

Selection Precautions of Injection Molding Machine

Currently, there are many manufacturers of injection molding machines, which provide different specifications, models, quality and grades of injection molding machines. When users select the injection molding machine, they shall combine the current and long-term interests, and comprehensively consider the specification and model of the injection molding machine selected. Namely, the users shall select the injection molding machine through considering the following factors: performance, quality requirements, material, size, weight, annual yield and other relevant factors of the product to be manufactured (for instance, the manufacturers who produce ordinary plastic toys and plastic parts of high-end household appliance shall take different selection ideas).

Now the selection of specification and model of the injection molding machine shall be introduced through the following several technical parameters and important components.

A: Injection weight

The maximum weight of PS plastic air injection serves as one of most common parameters of injection molding machine. When the materials of plastic products are different from PS, the injection volume can be used after the conversion. According to the practical experience, the gross weight of the products shall be controlled within 85% of the injection volume; the non-crystalline plastic shall take large value, while high-viscosity plastic shall take small value.

B: Locking force

It is defined as mold clamping end, when the molten materials are injected into the mold cavity, the final locking force is formed by template against the mold. It is one of the most common parameters of the injection molding machine. When the clamping force is insufficient, the "burr (flash)" may be generated; when machine model is selected, the locking force required by the product processing shall be ensured to be less than the clamping force. Generally, the locking force shall be calculated by the product of average pressure within the cavity, and projected area of mold cavity. Thereof the average pressure within cavity shall generally take 20~40mpa, and be determined by plastic characteristics, product requirements, product flow length ratio and other factors. The accurate locking force can be calculated by the computer simulation when the mold is designed.

C: Injection pressure and injection ratio:

The injection pressure among specification parameters of injection molding machine indicates the maximum pressure within the material canister during injecting period rather than the maximum oil pressure of injection system; the relationship between injection pressure and oil pressure is inversely proportional to ratio between screw cross-sectional area and shot cylinder area.

Injection ratio indicates the molten material quantity emitted from the nozzle per unit time, its theoretical value indicates the product of inner sectional area and speed of material canister. Currently, the requirements of injection molding process against injection ratio tend to be not only the high value, but also can conduct the programming (namely, multi-level injection) during the injection process. According to the features of plastic material and processing product, the flow state shall be controlled effectively during the mold filling of the molten materials. As for those products required large flow length ratio and extremely high injection ratio, our company has configured accumulator accessory device, so as to reach the ideal effect of the products.

D: Maximum and minimum mold thickness and mobile template stroke:

Maximum and minimum mold thickness: generally the maximum mold thickness and minimum mold thickness (or mold thickness) is within the specification parameters of injection molding machine, which represent the mold size encompassing by injection molding machine.

Mobile template stroke: the mobile template stroke of injection molding machine is limited, and the open mold distance required by the removed parts must be less than the maximum open mold stroke of the injection molding machine. As for single parting surface injection mold, the open mold stroke is of $S \geq H_1 + H_2 + 5 \sim 10(\text{mm})$, where the H_1 indicates stripper distance, which generally equals to the height of mold core, however, as for the parts with large stripping slope or step-shaped internal area, sometimes it is unnecessary to eject the total height of the core to take

out the product, therefore, stripper distance of H1 shall be determined according to the actual situation, it shall be subject to take out the parts smoothly. H2 is the parts height (including gating system), as for three-plate two parting surface injection mold (mold with pin point gate), the open mold distance shall increase the separation distance between fixed template and clamping plate, such distance shall be sufficient to take out the freezing materials of gating system.

E: Relevant dimensions of the mold mounting portion

The length and width of mold shall adapt to mold dimension and of internal interval of drawbar of the injection molding machine, the mold shall be ensured to be installed to the template through the drawbar interval. When position, the following factors shall be considered:

1. Main sprue center of mold shall overlap with central line of material canister nozzle;
2. The size of locating ring on the mold shall be consistent with the size of locating hole on template of injection molding machine, and the clearance fit shall be adopted.
3. The spherical radius of injection molding machine nozzle shall be identical to spherical radius on the end of main sprue of mold;
4. The mold foot size of the male and female mold shall match with the arrangement of threaded hole on fixed mold.

F: Screw and material canister

Screw and material canister serve as important link to influence the overall function of injection molding machine. The molten material in the material canister must have good plasticizing mixing effect and uniformity, good plasticizing capacity is crucial to the forming efficiency of products; while as for the abrasive materials (for instance, glass fiber reinforced plastic) and corrosive material (for instance, hard PVC, and etc.), the material structure of material canister and screw are important. Our company develops corresponding plasticizing unit against such plastics, such as PVC, special PC screw, bi-metal screw material canister, and etc. When purchase machine, the customers shall clearly describe the processing raw materials, so that the corresponding screw material canister shall be configured.

G: Ejection stroke:

Effective ejection distance can make the forming products strip from the mold, which facilitates the continuity of next mold movement (mold doesn't have such function). Ejection stroke shall be selected as per the product appearance and design structure of mold, generally the maximum ejection stroke of machine is fixed, which can be adjusted when used by the users, during the purchasing of machine, ejection stroke shall take large value, so as to adapt to the more products.

H: Plastic machinery computer

The capacity and working speed of plastic machinery computer serve as factors play a decisive influence to the quality and rejection rate of the products. The improvement of function and speed of plastic machinery computer is crucial to the no waste production; the more frequent the plastic machinery computer is monitored and corrected, the more accurate repeatability of various units of injection molding machine, and more stable of the product quality. When the machine is selected, proper controller shall be chosen according to the required accuracy of the product itself, the performance of the controller is directly related to the performance and cost of the machine.

I: Hydraulic control system:

Currently, in addition to fully-electric injection molding machine, most injection molding machines is controlled through the hydraulic system, and the oil pressure, flow and direction shall be controlled through adjusting various control valves, so as to realize various actions of the injection molding machine. Our company now takes the electro-hydraulic proportional control system for the injection molding machine, matched high-performance hydraulic components, all of which make the injection molding process have the following features, namely, good repeated accuracy, working stability, reliability, low-noise, good sealing, easy to be installed, easy to be maintained, energy-saving, and etc.

In addition to the above important factors, those parameters that have been mentioned in the specification parameter table of our company shall also be paid attention to.

In short, it is not a small investment to purchase an injection molding machine, so multiple factors shall be considered comprehensively to select a injection molding machine with specification conforming to and applying to the product itself. Before purchasing, for one thing, learn the main parts of the injection molding machine provided by the manufacturer; meanwhile comprehensively evaluate the various Strength of the manufacturer, compare the different injection molding machines from the aspects of quality, price and performance, so that select an injection molding machine that conforms to the company requirements, but also cost-effective.

Chapter Machine Installation

2.1 Preparation before installation

- 2.1.1 After the working position of the machine is determined, the requirements of machine dimension and ground foundation dimension shall be ensured, the machine installation position must consider the space for the auxiliary equipment, material stockpiling and maintenance work, the minimum distance from the wall is recommended to be 2m, the machine interval is recommended to be no less than 2.5m; plastic injection molding machine is a heavy equipment, which shall not be installed on the normal ground.
- 2.1.2 The most suitable hydraulic oil and lubricating oil shall be purchased from the recommended working oil (see Attachment A in details).
- 2.1.3 Before the installation of the machine, firstly arrange the power supply system and water supply system with the purpose of safety and application, the sectional area of the power supply cable shall be laid according to the total power of the machine, see Chapter I for the special voltage and frequency, the supply pressure of water source is of 2-10kgf/cm², water supply and discharge shall be smooth, all pipelines are embedded underground (cable must penetrate into the electrical pipe).
- 2.1.4 The usage environment of the machine must be clean, tidy and indoors, sufficient illumination and ventilation must be guaranteed, as well as met the following conditions, if the following conditions are exceeded, then professional personnel shall evaluate whether it is suitable for production;
 - 2.1.4.1 Ambient air: the temperature shall be maintained at +5℃~+55℃ where it is ventilated, the average air temperature shall be no more than +50℃ above 24h.
 - 2.1.4.2 Air humidity: it is required to be 20%~95%;
- 2.1.5 When the potential toxic plastic products are processed, please reserve installation space for the exhaust pipeline.

2.2 Lifting and moving of the machine

- 2.2.1 Before the machine is moved, make sure the weight of the overall machine (please see main technical parameters in Chapter I), the load of the lifting equipment is crucial, the experienced rigger shall select equipment (crane, hook and wire rope) with sufficient load to lift.
- 2.2.2 Before lifting, the contact parts with wire rope and machine components are required to pad waste cloth layer or hardwood, so as to avoid the scratch, or damage the machine components.
- 2.2.3 When the machine is lifted or hoisted about 50~100mm away from the ground, the gravity position and inclination of the machine shall be checked, so as to ensure the horizontal lifting level of the machine.

2.3 Appearance inspection

Check whether the machine appearance is damaged or not during the transportation period. If there is obvious damage, please contact the sales company or selling office of our plant, as for the foreign customers, please contact the agents.

2.4 Installation

- 2.4.1 After ground foundation is dried, set the adjustable pads according to the foundation diagram, after that install and position the machine.
- 2.4.2 A set of precision level is placed on the drawbar, adjust the adjustable pads to make the machine in the horizontal position, and then lock it.
- 2.4.3 Pay attention to removing the temporary lifting bracket that is used for fixing the clamping parts and machine parts during the lifting process.

2.5 Power supply connection

The power incoming line of this machine adopts three-phase and four-line mechanism, thereof the motive power is AC380V/50Hz, and the electric heating part shall be controlled by AC220V.

2.5.1 Users shall equip a group of fuse with certain rated value on the self-powered wiring board.

2.5.2 The power lines shall connect with the screw nails on wiring board in the circuit box, three lines connect with live line, while one line connects with zero line, the earthing resistance is required to be less than 0.1ohm.

2.5.3 In order to prevent the accidents due to the leakage of electricity, connect a lead (its sectional area can be seen in the right table) to the earthing copper row in the circuitbox of the machine, the other end shall connect to the earthing bar or welded to a copper plate, and then the earthing bar or copper plate shall be embedded in the ground that is not easy to be dried.

2.6 Oiling

2.6.1 The hydraulic oil is injected into the oil tank through the bath filter of the machine body oil tank, the oil level shall be higher than the midscale of level meter (the quantity of hydraulic oil can be seen Column of oil tank capacity in parameter table of Chapter I), in order to guarantee the normal operation of the machine, the hydraulic oil that is prepared shall be 20% above more than the oil tank capacity (pay attention that different brands of oil can't be mixed use). The hydraulic oil model shall be YB-N46 anti-wear hydraulic oil, it is recommended to use MOBIL DTE26, SHELL TELLUS OIL 46, AND shanghai sea brand 46 anti-wear hydraulic oil.

