In the high-frequency adjustment, the light is not enough to notice the local adjustment of the frequency, current or extrusion amount. This adjustment must be based on the specific conditions of the entire molding system, from all aspects associated with high-frequency welding. Adjustment. The main factors affecting high frequency welding are the following eight aspects:

First, frequency
The frequency at high frequency welding has a great influence on the welding because the high frequency influences the distribution of the current inside the steel plate. The influence of the frequency of selection on the welding is mainly the size of the heat affected zone of the weld. In terms of welding efficiency, a higher frequency should be used as much as possible. The high-frequency current of 100KHz can penetrate 0.1mm of ferritic steel, and the 400KHz can only penetrate 0.04mm, that is, the current density distribution on the surface of the steel plate, the latter is nearly 2.5 times higher than the former. In the production practice, the frequency of welding carbon steel materials can generally be selected from 350KHz to 450KHz; when welding alloy steel materials, when welding thick steel plates of 10mm or more, the lower frequency can be used from 50KHz to 150KHz, because it is contained in alloy steel. The skin effect of chromium, zinc, copper, aluminum and other elements is somewhat different from steel. Foreign high-frequency equipment manufacturers have now mostly adopted the new technology of solid-state high-frequency. After setting a frequency range, they will automatically track the adjustment frequency according to the material thickness and unit speed during welding.

Second, the angle of convergence
The angle of convergence is the angle at which the two sides of the steel tube enter the pressing point. Due to the effect of the proximity effect, when the high-frequency current passes through the edge of the steel sheet, the edge of the steel sheet forms a preheating section and a melting section (also called a lintel). When the beam section is heated intensely, the molten steel inside is rapidly vaporized and The blast is sprayed out to form a flash, and the size of the angle of convergence has a direct effect on the melt section. The convergence effect of the convergence angle is significant, which is beneficial to increase the welding speed, but the convergence angle is too small, the preheating section and the melting section become longer, and the melting section becomes longer, which makes the flashing process unstable, and it is easy to form a deep pit after the beam is overbursed. And pinholes, it is difficult to press. When the angle of convergence is too large, the melting section becomes shorter and the flash is stable, but the proximity effect is weakened, the welding efficiency is significantly reduced, and the power consumption is increased. At the same time, when forming a thin-walled steel pipe, the angle of convergence is too large, and the edge of the pipe is elongated, resulting in wavy wrinkles. At present, we generally adjust the angle of convergence in 2° ~ 6°, the speed is faster when producing thin plates, the smaller convergence angle is used in extrusion molding, the speed is slower when producing thick plates, and it is used when extrusion molding Larger convergence angle.

Third, the welding method
There are two ways to weld high frequency: contact welding and induction welding. Contact welding is a pair of copper electrodes in contact with both sides of the welded steel pipe, the
induction current penetration is good, the two effects of high-frequency current are maximized by the direct contact between the copper electrode and the steel plate, so the welding efficiency of the contact welding higher and lower power consumption, it is widely used in high-speed and low-precision pipe production, and contact welding is generally required in the production of particularly thick steel pipes. However, there are two disadvantages in contact welding: one is that the copper electrode is in contact with the steel plate, and the wear is fast; the second is due to the influence of the flatness of the surface of the steel plate and the straightness of the edge, the current stability of the contact welding is poor, and the internal and external burrs of the weld are higher. It is generally not used when welding high precision and thin walled tubes. Induction welding is performed by one or more turns of induction coils on the welded steel pipe. The effect of multi-turn is better than that of single-turn, but it is more difficult to make and install multi-turn induction coils. When the distance between the induction coil and the surface of the steel pipe is low, the efficiency is high, but it is easy to cause the discharge between the induction coil and the pipe. Generally, it is preferable to keep the induction ring from 5 to 8 mm from the surface of the steel pipe. When induction welding is used, since the induction coil is not in contact with the steel plate, there is no wear, and the induced current is relatively stable, which ensures the stability during welding. The surface quality of the steel pipe during welding is good, the weld seam is flat, and the production is as high as API. In the case of precision pipes, basically the form of induction welding is used.

