Origin of inverter

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As an "old acquaintance" in the field of industrial control, frequency inverters have been active in various industries for decades. It bears the responsibility of motor speed regulation, and plays an indispensable role in improving production processes and energy conservation. From a professional point of view, it is actually a kind of power control equipment that uses variable frequency technology and microelectronic technology to control the speed of the AC motor by changing the frequency of the AC motor power supply.

So, what is the significance of the inverter for motor speed regulation? Why is AC motor speed control "none but it"? Regarding the importance of the frequency inverter, we will understand its birth and development process from the following aspects.

In industrial production, the use of motors to accurately control the speed and position of objects or components is a necessary process. For example: lifting equipment, loom equipment, material conveyor belts, rewinding and unwinding, etc., and other types of machinery and equipment.

When the motor speed control technology is still immature, people can only use some mechanical aids to solve the problem of object motion control, such as gearboxes, clutches, etc., which are not mechanically adjustable. In the case of a motor, in order to achieve a certain sporting purpose, it is necessary to replace the gearbox, change the gear ratio, or switch the clutch. This process is not only very time consuming, but also a great loss to the machine.

In another type of fluid control application scenario, the motor drives the impeller to rotate, thereby propelling gas or liquid flow or generating corresponding gas and hydraulic pressure. In the early stage, the motor speed cannot be freely controlled, the control of fluid flow and pressure can only be achieved by opening and closing the valve in the pipeline, which is a waste of electrical energy.

In the age when there is no frequency inverter, because the motor speed cannot be adjusted freely, in order to achieve certain motion purposes, the traditional machine has to add many accessories, which not only increases the overall system complexity and cost, but also limits the performance and development space of the device, in order to solve these problems, the introduction of simple and efficient motor speed control technology has been a hot spot and pain point of industrial transmission research.

The focus of early motor speed regulation has always been DC motor. One of the main reasons is that people first grasp the rectification technology, and the mechanical characteristics of DC motor are also very suitable for certain scenes. The simplest way to adjust the armature voltage is to string resistors. The higher the resistance is, the greater the voltage drops, and the slower the DC motor speed would be.

However, the defects of the DC motor are also very obvious. For example, the collector ring and the carbon

brush require regular maintenance, the DC motor manufacturing process is complicated, and the manufacturing cost is high. This means that DC motors are not suitable for a wide range of motor applications.

Compared with DC motors, AC motors are much simpler in internal structure, without commutator and other structures. They are easy to manufacture and stable, suitable for high-speed, high-voltage, high-current applications. The only thing that needs to be solved is the control problem of AC motor speed.

In 1888, AC and AC motors were introduced, but after a long time, AC motors were only able to operate at one or more fixed speeds due to their structural reasons. Its speed is proportional to the frequency and inversely proportional to the number of pole-pairs.n = 60 f(1 - s)/ p

It can be seen from the above formula that the slip rate “s” and the pole pair “p” are the inherent characteristic parameters of the motor. It cannot be changed after the motor is manufactured. If you want to adjust the speed freely, only change the input frequency of its power supply “f”. There is basically no means to freely adjust the frequency of the grid voltage before the birth of the inverter.

Finally, combined with rectification technology, we can quickly convert the standard frequency of the grid into the corresponding frequency and the AC of the corresponding voltage according to the amplitude and frequency of the required power supply, thereby changing the input frequency of the motor to realize the adjustment control of the speed of the AC motor. After a long period of technological development and unremitting efforts of scientists, the frequency inverter has been upgraded and evolved in one application, and it has gradually become what we see today.

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