2.6.2 After the machine is started, the oil in the tank shall be absorbed into hydraulic cylinders through the pump, so the oil storage in the oil tank reduces correspondingly, please note after the machine is started, check the oil level indicated by level meter once again, if it is lower than the midscale of the level meter, then supplement oil to the oil tank once.

2.6.3 Oil pump shall not be starting within three hours of oiling, so as to facilitate the emitting of the gas in the oil.

2.7 Cooling water pipe connection

The cooling system of this machine can be divided into two parts, which can enter into the oil cooler and cooling dispenser through the same water supply pipe.

Pay attention to use the clean water source.

2.7.1 Oil cooling



This machine can monitor the oil temperature, the specific monitoring scope can be set on the computer screen by the user, when the actual temperature exceeds the setting value, the machine shall shutdown automatically.

Hydraulic system serves as the core of the machine, and its working stability directly influences the performance of injection molding process. Since the hydraulic system continues to work, hydraulic oil temperature continuously rises due to the heat generated by the cycling, compressing and friction of the hydraulic components, if the oil temperature is too high, the oil viscosity may decrease, while the system leakage may increase, so that cause the fluctuation of system pressure and flow, make injection pressure and injection rate generate pulsation, and influence the action stability, in serious case, it may damage the hydraulic components; therefore, pay attention to the change of oil temperature during the working process, the ideal hydraulic oil temperature shall be maintained at 30℃~50℃, while oil cooler can withstand water pressure of 2-10kgf/cm².

2.7.2 Cooling water flow (shown in the following table)

Power of pump driving motor	Cooling water flow	Power of pump driving motor	Cooling water flow
11KW (15 H.P.)	19.0 l/m or more	30KW (40 H.P.)	51.5 l/m or more
15KW (20 H.P.)	26.0 l/m or more	37KW (50 H.P.)	63.5 l/m or more
18.5KW (25 H.P.)	32.0 l/m or more	45KW (60 H.P.)	77.5 l/m or more
22KW (30 H.P.)	38.0 l/s or more	55KW (75 H.P.)	94.5 l/m or more

The cooling water flow of oil cooler shall prevent the temperature of hydraulic oil in tank to exceed 55°C, the change of cooling water flow is determined by injection molding condition, water temperature, air temperature, oil cooler dirt which make the decreased efficiency and other factors. So the flow shown in the right table shall be taken as the requirement rather than the reference standard.

2.7.3 Cooling water dispenser

Cooling water dispenser is equipped with different amount of waterways for different types, but a group of waterway is used for cooling of the material canister, namely, conduct circulating cooling for the material canister between the electrically heated coil and feed inlet, so as to prevent the materials be molten before entering into the material canister; others shall be connected as per the design of mold cooling circulation waterway, see Chapter I for the connecting thread between the cooling dispenser interface and two waterways.



2.7.4 Injection material canister and cooling water flow of mold

The cooling water flow of injection material canister and mold is determined by the molding conditions, most applicable flow shall be established as per the actual molding work experience.

2.7.5 Precautions

A: The cooling water for oil cooler shall be supplied before the molding work;



B: According to the local climate change, when the machine stops working in the low temperature of Winter, small amount of water is still required to be cycled, so as to prevent the icing and cracking of the pipe, if the cooling water is possible to be icing, the residual water in the oil cooler shall be discharged totally with the compressed air, so that protect the cooler and other equipment against being damaged.

C: Oil cooler must be checked and maintained regularly, see Section 7.3 of Chapter VII for the specific methods.

2.8 Exterior cleaning

2.8.1 After installation of the machine, the parts without paint shall be removed inhibitive oil with gasoline or coal oil, and then use soft cloth to wipe cleanly (be careful, please don't smoke at site or there is fire nearby during the cleaning period).

2.8.2 Chrome plated parts, such as drawbar, guide bar, piston rod and etc., shall be removed dust and dirt, so that to prevent the damage of sliding sleeve and sealing ring galling, the sliding surface after cleaning shall be coated lubricating oil.

2.9 Lubrication

2.9.1 There are three types of lubricating devices and lubrication:



- Pressure injection type oil cup;

- 000# extreme pressure lithium-based grease shall be injected by oil nozzle manually;
- GEP220 gear oil shall be injected by electric lubrication pump.

2.9.2 Before the machine is used, fully check whether lubricating points and lubrication is normal, so as to ensure there is no blocking or leakage of the lubricating oil circuit, while the gear oil level shall be checked before starting the electric lubricating pump.

2.9.3 The applied lubricating oil type and brand shall be subject to the principle of high quality, try to use our plant recommended oil products, high viscosity or nonconforming lubricating oil may cause ineffective lubrication or poor lubricating effect, keep the lubricating oil clean during the using period.

2.9.4 When the machine shutdown for a long-term, start the machine once, add lubricating oil once every month, especially conduct the clamping action once, so as to prevent the grease waxing and hardening.

2.10 Others

After installation of machine, check whether the machine, electrical components and wire are loose or stripped due to the vibration of transportation, if they are loose, then tighten them again. After the installation is finished through the above step, check again to prevent any oversight.

Chapter IV Machine Commissioning and Precautions

The design and manufacture of this machine have the molding function of the normal plastic injection molding machine. Any improvement to the machine shall contact the manufacturer, if the oil circuit or electric circuit of the machine is changed arbitrarily, it may damage the machine and cause accidents, then the manufacturer shall not take any responsibility to such damage or accidents.



Special note: operator shall take training and fully learn and understand the machine performance, and then can they conduct the production activities.

4.1 Machine commissioning

4.1.1 According to the process in Chapter II, the machine has been installed on the ground foundation, and the level has been adjusted, in addition, the supporting oil, water and gas facilities have been connected.

4.1.2 Commissioning procedure:

4.1.2.1 Turn on the main switch, and transmit power to the machine;

4.1.2.2 Check whether the function buttons on the operation panel are normal (see computer instructions);

4.1.2.3 Set the parameters of actions (see computer instructions):

4.1.2.4 The oil pump motor shall be started, idle for three minutes, and then enter into the next step action;

4.1.2.5 Conduct the trial operation of manual, semi-automatic and full-automatic actions as per the steps, and ensure the machine operates normally;

4.1.3 Safety equipment testing:

4.1.3.1 In manual, semi-automatic and full-automatic state, open the nozzle cover, then machine can't conduct the injection, plasticizing and feeding, and loose retreating actions, if there actions is activated with the opening of the nozzle cover, the machine shall stop immediately, and screen shall display the nozzle cover hasn't been closed, the alarm lamp lights.

4.1.3.2 In manual state, open the safety door, the machine shall not alarm, other actions in addition to the clamping action shall be conducted normally;

In semi-automatic state, when clamping action is finished, the safety door is opened, the machine shall finish a cycle of action; after close the safety door, and then press the confirm button, it shall enter into the second mold; otherwise, when safety door is opened without the finishing of the clamping action, the machine shall open the mold thoroughly, stop and alarm;

In full-automatic state, when clamping action is finished, the safety door is opened, machine shall finish a cycle of action; after close the safety door, it won't enter into the second mold, but alarm; otherwise, safety door is opened without the finishing of the clamping action, the machine shall open the mold thoroughly, stop and alarm;

4.1.3.3 In manual, semi-automatic, and full-automatic state, turn off the emergency shutdown switch, the oil pump motor shall stop immediately, the machine stops all actions, but the computer

screen has power, the parameter can be set;

4.1.3.4 Check whether the falling of the mechanical insurance stopper is flexible;

4.1.3.5 Check whether the safety door is light and flexible;

After the above corresponding tests are finished, the machine can be produced.

4.2 Mechanical equipment precautions

4.2.1 The safety door, cover, plate and hopper of the machine can't be removed arbitrarily, they shall be installed in the original places except for the maintenance, test and inspection situations.

4.2.2 The safety device of this machine is equipped with electrical and mechanical protection (parts of machines have hydraulic insurance), when the machine is opened every day, check whether the stroke switch and stroke change-over valve are reliable when the front and rear safety doors are opened, as well as check whether the safety stopper can fall freely when the front safety door is opened.

4.2.3 Never put any things on the material canister cover, so as to prevent the concave and deformation.

4.3 Electric equipment precautions

4.3.1 The power must be cut off before the machine inspection and maintenance;

4.3.2 The equipment parameters and setting values shall not be changed arbitrarily, non-operators are prohibited to operate the machine;

4.3.3 The machine must be equipped with reliable grounding device;

4.3.4 Close the door of control box;

4.3.5 Pay attention to check whether the thermocouple used for heating and temperature testing works normally;

4.4 Hydraulic equipment precautions

4.4.1 Check the oil level indicated by level meter. Add oil the oil tank, if necessary;

4.4.2 Pay attention to the hydraulic oil grade, generally the hydraulic oil shall be purchased as per the recommended one, however, the local climate conditions shall also be considered to make corresponding changes, for instance, the hydraulic oil grade shall be increased in the cold region, while it shall be decreased in the hot region;

4.4.3 Pay attention to the opening of cooling water system, the oil temperature shall be maintained at 15°C~55°C;

4.4.4 Pay attention that the working pressure during the using period shall not exceed the maximum system pressure in the technical parameter table, if such scope is exceeded, it may cause failure, in serious case, the equipment may be damaged;

4.5 Other precautions

4.5.1 The new machine needs to be lubricated comprehensively before formal starting;

4.5.2 When the machine is started, firstly inch the starting, and check the rotation direction of the motor;

4.5.3 Before pre-plastic (rotate screw), firstly start the electric heating device, and then

conduct pre-plastic and feeding after reaching the setting temperature (pay attention whether the relevant temperature setting conform to the feature requirements of the processing plastics);

- 4.5.4 Within the first month when the new machine is started, make the screw rotate at low speed and high torque (60rpm below);
- 4.5.5 When the mold is replaced and adjusted, please operate under low pressure and low speed conditions;
- 4.5.6 Before the machine is stopped, raw materials must be emptied from the material canister completely;
- 4.5.7 Never high speed or high pressure action are allowed to be used when remove the raw materials, never move the nozzle away from the mold sprue bushing surface, otherwise, it may be dangerous to be burnt by the spills;

Operation Step

Before operate the machine, operators must take strict training, after learn and be familiar with the machine performance, can they operate this machine, see computer instructions for the specific operation.

5.1 Use scope of operators



WARNING

In order to avoid the injury of the operators during the running of the machine, our company designates the safe position, where the operators shall stand.

5.2 The scope where operators can't enter into



WARNING

In addition to the warning place, operators shall not stand in other places where warning signs have not been labeled such as pipeline, safety door internal, material canister, ejection device and etc., so as to avoid the danger. If users are injured due to improper use of the machine, then the users themselves shall take such responsibility.

