
The basic introduction of the LT series conical twin-screw extruder

Plastic extrusion molding is one of the most widely used technology in the molding and processing of plastic products. The extrusion molding process can be used to make plastic pipes, sheets, strips, profiles, bars, uniaxially stretched products and plastic blending modification. Its mature technology, wide application, and various types of plastics play an increasingly important role in people's daily life, and LT series conical twin-screw extruder try to help someone needed.

According to the number of screws, it is divided into the non-screw extruder, single-screw extruder, twin-screw extruder and multi-screw extruder. According to the rotation speed of the screw, it is divided into the ordinary extruder, high-speed extruder, and ultra-high-speed extruder. According to the assembly structure, it is divided into the integral extruder and piecewise extruder.

The conical twin-screw extruder is the hardcore of the conical twin-screw extruder unit. In general, it isn't different from the single-screw extruder. It is made of the transmission system, extrusion system, heating and cooling system, control system. This article will introduce every system in the conical twin-screw extruder.

1. Extrusion system

The extrusion system is the hardcore of the conical twin-screw extruder. Its function is to plasticize, mix the molten solid and liquid, provide the fusion of fixed temperature and pressure and quantitative for the outlet mold. And remove the gas or liquid produced in this process, and finally produce high-quality products through the outlet mold. The extrusion system is made of screw and barrel. Therefore, its design is actually the design of the screw and barrel.

1.1 Screw

Two screws are distributed on the conical surface in the form of conical threads, and the two screws are not parallel in the axial direction and rotate in opposite directions in the barrel. The screw is made of high-strength and corrosion-resistant alloy steel, usually choose 38CrMoAlA, which is processed into a screw and then subjected to nitriding treatment.

1.2 Barrel

It adopts an integral or flange combination structure, which is step-shaped, and the outer diameter is from large to small. The upper end has a feeding port and two exhaust holes. The material of the barrel is mostly 38CrMoAlA nitrided steel, after nitriding treatment, the nitriding thickness is about 0.4-1.0 mm. There are spiral grooves on the length of the barrel surface, so that the copper wire can be wound and cooled by oil. The exhaust port is two small holes, each leading to the screw groove of the exhaust section of the two screws.

2. Feeding device

The conical twin-screw extruder is used for the extrusion molding and pelletizing of the RPVC powder materials. Due to its low density, so the most useful forced feeding device in order to increase the contact area of material and barrel, it is also good for heat transfer and improves output capacity.

3. Extrusion die

The extrusion dies, a screening device, pelletizer, and drying device and packer belong to the downstream device of the extruder. The die includes the profile die and pellet die. The extrusion die will plasticize the uniform plastic melt under a certain temperature and pressure, through the extrusion molding die surface, into a viscous fluid continuum with a certain cross-sectional shape, and then further adjust the cross-section by the vacuum calibrator, finally produces a continuous profile with a certain cross-sectional shape and size.

4. Heating and cooling system

The extrusion process of the twin-screw extruder is an exothermic process, in which heat is provided to the polymer to transform from solid-state to viscous-state. There are two heat sources in the twin-screw extrusion process: one is the conduction heat

provided by the external heater, and the other is the shear of the material by the screw, which converts the mechanical energy of the motor into heat energy.

The ideal extrusion process is that heat energy provided by the heater and heat energy converted by mechanical energy can just make the polymer complete the transition from solid to viscous state. Due to the different rotation speed of the screw, the temperature of the material will be overheated or overcooled. Therefore, a heating and cooling system and a control system are required. The heating device has electric heating and carrier heating. The cooling device has air-cooling, oil-cooling, water-cooling, etc. There are two ways to control the temperature of the screw, one is the external circulation type and the other is the heat pipe type.

5. Transmission system

The transmission system of the conical-twin screw extruder is made of a driving motor, gearbox (torque distribution part and deceleration part). The screw speed should be adjusted according to the technical process, and the motor should be a DC motor or an AC variable frequency speed motor. Most of the conical twin-screw extruder torque distribution part and deceleration part are arranged separately.

6. Safety protection device

Compare with the single-screw extruder, the twin-screw extruder has many safety protection device as follows:

6.1 Screw torque overload protection

The working conditions of the two screws of a twin-screw extruder are much worse than those of a single-screw extruder. The two screws transmit large torque when the center distance is limited (or the diameter is limited). Besides, the design and manufacture of two screws are much more difficult and expensive than the single-screw. Therefore, during the extrusion process, more attention should be paid to the overload protection of the screw. Specifically, it is necessary to ensure that the screw runs under the rated torque. Once the rated torque is exceeded, the screw must be disconnected from the transmission box of the transmission system and the driving motor. There are some methods of overload protection as follows:

6.1.1 Machinery overload protection

The overload protection coupling is installed between the motor and transmission box, or set a mechanical overload safety latch between the transmission system and the extrusion system. Once overloaded, the overload clutch slips, or the safety latch is cut off, thereby protecting the screw and transmission system.

6.1.2 Electrical overload protection

Generally, adopt rated torque display or current relay. When the torque or current exceeds the rated value, in addition to the instrument display, the power supply will be cut off immediately to protect the screw and transmission system.

6.1.3 Thrust bearing overload protection

When making the twin-screw extruder, according to the bear axial loads and rated overload of thrust bearing choose its specification and quantity. When working, it needs to withstand lots of axial loads, once overloaded, it will damage the whole thrust bearing unit, even damage the transmission gear and screw. The thrust bearing is used to withstand the axial force of the screw, and the axial force of the screw is produced by the static pressure of the melt at the top of the screw during operation and the additional dynamic load along the screw axis. The former is the main one. Therefore, the static pressure of the melt at the top of the screw is controlled so that the axial force generated does not exceed the allowable load of the bearing to protect the thrust bearing.

The specific method is to install a melt pressure sensor at the die, and set the rated melt pressure. Once reached the rated value, a signal is sent to stop the machine to protect the bearing.

6.2 Lubrication system protection

When the oil temperature is high or oil pressure is insufficient, the lubrication part will alarm. Besides, there is temperature indication, control and over-temperature alarm for the heating carrier of the barrel. The exhaust system is equipped with an off-gas filter, which will alarm when there is a failure.

The conical twin-screw extruder has many features such as uniform plasticization, high quality, stable quality, a wide range of

applications and long service life.

Also it can make PVC powder become pipe directly. Equipped with suitable die and auxiliary machines, the conical twin-screw extruder can process high or low viscosity material, also belt-shaped material, mushy material and powder. This machine can extrude plastic products directly such as pipe, sheet, film and profile, etc. It also can be used to change the performance of plastic and pellet from plastic powder. The performance of this machine is very stable and it can extrude melt material at a low temperature. Equipped with a heater on the barrel, so it has high heating efficiency, and the temperature rises quickly and uniformly. In addition, it equips with a cooling system. We specially design the transmission part, which is drove by a variable frequency motor or DC motor. So it has many features such as smooth operation and high efficiency. It can reach continuously variable and stable speed through a frequency converter or DC speed regulator. This machine adopts an intelligent temperature controller, so it has features of high precision and small fluctuation. This machine is designed for overload protection and failure warning, and it also equips with a vacuum pumping device and weighs feeder.

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