THE IMPORTANCE OF SERVO MOTOR TO LASER CUTTING MACHINE

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Servo motor is a very important component in laser cutting machine, and its quality directly determines the stability of equipment use, especially in the deformation of processing contour. In addition to its own stability, there are many external factors that directly affect the normal operation of the servo motor.

Laser cutting machine

For the laser cutting machine, whether it is flat plate cutting or pipe cutting, if the equipment wants to process according to the established figure, the key lies in the dynamic response of each axis involved in the processing and the coordination between them. If the overall response of each axis is too slow in the process of machining, or if there is a small deviation of one axis and a large deviation of the other axis in some positions, the problem of machining contour deformation will occur. There are many reasons for this discrepancy, including mechanical, external force, servo response, control system and other factors, or the superposition of multiple factors. Therefore, the key to solve such problems lies in the better dynamic response of each axis and the coordination between them, so that they can carry out processing operations in strict accordance with the established goals. As an intermediate executive mechanism to undertake the mechanical and control system, the servo motor can compensate, optimize and coordinate the actions of various systems to a certain extent, so as to achieve a more perfect control purpose.

In addition to the stability of the servo motor itself, the external factors affecting its normal operation include:

1. Mechanical factors

Mechanical problems are relatively common, mainly reflected in design, transmission mode, installation, material, mechanical wear, etc.

2. Mechanical resonance

The biggest impact of mechanical resonance on servo motor is that it can not continue to improve the responsiveness of servo motor, so that the whole equipment operates in a relatively low response state. This kind of problem is common in synchronous belt drive machinery, in addition,

this kind of problem sometimes occurs in long-distance ball screw. The main reason is that the rigidity of the synchronous belt is low, the resonance frequency is low, the inertia of the long-distance lead screw is large, and there are many deformation cases, especially when the motor capacity is small, it is easy to start vibration. At the same time, the assembly process and material quality during installation will also affect the mechanical resonance.

3. Mechanical jitter

Mechanical vibration is also the natural frequency of machinery in essence. It usually occurs in single-end fixed suspension structure, especially in the acceleration and deceleration stage. Low-frequency jitter will show a large wavy shape in the workpiece, and high-frequency jitter will have a sawtooth shape.

4. Mechanical internal stress, external force and other factors

Due to differences in mechanical materials and installation, the mechanical internal stress and static friction of each transmission shaft on the equipment may be inconsistent. If the internal stress or static friction of one of the two axes involved in the trajectory interpolation control in the equipment is greater, the servo torque will be consumed to a certain extent, resulting in slower acceleration of this axis, resulting in deformation of the processing contour. Generally, we can observe the internal stress of the transmission shaft through the waveform curve generated by the feedback of the servo driver. The external force acting on the shaft is similar. The general plate cutting machine is non-contact between the axes and the workpiece, and may be subject to limited external forces. However, for some pipe cutting machines, the feeding shaft will participate in the interpolation during cutting, while the other shaft is generally non-contact. At this time, due to the influence of the clamp, the pipe will produce a reverse force on the pipe feeding shaft, so that the force of the two axes involved in the interpolation control is not consistent, and the cutting effect will certainly be affected.

5. NC system factors

In some cases, the debugging effect of the servo is not obvious. At this time, it may be necessary to intervene in the adjustment of the control system. The linear speed of laser cutting machine is

usually relatively constant, and it is the same speed in straight line and curve. This is not a big problem in linear motion, but in the processing of curves, especially small arcs, the contour may be deformed due to excessive acceleration.