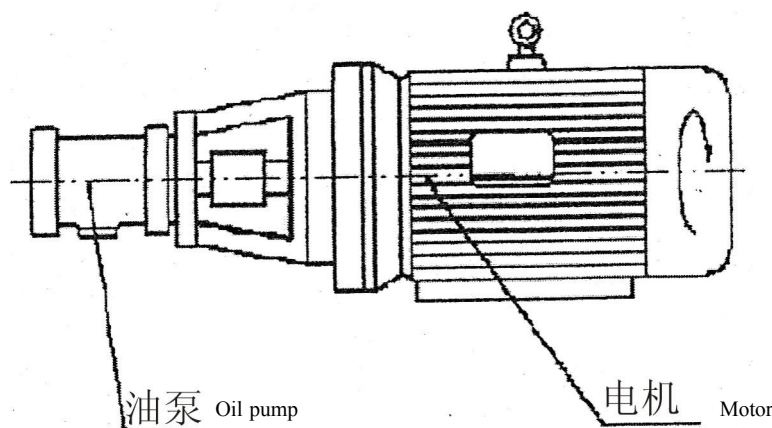
5.3 Inspection before operation

5.3.1 Connect the circulating cooling water, and observe whether the water supply and discharge is smooth.

5.3.2 Turn on power of the power supply line, unlock the power switch of the machine and open it, and turn on the power of the overall machine. There are several air protection switches in the distribution box, open the distribution box door, and pull up the switches, and turn on the power of all circuits. At this time, the LCD screen on the operation panel may appear text or graphics, which indicate that control computer begins to work, the next step procedure can be taken. The input power supply shall be checked.

5.3.3 Calibrating the rotation direction of oil pump

The oil pump shall be inch started before operation, check whether the oil pump direction is correct, for instance (see the label on the following motor) observing from the electric motor end, the clockwise direction shall be right, if it is counterclockwise direction, firstly cut off all power supplies, two-phase (L1, L2) among the three-phase power supply connected to the electrical box shall be exchanged.





The reverse rotation of oil pump won't generate oil pressure, but generate high degree of noise, and the oil pump may be damaged, so the machine must be stopped immediately.

5.3.4 Check the heating device

Check whether the thermocouple on material canister is tight and contact well, after it is ensured to be normal, turn on the heating switch, adjust to the plastic molding setting temperature, meanwhile pay attention to the current value.

5.3.5 Check whether the action of safety door system is normal, and check whether the safety device works after the machine is started.

5.4 Starting and stopping the oil pump motor

5.4.1 The oil pump motor can be started after it is adjusted as per the following steps.

NO.1: Turn on the machine power;

NO.2: Start the motor by pressing the starting button of the motor;

NO.3: The machine shall be stopped by pressing the motor stop button or emergency stop button switch.

5.4.2 Precautions:

(1) Before starting, the liquid level shall be ensured to be above the midscale of the level meter;

(2) Open safety door;

(3) When any hydraulic device is disconnected, never start the oil pump motor;

(4) Firstly start manually, and then stop immediately (inching), so as to check the rotation direction of motor, the pressure and flow of various actions shall be set at zero position;

(5) When the oil pump is run firstly, it shall run 30 minutes without load, and then enter into load operation, so as to extend the service life of oil pump;

(6) When the oil pump is working, firstly hear whether there is abnormal noise, and then enter into the action operation.

5.5 Electric heating start

Enter into the temperature setting screen, and set the temperature at different phases;

Press the heating button, the material canister begins to be heated. In normal case, it needs heating about 20 minutes to reach the setting temperature.

When the setting temperature is not reached, it is strictly prohibited to conduct the action of injection part.

5.6 Action operation

See computer instructions in details.

When the new machine is conducted commissioning operation, firstly set a group of low-pressure and slow-speed parameters, press action button in manual state, and observe whether actions can work stably.

After all actions are normal in manual state, press semi-automatic button, open the safety door once, and observe whether semi-automatic is normal.

After the semi-automatic state has been undergone three to five cycles, when the clamping action is finished, press automatic time button, the machine enters into the full-automatic function, observe whether the machine works normally.

If all work above is normal, it indicates that the commissioning action of this machine is finished, injection molding work can begin, and then enter into normal working state.

5.6.1 Clamping

- (1): Close safety door;
- (2): Set the machine action state to be manual;
- (3): Press clamping button, and the clamping action can be started.



When the mold is closed at high speed, never interrupt the closing of the mold, even at the low pressure clamping state, the inertia shall also make mold close suddenly, especially at the mold adjusting period. Therefore, be sure the select clamping action at low-speed.

5.6.2 Mold opening

- (1): Set the machine action in manual state;
- (2): Press mold opening button, and start the mold opening action.

5.6.3 Injection system operation

5.6.3.1 Pre-plastic (feeding)

In manual state, press feeding button, screw begins to rotate and gradually retreat, the retreating speed is relevant to the pre-plastic backpressure adjusting value (see Section 6.2 of Chapter VI in details), oil motor stops rotation till the position transducer reaches the measuring position, there is anti-salivation action during the automatic circulation period.

NO.1: in order to protect screw, ensure each point temperature of the heating tube reach the setting temperature for 15-30 minutes before feeding materials, and then operate the machine;

NO.2: in order to use screw better, make sure the screw works with low speed and large torque within one month after the new machine is started, the maximum rotation speed shall not exceed 60rpm;

NO.3: please see computer instruction for the setting of measuring position of the material feeding.

5.6.3.2 Plunger

In manual state, press the plunger button, the plunger action shall begin.

NO.1: the nozzle protective cover must be closed, so as to prevent burns by the slashing materials;

NO.2: The injection must be implemented at low speed without the mold.

5.6.3.3 Backing off

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Press backing off button in manual state, the screw shall be retreated.

5.6.3.4 Screw cooling start protection

After the machine is started, when it is heated firstly, the material canister temperature is insufficient, so screw won't move; such function allow the screw to operate after the material canister temperature is heated to exceed the setting temperature value.

5.7 Prohibition operation instructions of the machine

- a. This machine is strictly prohibited to be operated in the open air!
- b. This machine is strictly prohibited to be used without the installation of the safety device!
- c. This machine is prohibited to be operated without relevant consent or training!
- d. People who don't receive the permit from the machine manager, or don't take training or don't read the specifications are prohibited to operate this machine!

- e. This machine is prohibited to be operated by exceeding the machine capacity or changing any parts of this machine!
- f. The toxic rubber plastic products are prohibited to be produced without the installation of relevant treatment equipments.

5.8 Mold installation

5.8.1 Preparation before mold installation

- a. The mold length, width and height shall be measured, compare the measured data with the data shown in the mold installation diagram, and then judge whether the mold can be installed in this machine;
- b. Measure the outside diameter of the mold locating ring, check whether it matches with the installation hold on template;
- c. The mold bayonet size, and the distance between bayonet and external panel of mold shall be measured, according to the relevant data in the attached mold installation diagram, judge whether this machine matches the mold, and the extended nozzle shall be selected, if necessary;
- d. The ejection plate dimension of the mold shall be measured, compare with the relevant data in the parameter table, and then judge whether this machine is applicable;
- e. According to the design parameter of mold, adjust the setting of ejection stroke and position of mold opening and closing, so that when the mold thickness is adjusted, it won't damage the mold;
- f. Prepare the mole plate, plate spacer, tight bolt, nut, flat washer, spring washer, wrench, pipe fitting, steel rope and etc.

5.8.2 Installation steps

- No.1: Start oil pump motor, place in the manual state, and press the seat back button, after injection seat retreat from front mold and mold positioning hole, it stops;
- No.2: Close the front and rear safety door, press closing mold till the dynamic template moves forward;
- No.3: Open safety door, press mold adjusting button in the mold adjusting state, press mold adjusting back button, dynamic template moves back (mold adjusting back stroke is determined by the mold thickness), and then press mold adjusting button, cancel the mold adjusting state;
- No.4: Stop oil pump motor, adjust the ejection bar position and quantity, so that it can match the mold, tie the mold to steel rope (ensure that the dynamic and fixed mold of template won't be separated), lift the mold with lifting equipment, and then gradually lower the mold, so that the mold is between the front template and dynamic template, observe whether the mold positioning bayonet is aligned with front template center positioning hole during the falling period, after aligning embed the mold center positioning bayonet into the mold center positioning hole, at this time, the mold surface shall be affixed to the front template (note: lifting equipment is still holding mold);
- No.5: Close the front and rear safety door, start oil pump motor, place the machine in manual state, press the clamping, dynamic template moves forward till toggle extends into a straight line, at this time, dynamic mold is in locking state;
- No.6: Press mold adjusting button, the machine is in mold adjusting state, press mold adjusting forward button, dynamic template enters into panel and flatten with the mold plate, and then press mold adjusting button again, the mold adjusting state is canceled.
- No.7: Stop oil pump motor, open safety door, and fix the mold with screw nails and washer plates to the front template and dynamic template, and then remove the steel rope and lifting equipment.



- 1: The above mold opening, closing and adjusting actions must be implemented under the mold adjusting or manual operating modes.
- 2: The position setting of ejection cylinder and clamping cylinder must be adjusted before mold installing, so as to protect the mold and the personal safety of the operators;

5.8.3 Mold adjusting

No.1: Start oil pump motor, set the parameters of mold opening, closing and adjusting (see computer instructions in details);

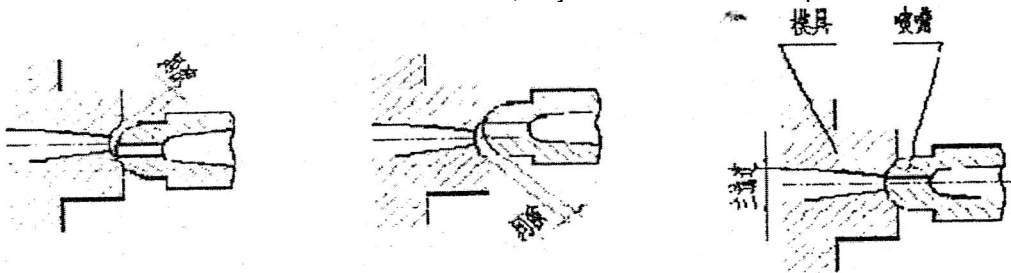
No.2: Place the machine in manual state, press automatic (material washing/mold adjusting) button, and place in ON state;

No.3: Press mold adjusting button, and place in ON state;

No.4: Press mold adjusting forward button, the automatic mold adjusting action begins. Or users press micro-motion mold adjusting button, and enter into the manually mold adjusting state.

5.8.4 Adjusting the contact between nozzle and mold

In order to prevent the leakage of molten materials during injection period, injection nozzle ball shall contact with the concave spherical of mold main flow channel. For instance, adjust if the contact is poor.