Fourth, input power
Input power control during high frequency welding is important. When the power is too small, the heating of the pipe blank is insufficient, and the welding temperature is not reached, which may cause unwelded defects such as welding, desoldering and pinching. When the power is too large, the welding stability is affected, and the groove surface is heated. The temperature is much higher than the temperature required for soldering, causing serious splashes, pinholes, slag inclusions, etc. This defect is called an overburning defect. The input power of high-frequency welding should be adjusted according to the thickness of the pipe wall and the forming speed. Different molding methods, different unit equipment, different material steel grades, we need to summarize from the production line, and prepare equipment suitable for our own unit.

Fifth, the billet groove
The groove shape of the tube blank is the shape of the section. The general manufacturer directly enters the high-frequency welding after slitting, and the groove has an "I" shape. When the thickness of the welding material is more than 8~10mm, if this "I"-shaped groove is adopted, because of the relationship of the curved arc, it is necessary to melt the inner layer which the tube blank first contacts, forming a high inner portion. The burrs are easy to cause insufficient heating of the center layer and the outer layer of the sheet, which affects the welding strength of the high frequency weld. Therefore, in the production of thick-walled tubes, the tube blanks are preferably treated by planing or milling, so that the bevels have an "X" shape. It has been proved that such bevels have a great relationship with uniform heating to ensure the quality of the welds. The choice of the shape of the groove also affects the size of the convergence angle. The design of the welded joints is a weak link in the design of the welding project. The design of the ruled groove of many steel structural parts is not from the hands of welding engineering technicians.
The hard set standard and the poor performance of the groove are not uncommon. The groove form plays an important role in controlling the internal quality of the weld and the quality of the welded structure. The groove design must consider the fusion ratio of the base metal, the welding space, the welding position and the comprehensive economic benefits.

Sixth, welding speed
The forming speed of the welded pipe unit is restricted by the high-frequency welding speed. Generally speaking, the unit speed can be driven faster, reaching 100 m/s. The speed of the existing unit in the world even reaches 400 m/s, and the high frequency welding, especially induction welding, can only be formed at a speed of 60 m/s or more and more than 10 mm. The forming speed of domestic units can only reach 8~12 m/s. The welding speed affects the quality of the weld. When the welding speed is increased, it is beneficial to shorten the heat affected zone and facilitate the extrusion of the oxide layer from the molten groove; on the contrary, when the welding speed is very low, the heat affected zone is widened, and a large welding burr is generated, and the oxide layer is thickened. The quality of the weld is deteriorated. Of course, the welding speed is limited by the output power and cannot be raised very high. The operating experience of domestic units shows that the welding speed of steel pipes of 2~3 mm can reach 40 m/s, the welding speed of steel pipes of 4~6 mm can reach 25 m/s, and the welding speed of steel pipes of 6~8 mm can reach 12 m/s. The welding speed of steel pipes of 10~16 mm is below 12 m/s. The speed of contact welding can be higher, and the induction welding should be lower.

Seventh, the resistor
The function of the resistor is to enhance the skin effect and adjacent effect of the high-frequency current. The resistor is generally made of M-XO/N-XO type iron oxide, and is usually made of magnetic Φ 10mm × (120~160)mm. The rods are bundled in a heat-resistant, insulated enclosure with internal water cooling. The impedance is set to match the diameter of the tube to ensure the corresponding flux. To ensure the permeability of the resistor, in addition to the material requirements of the resistor, it is necessary to ensure that the ratio of the cross-sectional area of the resistor to the cross-sectional area of the tube is sufficiently large. When producing high-grade pipes such as API tubes, it is required to remove the inner burrs. The resisters can only be placed in the inner burr body, and the cross-sectional area of the resisters will be much smaller. At this time, the effect of the concentrated fan arrangement of the magnetic bars is better than that. Circular arrangement. The positional distance between the resistor and the solder joint also affects the welding efficiency. The gap between the resistor and the inner wall of the tube is generally 6~15 mm. When the diameter is large, the upper limit is taken. The resistor should be placed concentrically with the tube, and the head and the solder joint. The spacing is 10~20 mm. Similarly, when the diameter is large, take a large value.

Eighth, welding pressure
Welding pressure is also the main parameter for high frequency welding. Theoretical calculations suggest that the welding pressure should be 100~300MPa, but the actual pressure in this area in actual production is difficult to measure. It is generally estimated based on experience and converted into the amount of extrusion at the edge of the pipe. Different wall thicknesses take
different extrusion amounts. Usually, the extrusion amount below 2mm is 0.5t~t when 3~6mm; 0.5t when 6~10mm; 0.3t~0.5t when 10mm or more.