with the same effect for benefiting both. If the problem is caused by a improper use after checking, we will assist the client and support related technology instructions via communication tools until the problem is solved, or send one professional technical staff to client's brewery to assist repairing till it is solved, and the client will be asked to provide room, board, round-trip transportation, or adopt other agreed method with the same effect for benefiting both buyer and seller.

Main parts means all the tanks like mash tun/kettle, fermentation/bright beer tank, CIP tanks, hot water tank etc.

Provide 16 months complete warrantee for auxiliary equipments. In case the auxiliary parts occurred any errors within the warranty, please feel easy to inform our sales. We will according to customers' record / file and the detailed Fault Conditions to help them deal with their problems together. If it is a quality problem within the warranty, we will assist the repairing and support technical instructions until it is solved, or send a new part to client for free charge, and the client should send back the broken part if it is pump, heat exchanger, chiller, filter, boiler etc. which has high cost, as we will replace it in the relevant suppliers. If the problem is caused by a client improper use, we will assist the client and support related technical support via communication tools until the problem is solved, or send a new one to the client based on client’s requirement with reasonable charge.

h.)Any accessories will be supplied with our cost price only after the warrantee.

The seller is responsible for the nature damage of the machinery in the warranty period except for man-made damage. All spare parts and wearing parts are attached with the machinery for free;

G. FAQ and Answers

Questions	Answers
Wort Opacity or difficult for filtering	
1. Malt quality is low, so that the saccharification is not good enough. 2. Bad crash result 3. The temperature of saccharification is not right and the time is not enough. 4. The mash liquid concentration is too low 5. The way for filtering is not correct.	1. Choose good quality malt. 2． Should know the rule as “ Broken but not break”. 3. Correctly and strictly control the temperature and time of saccharification. 4. Control temperature and qty of bach feeder water according to technical process. 5. Control time of malt grains Precipitation and wort reflux speed.
After inoculation but without any fermentation	
1.The ferment temperature is lower than the required for. Especially when it is lower than 7℃ or there is any error on temperature, that means the actual temperature is lower than the indicated one on the thermometer. 2.Oxygenizing is not enough. There isn’t continuously oxygenizing during cool the wort. 3.The qty of yeast is lower than 1% (yeast mud), or 0.1% (dry yeast). 4.The aging and death rate of yeast is high (which also include when store the yeast mud that make it iced), or the application of the yeast is over 8 generations.	1. After sterilization of oxygenizing pipelines, oxygenize is filled from the valve on the bottom of tank, which will make temperature be higher. At the same time correct the thermometer. 2. After sterilization of oxygenizing pipelines,every 4 hours for oxygenizing once. 3. Re- add yeast. After adding yeast then oxygenize again. 4. Re- add the yeast with strong vitality, then oxygenize again.

After drinking the finished beer, the person is very easy to feel headache.	
1.The temperature of fermentation is higher than the required one 2. The value of the thermometer is lower than the actual temperature (error on display) 3. sugar degree of wort is higher than 11°BX 4. The beer temperature stored in the fermenters is cooled down to below 2℃. (which include that the actual temperature is lower than the thermometer).And the beer near by the fermenter's inner wall iced. 5.The storage of beer is too long and the yeast isn't drained off in time. When beer cooled down to 2℃, the storage time is over 10 days, then the yeast will be soluble.	1.Strictly operate according to required temperature value. 2.The thermometer should be corrected every time after one batch. Every thermometer adjustment for controlling range, the thermometer should be corrected (correct errors). 3. Control the wort thickness to be 10°BX---10.5°BX. 4. Correct the thermometer of ice water tank. The actual ice water temperature is forbidden to lower than －6℃; and control the stored beer temperature strictly in accordance with the technic process. 5. Once the beer is matured, it should be sold out asap. To avoid long time storage. After one week storage, the dead yeast at the bottom of the tanks should be drained out asap.
1.Bad smell; 2.Rough foam; 3.Not tasty; 4.Less foam, and the foams'time is short. 5.Not full bodied. 6.Acid 7.Unpleasant Taste 8.Dark color 9. Beer is clear, the turbidness is bad .	
1.Raw material is bad. Yeast is aging. 2.Bad result of saccharification or high temperature fermentation 3. High temperature fermentation, and the mature condition is not enough. 4. Bad quality of saccharification water and the technic process is not reasonable. 5. Yeast aging and the mature condition is not enough. 6. Yeast aging and contamination. 7. High temperature fermentation; diacetyl reduction is not thorough. After tank is sealed then Oxygenized or the yeast is not drained out for a long time. The dead yeast is	1. Choose good quality material with strong yeast. 2. Strictly control the saccharification process and adjust the PH value of saccharification water to be about 5.5 and control the temperature of fermenter. 3.Control fermenter, mature temperature and beer storage time. 4. Improve water quality and reduce the hardness and adjust the PH value of mash liquid. 5. With strong yeast and control the maturation temperature and time. 6.With strong yeast, the equipments must be disinfected thoroughly and maintain the environmental health.

autolyzed 8. Long mash and boiling time. Burned malt has high chromatic value after long mash and boiling time, or it is excessively added. 9.The storage time is over 2 weeks. The yeast subside or the temperature of beer storage is too low and iced.	7.Control ferment temperature, diacetyl reduction temperature and time. Strictly forbidden to oxygenize after tank is sealed and should according to the required time to drain out the precipitant and dead yeast. 8. According to the malt quality to adjust the saccharification process to reduce the burned malt qty. 9. Yeast sinking is a normal organism reaction. Should sell beer in time and drain yeast out. Control the ice water temperature and beer storage process strictly. Sightless temperature reduction is forbidden.