(a) Poor contact

(b) Poor contact

(C) Good contact

Adjustment steps are shown as follows:

No.1: Start oil pump motor, place the machine in manual state, press the forward button till the nozzle contact the mold, observe whether there is gap on the upper, lower, left and right sides of the contact surface (see the diagram above);

No.2: If the contact between nozzle and mold is poor, it indicates that nozzle center is not aligned with the mold main channel center, firstly loosen the socket head cap screw in the front and rear bearings during the adjusting period, and adjust the screw nail till nozzle ball contact mold main channel totally as per the contact situation between nozzle and mold, and then tighten the socket head sap screw on the front and rear bearings.

5.9 Injection molding production

5.9.1 Precautions before injection molding

Note 1: In order to protect screw, after each point temperature of heating material canister reaches the setting temperature for 15 to 30 minutes, and then operate the screw.

Note 2: In order to prevent the damage to the screw, when the machine is run without materials, the trial operation shall be implemented at the speed of 60rpm below.

Note 3: Never let the face and hand be close to the nozzle tip.

Note 4: The mold installation must be finished before the injection molding work.

Note 5: All those things that are not indicated in the next section of injection molding step shall be implemented in the manual state.

5.9.2 Injection molding steps

a: Set the electric heating temperature of material canister to be the applicable temperature of used materials, and the next step action can be started after the material temperature reaches the setting temperature for about 15 minutes;

b: Open the hopper lid, and pour the plastic materials, and then cover the hopper lid (if there is automatic feed machine, then implement according to the feed machine operation instructions);

c: According to the product weight, raw material ratio, total injection volume of machine, the

generally set the finishing position of stored materials, pressure and speed of stored materials, and adjust the pressure of stored material backpressure valve; meanwhile set the relevant injection and protection pressure parameters.



The too large backpressure may increase the energy consumption of stored materials.

d: Start motor by pressing start button of the motor;

e: Press clamping button, and do the clamping action till the clamping action is finished;

f: Press injection seat forward button, make injection seat move forward, till the nozzle mouth contact the mold gate;



As for different plastics and molds, the sequence of Step e and Step f may be changed.

g: Press stored material button, as the screw rotates, it gradually retreats to the setting position, after that it stop stored materials automatically; during the material storing period, press stored material button again, make the material storing action stop;

h: Press injection button, and the injection action pressure protection action begin;

i: After the pressure protection is finished, loosen the injection button, press the stored material button, and the material storing of next mold begins;

j: After material storing is finished, if the cooling time is enough, press mold opening button, and the mold opening action begins;

k: After mold opening action is finished, do the ejection action, open safety door, and take out product;

l: Observe the molding situation of the products, and properly adjust the relevant parameters;

Repeat Step C – Step 1 till conforming product is formed.

m: After the product is qualified, press the semi-automatic and full-automatic buttons, and enter into the automatic work.

5.10 Shutdown

5.10.1 It is just before the molding is finished or before temporary stopping;

a: Press heating button, close the electric heating action of the material canister.



If it is temporary and short-time shutdown, please never close the electric heating action of material canister.

b: Close hopper baffle.

5.10.2 When materials are used up or the required product quantity has been finished production, then the electric heating action must be closed or stop the machine;

a: If the injection molding machine is equipped with temperature regulator used for adjusting the temperature of the nozzle, rotate such regulator button to 0, so that disconnect the regulator.

b: In order to heat the material canister in a short time in the next molting operation, and in

order to prevent the molten resin stuck in the material canister, so the residual materials in the heating canister shall be removed completely.

5.10.3 In manual state, implement clamping action (but don't enter into the high-pressure mold locking), and the injection seat and screw shall retreat to the stop position.

5.10.4 Stop oil pump motor, and cut off the main power supply of the injection molding machine.

5.10.5 Emergency shutdown: stop the machine under emergency situation by using the red emergency shutdown button;

a. When press it, oil pump drive motor to rotate, and machine immediately stop running, such button can realize self-locking under being pressed state, at this time the oil pump motor can't be started.

b. Turn such button to the right as per the arrow direction, then it can reset. When emergency shutdown is unnecessary, in order to stop the oil pump motor under the normal condition, the normal operation switch shall be used.

5.11 Mold unloading

No.1: Start oil pump motor;

No.2: In manual state, press clamping button to implement clamping action;

No.3: Press seat back button, injection seat retreats, after retreat from the template mold positioning hole, the nozzle stops;

No.4: Stop oil pump motor;

No.5: Open safety door, install bolt on the mold, tie to the steel rope, and make preparation for lifting;



Ensure that the fixed and dynamic mold not to be separated.

No.6: Remove the plate, screw nail and washer of the mold;

No.7: Start oil pump motor;

No.8: Press mold opening button, the machine opens mold, and then stop the machine;

No.9: Firstly suspend the mold, and then push the mold out of the fixed template positioning sleeve;

No.10: Take out mold, place it in a safe storing area.

Machine Adjustment

6.1 Action adjustment

6.1.1 Stroke adjustment

A: Mold moving stroke, and pre-plastic stroke shall be set by computer on the screen through the position transducer, ejection stroke shall be adjusted through adjusting the block, if it is position transducer, it can be set through the computer.

Note:



(1) Only when the mold opening is finished, press ejection button, can it ejects;

(2) When ejection stroke is set, stroke shall be set as short as possible, and then adjust a little, till the proper stroke is reached, so as to prevent the damage of the mold;

(3) Only when ejection bar retreating stops, clamping action shall begin.

B: stroke switch of injection molding device (overall oil cylinder)

The advancing and retreating scope of injection molding device can be adjusted through adjusting the position of block.

Precautions:

(1) When adjust, implement intermittent operation before the contact between mold and nozzle, namely, firstly move forward, stop immediately, and then move forward again, so as to prevent the damage of nozzle.



(2) When nozzle is moving forward, never clean salivation resin with bare hand, it shall be removed by metal clip after the injection molding is stopped.

(3) Pay attention that the seat forward switch is activated when the nozzle contacts the mold, in automatic state, unless such switch has been activated, otherwise injection won't be implemented, and circulation shall be stopped.

6.1.2 Pressure and flow adjustment

The pressure and flow rate of this machine are adjusted through the computer system, the pressure and flow rate values shall be set on the computer directly, and input the proportional solenoid valve through the amplifier to control.



Note 1: The pressure and flow upper and lower limit of proportional amplifier, and the resistor with variable upper and lower limit has been confirmed before leaving the factory, users shall not change them arbitrarily, the working pressure of proportional pressure valve has been adjusted to the maximum working pressure, flow rate is set to 99, and the proportional flow valve has been adjusted to the maximum flow.



Note 2: If there is exhaust screw nail on the proportional valve, when users start oil pump motor after starting the new machine or refueling, in order to eliminate the air in the hydraulic system, firstly exhaust the air. The steps are shown as follows:

No.1: Firstly set the pressure of actions to be 3MPa, and flow to be 30.

No.2: Loosen the exhaust screw nail on top of the proportional valve, and then implement actions manually.

No.3: When hydraulic cylinder needs implementing the whole-stroke advancing and retreating actions, eliminate the air from the hydraulic cylinder and pipeline completely, and then tighten the exhaust screw nail on the pressure and flow valve.

No.4: Stop the machine for 15 minutes, after all bubbles are eliminated from the oil, and then start the oil pump.



Note 3: The adjustment of pressure and flow shall be in accordance with the matching between process feature of raw materials and molding process, try to decrease the working pressure of the machine on the premise of the conforming products, prolong the service life of the machine and reduce the energy consumption.



Note 4: After the pressure and flow is determined, implement a period of trial operation, repeat the mold opening and closing actions, so that toggle mechanism is just straightened when the mold is tightened.

6.2 Adjustment of pre-plastic backpressure

Injection molding process needs to properly adjust the molten time of the plastics, according to the features of various resin, on the premise of guaranteeing the product quality, the plastics shall be molten evenly in the shortest time. The pre-plastic speed is reached by adjusting the retreating speed of screw. The screw rotation speed of this machine is set through computer in advance, the retreating speed of screw shall be controlled by adjusting the pre-plastic backpressure valve, when pre-plastic begins, the plastics continue to be transferred to the screw head, for which the pushing force is generated to retreat the screw. However, the pre-plastic backpressure restrains its retreating, correspondingly, the speed of molten plastics being pushed to the screw head becomes slow, the plasticizing speed becomes slow, and the plasticizing density becomes even and dense.

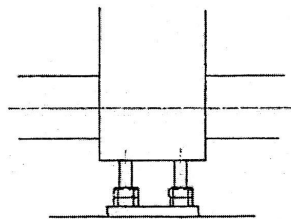
6.3 Nozzle centering adjustment

The centering problem between nozzle and mold positioning hole directly influences the production activity of the injection molding machine, if it is not centering, it shall curtail the service life even damage the nozzle; generally we have tested the nozzle centering issue before the product leaves the factory, so it needn't to be adjusted; if any problems are found to be re-adjusted, then invite experienced personnel to adjust, the specific adjusting method can be seen Section 5.8.4 of Chapter V Mold Installation.

6.4 Dynamic mold support

As for the middle and large size machines, as a frequently working part like dynamic template, it is heavy, in order to reduce the wearing influence to the template, drawbar, toggle bar, and other relevant parts, generally the accessory support structure is designed, so as to guarantee the four bars not to bend; our HS series machine has two structures: mechanical support and roller support, which have been adjusted properly, so the users won't adjust when the new machine is used, but it needs adjusting the during the use in the future.

6.4.1 机械支承(如下图所示) 6.4.1 Mechanical support (see the figure below)



Nut adjustment mode is adopted, it needs regular inspection during the producing period, it shall be adjusted if any loose parts are found, the methods are shown as follows:

No.1: Firstly remove the mold;

No.2: Operate the machine and clamping completely;

No.3: Re-adjust the machine body level, so as to guarantee the four drawbars in the horizontal state;

No.4: Adjust the first nut in the above figure (totally four pieces on two sides), and then rotate downside a little;

No.5: Implement mold adjusting action, observe the change of system pressure, adjust the preload degree of nut to a proper degree (note: four nuts shall be adjusted at the same time, all torques shall be maintained evenly);

No.6: Tighten the second locknut, such nut is used for prevent the loosening phenomenon, so the force shall be large a little;

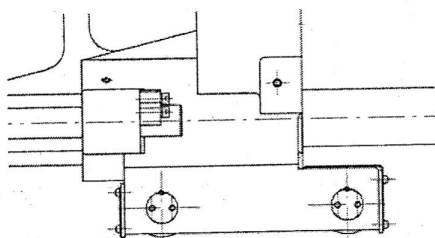


Note: If it is adjusted to loose or too tight, it shall increase the friction between the template and drawbar, and cause the difficulty of mold adjusting; meanwhile the protection against the drawbar disappears.

After adjustment, install a mold to have a try, observe whether the adjustment effect is good; during the normal producing period, regularly check whether the nut is loose, so as to facilitate the adjustment, re-adjust after the return board is worn.

6.4.2 Roller support

Roller support device supported by four rolling bearing shall be adopted under the template, when the template moves, the resistance and wear are both small, the support force has been adjusted when the products leave factory, As for large machine, there is a eccentric wheel device on the rear template that can be adjusted.



Machine Maintenance

In order to facilitate the machine to work normally, reduce its failure rate and prolong its service life, the users are required to take curing and maintenance measures to the machine.

7.1 Daily inspection

- No.1: Check whether the emergency shutdown button is normal;
- No.2: Check whether the machine has abnormal noise during the operating process;
- No.3: Check whether mechanical, electrical and hydraulic safety protection devices are normal (the adjusting and inspecting methods can be seen Chapter III Safety Device of Machine). The manual/semi-automatic/full-automatic clamping actions shall be operated separately, open the safety door for 20-30mm, and test whether the clamping action can be terminated;
- No.4: Check whether the hydraulic oil level reaches the midscale of the level meter, and whether there is leakage;
- No.5: Check whether the oiling of lubricating device and lubricating point is sufficient, check whether the liquid level of lubricating pump is high enough;
- No.6: Check whether the working pressure of hydraulic system is too high;
- No.7: Check whether oil temperature rises too rapidly, whether cooling water is normal;
- No.8: Check whether the heating instrument and temperature controller of material canister are normal;
- No.9: Check whether mold installation is fixed;
- No.10: Check whether the screw nails and contacts of stroke (proximity) switch is loose;
- No.11: Check whether various injection molding parameters are set correctly;
- No.12: Check whether the action operation in Section 5.6 of Chapter V is correct.

7.2 Regular inspection

7.2.1 Weekly inspection

- (1) Take regular inspection according to the contents specified in Clause 7.1 daily inspection;
- (2) Check whether stroke switch, electric heating coil, thermocouple wire and screw nail are loose;
- (3) Check if there is leakage in the hydraulic cylinder, joint, flange, hose and etc., if they leaks, corresponding seals shall bereplaced.

7.2.2 Monthly inspection

- (1) Take regular inspection according to the above inspection contents;
- (2) Check whether the tighten screw nial and nut of various mechanism are loose, if they are loose, tighten them, the specific torque reference value used for tightening the bolt is shown in the following table:

Bolt specification	Torque (kg*m)	Bolt specification	Torque (kg*m)
M3	0.23	M12	13.0
M4	0.46	M16	30.6
M5	0.92	M18	43.0
M6	1.6	M20	61.6
M8	3.9	M24	80.4

M10	7.5		
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(3) Check whether the net filter has thread, and grain to attach or block, clean them once, if necessary;

(4) Check whether there is corrosion within the oil cooler and out of the conductor pipe (Check the urban water supply once every six months, and then determine whether to clean or not).

7.2.3 Yearly inspection

(1) Take regular inspection according to the above inspection contents;

(2) Check whether the hydraulic oil is deteriorated or contaminated, replace with new hydraulic oil, if necessary;

(3) Check whether the wire is aging, hardening, and then replace it, if necessary.

(4) Check whether screw, retaining rod, seal ring, and mixing head are corrosive;

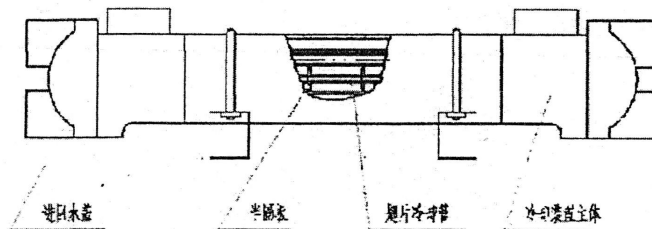
(5) Check whether there is noise, when pre-plastic oil motor runs, if the bearing of transmission shaft is damaged, then replace the bearing;

(6) Clean the overall machine, and wash the oil stain and dirt on the appearance.

7.3 Maintenance of oil cooler

This machine adopts float tube sheet oil cooler to cool down the oil, the cooling water flows to the backwater cover cavity from the inlet pipe, and then conduct the dual pipe flowing along the cooling pipe again, the water absorbs the heat from the oil and then discharges from the outlet pipe (see the figure below).

After the long-term working, the water media in the oil cooler gradually accumulates scale on the cooler wall, which reduces the heat transfer performance, even though it can't meet the cooling requirement.



7.3.1 Inspection and maintenance steps:

No.1: Close the oil and water inlet and outlet valves, discharge the residual water from the cooler completely, and then remove them off the machine;

No.2: Loosen the screw nail on the backwater cover, and then remove the backwater cover, meanwhile take off the seal gasket;

No.3: Loosen the screw nail on the rear cover, remove the rear cover, meanwhile take off the seal gasket, and then withdraw the cooling device from the fixed orifice plate end;

No.4: Introduce clean water from the hose, wash the accumulated dirt on the backwater cover, rear cover, and internal surface of the pipe, meanwhile use the soft cloth to clean the internal surface of the cooling pipe;

No.5 Adopt the alkaline cleaning solution that can be purchased from the market, wash the internal surface of the cooling pipe, washing pressure shall be no more than 5kgf/cm², observe the cleaning situation for the accumulated dirt till the clean water flows out;

No.6: As for mezzanine fouling that is difficult to be treated, immerse into the weak hydrochloric acid solution for 15-20 minutes till the effluent color is similar to the clean color.

Note: After cleaning with the cleaning solution, the clean water must be used to wash

repeatedly, so that prevents the corrosion from the chemical substance of the cleaning solution.

No.7: After clean with clean water, dry with compressed air.

No.8: Assemble as per the sequence, the sealing ring shall not be distorted or damaged during the loading period.

No.9: Conduct "air tight" hydraulic test, fill water in the place where the cooling water in the cooler flows, close the oil inlet and outlet, pass the compressed air (5kgf/cm²) from the exhaust port on the oil side, the exhaust port on water side shall be always opened, if the cooler has leakage, water shall overflow from the exhaust port on the water side;

No.10: After test, install in the original machine position as per the original sample, after that connect with the pipe.

7.3.2 Precautions during the use of oil cooler

1. The cooling media generally adopts clean fresh water, the turbid water shall be equipped with water filters (if the seawater is used for cooling, it shall be indicated during purchasing period).

2. In cold season, the residual oil and water must be discharged completely when the machine is shutdown, so as to prevent the crack;

3. In order to prevent the scale, cooling water temperature shall be low, and the flow rate shall be large, if the water source of supply cooling water takes underground water or industrial water, the water containing large amount of saline ingredients may accelerate the formation of scale in the cooler;

4. Exhaust regularly, and conduct internal inspection and cleaning regularly, the cleaning cycle shall be determined by the cool water quality, the urban supply water shall be maintained once every six months, while the underground water and industrial water shall be inspected and maintained once every month;

5. The oil inlet and outlet temperature shall be paid attention to during the ordinary working period, oil discharging temperature shall be adjusted through adjusting the inflowing rate of cooling water, so as to meet the use requirements.

7.4 Maintenance of net filter

The net filter plays the role of filtrating oil, only when oil pump absorbs clean oil, can the machine hydraulic system works normally, after long-time operation of the machine, oil continues to circulate, the impurities in the oil may attach to the surface of net filter, even block the net filter, and seriously influence the operation of oil pump, therefore, it is crucial to regularly inspect and check the net filter.

When the machine begins to use within one year, it shall be inspected and cleaned once every six months, after that the machine shall be inspected and cleaned once when it needs replacing oil.

Inspection and maintenance steps:

No.1: Remove oil tank cover, discharge all hydraulic oil in the oil tank, and take off the net filter on the oil inlet pipe within the oil tank;

No.2: Clean the oil tank completely;

No.3: The gasoline or coal oil are used to clean the filter, the thread, fine particles and other impurities on the filter surface shall be eliminated completely;

No.4: If net filter is found to be damaged, it must be replaced with a new one.

Note:



1: Never use the hard objects to scrape the wire mesh on the net filter surface, so as to prevent the damage of the net.

2: When oil filter is removed, never start the hydraulic pump motor.

3: When start pump motor after installing the filter, the oil pump shall work for 10 minutes without load, after the oil pump works normally, it can be loaded.

7.5 Cleaning and inspection of screw and heating material canister

The screw plastic injection molding machine material canister shall conduct the refueling cleaning, which shall take correct operation steps, the thermal stability and molding temperature of plastics, the melting performance among various plastics and other technical data shall be mastered. If the molding temperature of the plastic to be changed is far higher than the temperature of plastic remained in the material canister, firstly the temperature of material canister and nozzle shall be risen to the minimum processing temperature of the plastic to be changed, and add the plastics to be changed or its recycled plastics, continuously conduct the air injection till all stored materials finish cleaning, and then adjust to the normal temperature and conduct the production. If the molding temperature of the plastic to be changed is far lower than the temperature of plastic in the material canister, the temperature of material canister and nozzle shall be risen to the maximum flowing temperature, cut off the heating power supply, clean with the plastic to be changed at the temperature reducing state. If the molding temperature of plastic to be changed is high, molten viscosity is large, while the stored materials in the material canister are heat-sensitive like polyvinyl chloride and etc. In order to prevent the plastic decomposition, the polystyrene with good liquidity and high heat-stability or low-density polyethylene plastic shall be used as the plastic to be changed.

7.5.1 Disassembly of screw and material canister



Screw and material canister serve as important plastic parts, after the long-time operation of the machine or plastic molding is conducted with recycled raw materials; screw, material canister, screw head and retaining ring may generate wearing and abrasion, so if necessary, disassemble screw and material canister to clean and inspect, the wearing and abrasion can be observed directly.

Note: The nozzle, plastic components, heating coil and fastener designated by this company can be used.



A: Preparation before disassembly

- (1) The stored materials in the material canister is high-viscosity heat-sensitive plastics (polyvinyl chloride, polycarbonate and etc.) after cooling, which shall be attached to the screw and material canister bore surface, when strip, if the metal surface is damaged carelessly, before disassemble the screw and material canister, they shall be cleaned as per Section 7.5, firstly use the clean by the materials with good liquidity, and then continue to conduct air injection for several times.

- (2) The following auxiliary tools (materials) shall be prepared

a: 4-5 pieces of wooden or steel bars (diameter<screw diameter; length<injection stroke);

b: 4-5 segments of square hardwood (100mm×300mm);

c: Clamp;

d: Several pieces of waste cotton or cloth;

e: A piece of long wood material (diameter<screw diameter; length>length of heating material canister);

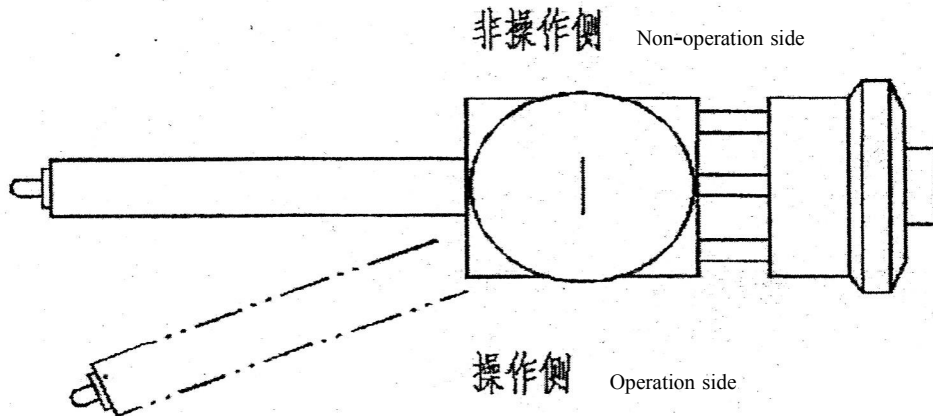
f: Nonflammable flux;

g: Brass rod and brass brush;

- (3) Overall moving of injection seat

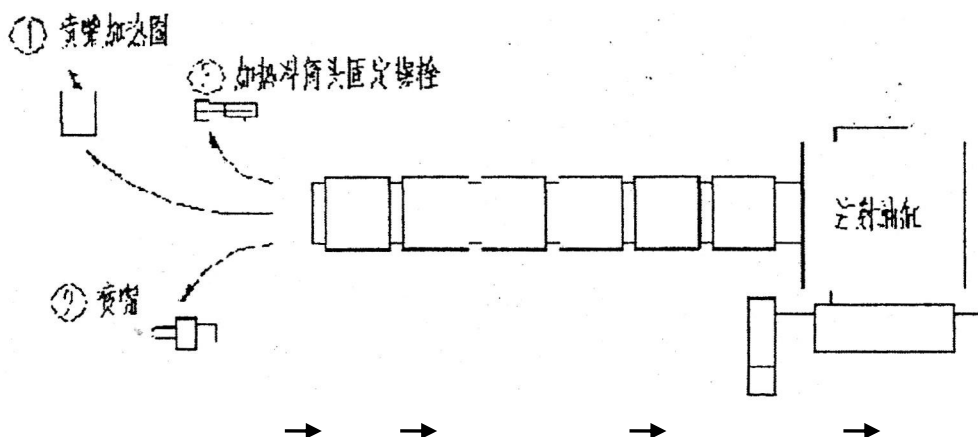
No.1: Start oil pump motor;

- No.2: Adjust the seat retreating proximity switch and block to the maximum place;
 No.3: Press seat retreating button, make the injection molding device to retreat to the bottom;
 No.4: Remove the bolt that connect the injection seat with overall advancing and retreating cylinder flange seat, and make them separate;
 No.5: Remove the socket head cap screws on the front and rear injection seat, loosen and adjust the screw nail;
 No.6: Rotate and move the overall injection seat to an certain angle, and push to the operation side (see the following figure).

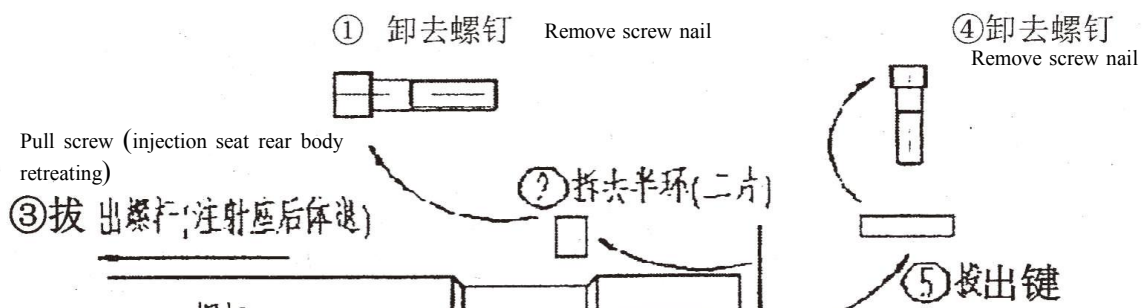


B: The methods and steps of disassembling screw

- No.1: The temperature of material canister and nozzle shall be heated to the maximum molten temperature of stored materials in the material canister, and then cut off the heating power supply.
 No.2: Adjust the injection pressure and speed to the minimum values on the computer.
 No.3: Start oil pump motor, place the machine in manual state, press the feeding button, and screw (injection piston) retreats to the end position of the stroke.
 No.4: Disassemble nozzle electric heating coil – nozzle – front body of material canister in sequence (shown in the following figure).



- No.5: Disassemble screw nail → semi-ring → pull the tail end of screw → flat key fixed screw nail → flat key (shown in the following figure).

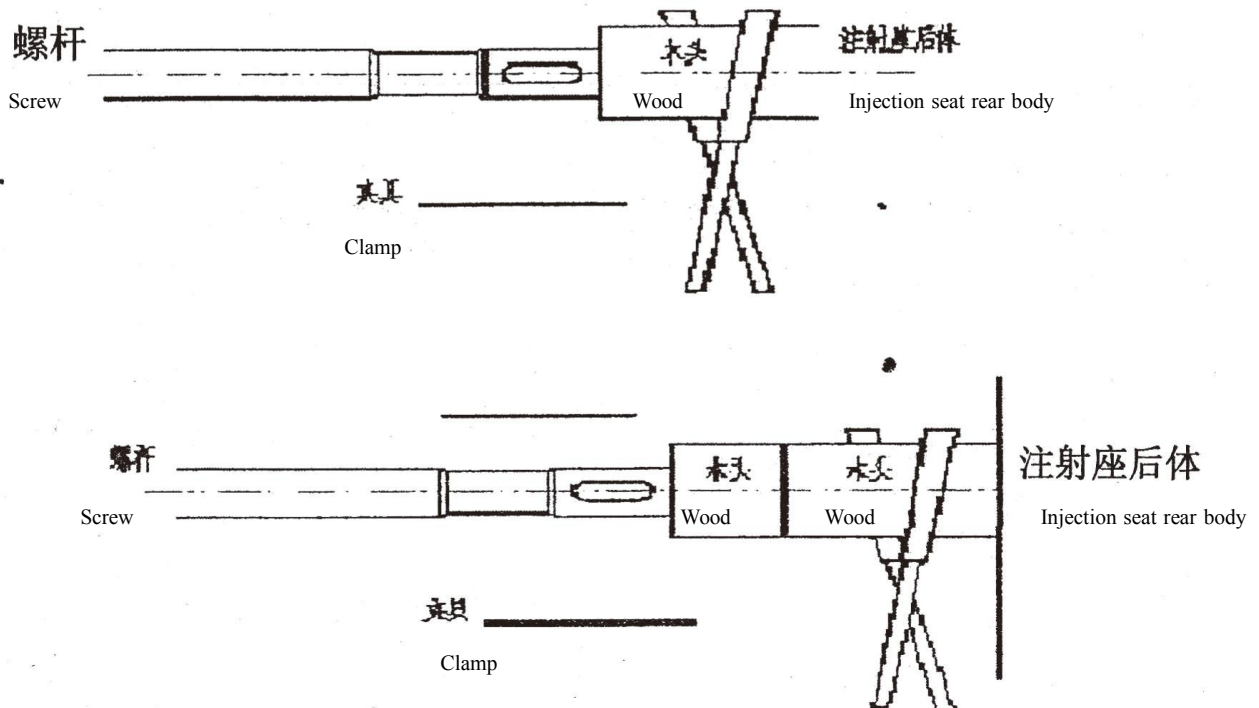


Disassemble semi-ring

Pull key

Injection seat rear body

No.6: Place a segment of square hardwood to the screw end, hold the square hardwood with clamp, start oil pump motor and place the machine in manual state, press the plunger switch, make the pre-plastic seat push the hardwood and screw to the front of material canister as per the overall injection stroke, when the injection stroke reaches the end, press the loose back button, the injection bar retreats (shown in the following figure).



No.7: Cushion the second square hardwood and repeat the action in No.6, so that the screw shall be pushed from the front of the material canister.

Note: At this time, the screw temperature is still high, never pull the screw with bare hand. After the screw is disassembled, in order to prevent it is damaged, it shall be placed on the wood block.

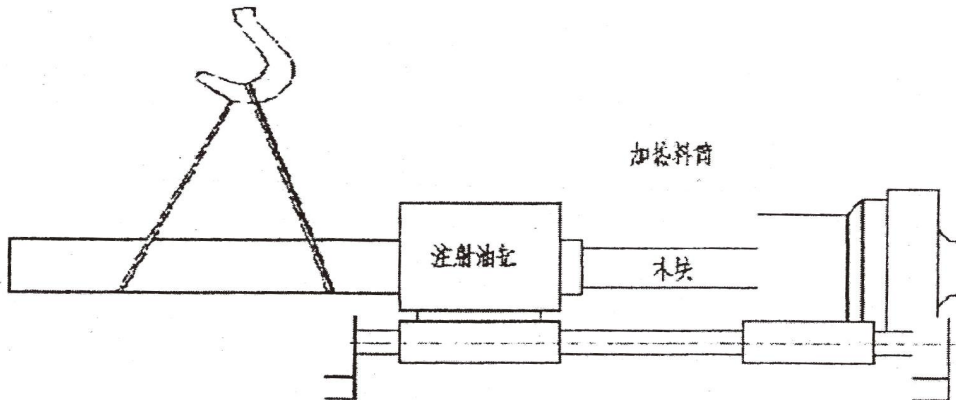
C: Methods and steps of disassembling material canister

No.1: Remove all electric heating coil and thermocouple on the material canister.

No.2: Rotate and move the overall injection seat, push back to the original position, and then fix it with screw nail.

No.3: Special wrench shall be used to loosen and remove the slotted nut fixed on the end of material canister.

No.4: Suspend the material canister temporarily with the lifting equipments (see the following figure).



No.5: According to the method in the above figure, take a hardwood to place it between the pre-plastic seat and material canister end, then hold the square hardwood with clamp, start the oil pump motor, press the plunger button, so that the pre-plastic seat push the square hardwood and material canister for a distance.

No.6: Pre-plastic seat retreats, cushion a square hardwood, repeat the action in No.5 till material canister push the injection seat; meanwhile pay attention that the lifting hook matches action as the material canister ejects, so that maintain the material canister in horizontal level.

No.7: After the heating material canister is disassembled, it shall be placed in a safe place.

7.5.2 Cleaning of screw and material canister

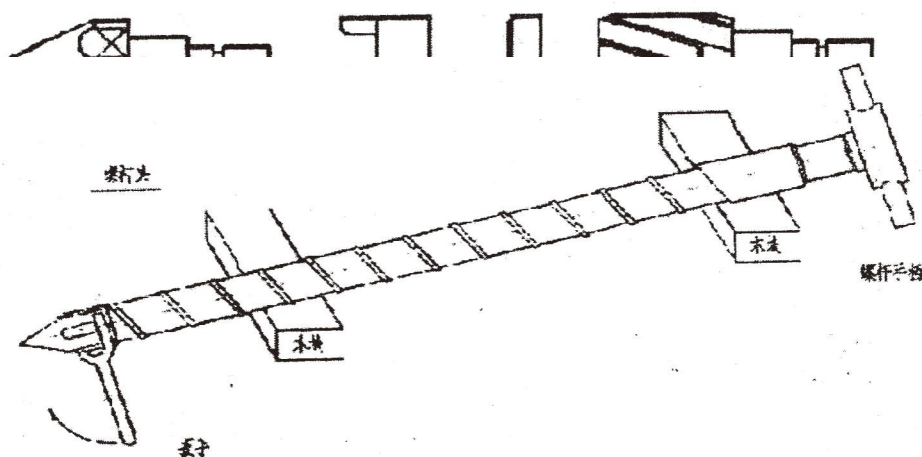
A: Cleaning and inspection of screw (shown in the following figure)

No.1: Put the screw spindle on the screw end (keyway end). Hold the screw head with wrench, rotate the screw head as per the rotation direction (screw head is left-rotated thread) in the figure.

No.2: The waste cotton or cloth is used to wipe the main body of the screw, so as to clean the most resin precipitate on the surface.

No.3: Heat the screw surface evenly with coal oil blow lamp, wipe with waste cotton or cloth, and then remove the precipitate on the screw.

No.4: Clean the screw head, retaining ring, sealing ring and mixing head with the same cleaning method as the one of cleaning screw surface (see the following figure).



No.5: Check whether the internal and external threads on the screw, screw head and mixing

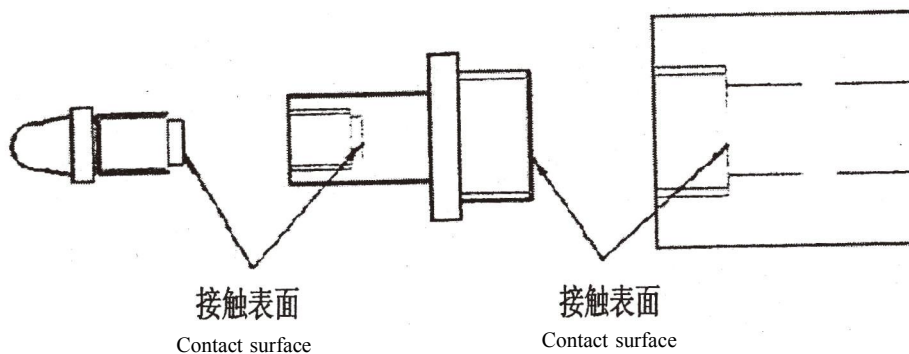
head are worn, if they are worn, the countercurrent, metering fluctuation and other failures may generate during the injecting period.

B: Cleaning and inspection of material canister

No.1: After disassembling, clean the material canister, which shall be implemented under residual heat state, use the brass brush to remove the resin precipitate on the material canister surface.

No.2: Put the waste cotton into the material canister, use wood rod to push, wipe, and clean the internal surface of material canister.

No.3: Heat the nozzle and material canister with coal oil blow lamp, clean the external surface, thread and contact surfaces (shown in the following figure).



注意：上图的各接触表面必须十分小心进行擦拭，防止划伤、碰毛，以免在模塑时产生漏料。

Note: The contact surfaces on the figure above shall be wiped carefully, so as to prevent the scratch or damage, and further cause the materials leakage during the molding period.

No.4: If there is still residual precipitate, wipe and clean the inner hole of material canister with warm cotton dipping chlorylene solution.

No.5: After wiping and cleaning, wipe the surface, and check whether the inner hole of material canister is worn or scratch.

7.6 Exclusion of general failure

7.6.1 Oil pump motor doesn't start

- (1) If motor doesn't rotate, and has noise at the same time. Check whether the fuse is loose or blown, check whether the three-phase power supply is normal.
- (2) If the motor stops suddenly, it may be caused by the overload of air switch, after two minutes tripping, turn on the air switch, and start the oil pump motor.
- (3) If motor doesn't rotate when press the motor starting button, the button may be destroyed or thermal relay trips, in addition, check the emergency stop button and other relevant equipment wiring.
- (4) If motor doesn't rotate due to the oil pump stuck, remove and clean oil pump, take out the impurities, and check the pump vane rotating gap.
- (5) Motor is burnt, repair or replace with the same specification of motor.

7.6.2 Oil pump is started, but there is no pressure

- (1) The solenoid coil of pressure proportional valve doesn't absorb, or the internal valve core is stuck by impurities, remove it and clean; meanwhile check whether the solenoid coil is burnt, or whether the wiring is loose or broken.
- (2) Hydraulic oil is not clean, and the internal oil pump is worn and caused internal leakage for long-time usage. Repair or replace the oil pump.

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- (3) Hydraulic oil is not clean, purities accumulate on the surface of net filter to prevent the hydraulic oil to enter into the oil pump, clean the net filter, and replace the hydraulic oil.
- (4) Check whether electric motor rotates reversely.
- (5) Check whether the pressure gauge fails, if it is, replace it.

Note: If the oil pump has been disassembled and repaired, then the internal components of the oil pump must be installed to the oil cavity of the pump again, otherwise the oil pump may be installed reversely, in this case, motor rotates in opposite direction, so there is no pressure.

7.6.3 Not clamping

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- (1) Check whether the safety door is closed, or whether the safety door stroke switch is loose or broken.
- (2) The ejection doesn't retreat in place or positioning transducer fails, adjust the setting of ejection position, or check the positioning transducer.
- (3) The mold opening and closing hydraulic valve coil may be burnt or impurities are stuck in the valve core, so they shall be cleaned or replaced.
- (4) Check whether the sealing ring on the clamping oil cylinder piston fails.

7.6.4 Not mold locking

- (1) Check whether the position of positioning transducer is set correctly after the low pressure clamping action is finished, and set it again.
- (2) Check whether the mold locking force is enough;
- (3) Mold is adjusted to tight, increase the mold thickness;

7.6.5 Not injecting

- (1) The coil of injection hydraulic valve may be burnt, or the valve core is stuck by impurities, so they shall be cleaned or replaced.
- (2) The heating temperature of material canister is too low, pay attention to the computer alarm, check the electric heating coil and fuse, and the temperature shall be adjusted on the computer.
- (3) Check the tolerance rang of the temperature setting on the computer.
- (4) Injection seat forward proximity switch is not triggered or the wiring is loose, adjust the block position, and check the proximity switch.
- (5) Injection head cover stroke switch is triggered.

7.6.6 Screw doesn't rotate

- (1) Control the pre-plastic hydraulic valve coil, which may be burnt, or the valve core is stuck by impurities.
- (2) Heating temperature is too low, computer shutdown automatically, and alarms.
- (3) Oil motor overloads, at this time, stop the pre-plastic action immediately, so as to prevent the damage of the screw, additionally check whether the oil motor is damaged.
- (4) The impurities may enter into the material canister during the pre-plastic period, so that cause the seizure between screw and material canister.
- (5) The stopping position of the pre-plastic action is not set properly, please reset it.

7.6.7 Screw rotates, but the materials can't feed or the pre-plastic speed is slow

- (1) Material canister doesn't connect with cooling water or the waters supply is insufficient, so that the blanking temperature rises, the blanking materials melts on the blanking mouth, the material feed is prevented, so the molten caking materials shall be taken out.
- (2) There are no materials in the hopper.
- (3) The backpressure adjusting valve is not adjusted properly, or there are impurities in the valve, the backpressure is too high, which make the screw retreat at slow speed.
- (4) There are impurities in the material canister, which cause the unsmooth of material feeding.

7.6.8 The screw rotates abnormally and quantity of injecting isn't stable when injecting

- (1) The injecting components, especially the screw collar are damaged, so that make the melt plastic regurgitate, which lead the screw rotate.
- (2) Screw material canister is damaged.

7.6.9 Mold adjusting doesn't work

- (1) To see if the select switch isn't in state of ON (indicating lamp light).
- (2) Electromagnetic change-over valve for mold adjusting is burnt, or there are impurities in the valve core, clean and replace electromagnetic valve.

- (3) To see if the parallelism of molding platen meets the requirement, see if the level position of machine frame is wrong, which will increase the moving resistance of the template.

- (4) Check whether oil pump motor is damaged.
- (5) Check the working pressure.

7.6.10 The movement of mold opening isn't sensitive or there is engender noise

- (1) Check to see if the position setting for finish opening mold is suitable.
- (2) Electromagnetic change-over valve for mold adjusting is burnt, or there are impurities in the valve core, clean and replace electromagnetic valve.
- (3) Check the working pressure, increase the pressure properly.
- (4) Check whether the products stay for too long time in the mold, sometimes the mold swelling phenomenon may occur.
- (5) The position setting for finish opening mold isn't suitable, which will make the piston strike the back cover of oil cylinder, reset the position to be suitable.

7.6.11 The semi-automatic operation doesn't work

The semi-automatic operation is realized through mechanical action stroke triggers various stroke switch and positioning transducer, as well as electric signal which is sent by computer

controlling each electromagnetic valve. If each movement is normal in manually-operation state, while the semi-automatic operation doesn't work, whose reason mainly is electrical limit switch or proximity switch of time-relay doesn't send out signal, or the wire connection is loosed or broken.

Finding solutions: firstly look at the semi-automatic movement to find which phase doesn't work, then according to the drawing of electrical principal to find out the correlative controlling components or wire, inspect them and solve the problem.

Appendix B Causes to Common Injection Molding Disadvantages and Its Solution

In order to help users reduce downtime and find out the reasons for the production as soon as possible, the following solutions has been concluded for your reference according to our many years experience in production of injection molding machine, and combine with the results of exchanges with users in actual production, we don't assume any responsibility for the accuracy and completeness this document, so users are required to decide the availability of the data.

We roughly summarized common injection molding disadvantages into the following several aspects:

- ◆ Incomplete products and shrinkage;
- ◆ Product sticking and sprue (outlet) sticking;
- ◆ Burr and flash on the products;
- ◆ Crack on products during mold opening or ejection;
- ◆ Weld lines, flow line, lusterless, silver pattern, bubble and finished deformation ;
- ◆ Finished within the pores, black point and black lines;
- ◆ Instable cycle and so on.

The following is detailed answer and analysis of the reasons for the various molding defects and related solutions:

I . Incomplete products (under filled)

Possible failure causes	Treatment
Injection volume is not enough	Increase in the amount of injection or change the injection molding machine of larger size
Pre-plastic temperature is too low	Increase the material canister temperature
Injection speed is too slow	Speed up the injection speed
Injection pressure is too low	Increase injection pressure
Before shooting time is too short	Increase the injection time
The Sprue bushing and the nozzle are not correct, plastic spills	To re-adjust their tie
Pressure maintaining is improperly adjusted	Readjust
Mould temperature is too low	Increase mould temperature
Mold temperature irregularity	Resetting water mold
Die bad exhaust	Appropriate to add an appropriate vent location
Lower nozzle temperature	Improve the nozzle temperature
Into the plastic does not mean	Die overflow outlet location to reopen
Runner or overflow port is too small	Enlarge the runner or overflow port
Not enough plastic lubricants	Increase in lubricant

Lack of back pressure	Slightly increased back pressure
Over apron, worn screw melt	Check the repair removal
Product too thin	Use of nitrogen Injection

II. Shrinkage

Possible failure causes	Treatment
Less into the plastic mold	Increase the amount of melt
Material temperature is too high	Low melt temperature
Improper mold temperature	Appropriate temperature the whole
Not enough back pressure	High back pressure
Injection time is too short	Long injection time
Injection speed is too slow	Speed up the injection speed
Overflow population imbalance	Overflow port or location of the mold is too small
Nozzle hole is too small, the solidification of plastic in the sprue bushing to reduce the back pressure effect	Adjust mold or replace the entire nozzle
Gate is too small, plastic, solidified the role of loss of back pressure support	Increase gate size
Cooling effect is not good, the product continues to shrink after the entry	Cooling time delay
Accumulator section too	Injection should be in the most front end
Product itself and the column-or thick ribs	Product design review

III. Product sticking and sprue (outlet) sticking

Possible failure causes	Treatment
Injection pressure too high	Injection pressure reduction
Injection excessive	Reduce the amount of injection time and speed
Material temperature too high	Reduce the material temperature
Inequality so that part of the feed fed	Changes in population size or location of overflow
Mold temperature too high or too low	Adjust mold temperature and relative humidity on both sides
Mold surface is not smooth	Die grinding
Create a vacuum stripping	The top of the mold or slow down or die gas equipment added
Injection molding cycle is too short	Enhance cooling
Lack of release agent	Slight increase in the amount of release agent
Runner cooling enough	Extend or reduce the cooling temperature of the cooling time
Sprue ejection angle is not enough	Modify the mold to increase the angle
Sprue bushing and nozzle with errors	To re-adjust their tie
Not only the inner surface of the runner or stripping chamfer	Die Maintenance
Runner outside the hole is damaged	Die Maintenance

No runner caught off	Caught off additional
Runner is too large	Modify the mold

IV. Burr and flash

Possible failure causes	Treatment
Plastic temperature is too high	Reduce the plastic temperature, lower mold temperature
Injection speed is too high	Reduce the injection speed
Injection pressure is too high	Injection pressure reduction
Fill too full	Reduce the injection time, rate and dose
Consistent with surface or mold lines bad	Die Maintenance
Clamping pressure is not enough	Increase the pressure or replace the mold clamping pressure of a large injection molding machine

V. Crack on products during mold opening or ejection

Possible failure causes	Treatment
Filler fed	Injection reduced pressure, time, speed and volume of injection
Mold temperature is too low	Increase mold temperature
Not part of the ejection angle	Die Maintenance
There ejection chamfer	Die Maintenance
Ejection from the finished product cannot balance	Die Maintenance
Insufficient or improperly positioned thimble	Die Maintenance
Local produce vacuum when ejection phenomenon	The top of the mold can be slow, added gas equipment
Lack of release agent	Slight increase in the amount of release agent
Poor mold design, product had extra stress in	Improved product design
Side of the block a time or location of improper action	Die Maintenance

VI. Weld lines

Possible failure causes	Treatment
Bad plastic melting	Increase the plastic temperature, increase the back pressure and speed up the screw speed
Mold temperature is too low	Increase mold temperature
Nozzle temperature is too low	Improve the nozzle temperature
Injection speed is too slow	Faster injection speed
Injection pressure is too low	Injection pressure increased

There are other plastic materials contaminated or infiltration	Check the plastic
Stripping too much oil	Use less oil or as much as possible without plastic mold
Gating and overflow port is too large or too small	Adjust the mold
Where melt bonding too far away from the water crossing	Adjust the mold
Mode is less than the air exclusion	Or check the vent to open the original vent is blocked
Insufficient melt	Use of larger injection molding machine
Too much release agent	Or reduce the release agent without

VII. Flow line and lusterless

Possible failure causes	Treatment
Bad plastic melting	Increase the plastic temperature, increase the back pressure, speed up the screw speed
Mold temperature is too low	Increase mold temperature
Improper mold cooling	Resetting water mold
Injection speed is too fast or too slow	Adjust the appropriate injection speed
Injection pressure is too high or too low	Injection pressure to adjust the appropriate
There are other plastic materials contaminated or infiltration	Check the plastic
Plastic drying properly	Improved drying
Overflow port have shot pattern is too small	Increase the overflow port
Too much difference between the finished section thickness	Changes in product design or overflow outlet location
Plastic dose is not enough	Increased Injection pressure, speed, time and dose
Excessive mold release oil cavity	Wipe clean
Surface of the water mold	Smear and check for leaks
Mold surface is not smooth	Die grinding

VIII. Silver pattern and bubble

Possible failure causes	Treatment
Plastic contains water	Plastic thorough drying, increase back pressure
High temperature plastic or plastic barrel to stay too long in the machine	Reduce the plastic temperature, the replacement of smaller volume of injection molding machines, reduce the temperature of nozzle and front-end

Other additives such as lubricants, dyes and other decomposition in plastics	Reduce its use of substitute or replacement of high temperature
Uneven mixture of other additives in plastics	Mix thoroughly
Injection speed offensive	Slow down the injection speed
Injection pressure is too high	Injection pressure reduction
Screw speed is too low	Improve the melting rate
Mold temperature is too low	Improve the speed of the mold
Uneven thickness of plastic granules	Use of uniform granular materials
Folder with air melt barrel	After the lower section of cones melting temperature, increase the back pressure, reducing the length of compression
Improper flow of plastic in the mold	Adjust the size and location of excess population, the average die temperature is kept, and the thickness of the average

IX.Finished deformation

Possible failure causes	Treatment
Not yet finished when the top of the cooling	Lower mold temperature, extended cooling time, reduce the temperature of plastic
Plastic temperature is too low	Increase the plastic temperature, increase the mold temperature
Asymmetric shape and thickness of the finished product	Mold temperature zone control, setting cage after ejection, change shape design
Too much filler	Injection reduced pressure, speed, time and dose
Injection reduced pressure, speed, time and dose	Change the overflow port
Thimble system imbalances	The top of the system to improve
Non-uniform mold temperature	Adjust mold temperature
Mouth part of the recent overflow of plastic is too loose or too tight	Increase or decrease the injection time
Poor Pressure	Increase the holding time

X.Finished within the pores

Possible failure causes	Treatment
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Finished section, thick rib or column	Changes in product design or overflow outlet location
Injection pressure is too low	Injection pressure increased
Injection volume and lack of time	Injection volume and increase the injection time
Runner overflow port is too small	Increase and overflow port runner
Injection speed is too fast	Slow the rate of injection
Plastic moisture content	Plastic dry thoroughly
Decomposition temperature is so high that plastic	Reduce the plastic temperature
Non-uniform mold temperature	Adjust mold temperature
Cooling time is too long	Reduce the mold cooling time, the use of cooling water bath
Water bath cooling too fast	Reduce time or improve the water bath temperature water bath
Back pressure is not enough	Increase back pressure
Melting temperature of improper tube	Nozzle and the front lower temperature, increase the temperature of posterior segment
Too much plastic shrinkage	Use other less plastic shrinkage

XI. Black point and black lines

Possible failure causes	Treatment
Hot melt glue plastic parts attached to the tube wall	Completely air-launched, removal of tube cleaning melt, reduce the temperature of plastic to minimize the heating time, reinforced plastics drying
Generated when the focal spot injection mold	Injection pressure and lower speed, lower temperature plastics to enhance the mold vents, molded shut down services as appropriate, change the overflow outlet location
Plastic mixed with debris, paper, etc.	Check the plastic, completely air-launched

Plastic temperature is too high	Reduce the plastic temperature
Melt too fast	Reduce the injection speed
Eccentric screw and melt tube is frictional heat generated	Machine repair
Nozzle hole is too small or the temperature too high	Re-adjust the aperture or temperature
Injecting excessive	Replacement of smaller injection molding machines
Barrel with the plastic melt overheating angle	Check the nozzle melt contact surface between the tube, with or without gaps or corrosion.

XII. Instable cycle

The above listed molding shortcomings, its causes, and solution are mostly relevant to the cycle stability, the proper plasticizing of plastic in material canister, or the temperature control of the mold are the results of heat balance, that is to say, during the whole injection molding cycle, plastic in the material canister receive the friction heat generated by rotation of screw, and heat from the electric heating coil. As the heat injects into the mold, mold heat comes from the plastic and mold thermostat, loss in the finished product ejection, disappear in the air or taken off by cooling water. Therefore, in order to maintain the temperature of material canister or mold unchanged, the incoming and outgoing heat balance shall be maintained. Maintaining the heat balance requires maintaining certain stable injection molding cycle. If the injection molding cycle time becomes shorter and shorter, then heat in material canister becomes hard to make ends meet, even can't melt the plastic, while the incoming mold heat is more than outgoing mold heat, so that the mold temperature continues to rise, otherwise, the reverse results may be generated, all of which cause the production can't be continued. Therefore, in any injection molding operation, especially in the manual operation, stable cycle time must be maintained, different cycle time shall be avoided as much as possible. If other conditions remains unchanged, then:

The accelerated cycle shall cause short shot, finished shrinkage, deformation, and stick mode.

The prolonged cycle shall cause overflow, feather, stick mode, finished products deformation, plastic hot, even burning, the coke charge remains in the mold material may cause mold damage. The too hot plastic in melting plastic tube can also corrupt the material canister or make finished products appear dark spots, black lines and etc.