

PROSPECTS OF USING PLASMA CUTTING

Cutting metal is the process of separating a sheet of metal into parts. It has become widespread in various fields of production. Up-to-date, there is a large number kind of cutting of metals: laser, gas-oxygen, hydroabrasive.

Such types of cutting have a number of advantages. For example, laser cutting allows us to make a smooth, accurate cut; waterjet cutting has a high cutting speed, and also allows cutting metal rolls up to 300 mm thick with a high accuracy. However, they also have disadvantages: laser method is only used for rolling thickness not more than 20 mm. It is difficult to work with stainless steel, aluminum and its alloys. A huge disadvantage of the method of waterjet cutting of metals can be called extremely high cost of cutting.

The disadvantage of gas-oxygen cutting is the formation of products of combustion and melting of metal as a result of a long-term high-temperature impact on the material – slags, incrustations, burr and oxides, which must be removed from the edge of the product [1].

Along with the mentioned above cutting methods there is one more. It is plasma method.

Plasma cutting is a process that cuts through electrically conductive materials by means of an accelerated jet of hot plasma. Typical materials cut with a plasma torch include steel, stainless steel, aluminum, brass and copper, although other conductive metals may be cut as well. Plasma cutting is often used in fabrication shops, automotive repair and restoration, industrial construction, and salvage and scrapping operations. Due to the high speed and precision cuts combined with low cost, plasma cutting has widespread use from large-scale industrial CNC applications down to small workshops [2].

The beginning of development of plasma technologies, i.e., methods processing of metals, parts, products and biological objects using plasma, can be considered the 1960s. At the same time, was invented technology for plasma cutting. Over time, plasma cutting equipment has been greatly improved. Modern plasma cutting is characterized by high speed, low operating costs, better quality.

Plasma cutting cuts the metal with the help of heat, which is released by a compressed plasma arc.

A plasma arc is obtained in a special device such as a plasma torch. A plasma torch is a device for generating a directed flow of plasma. A plasma torch is a technical device in which a current flows through a discharge gap to form a plasma used for processing materials. Metal cutting is performed at high temperatures, reaching 15000-20000 C°, due to which it is possible to use this method to almost all types of metals and alloys, including cutting high-carbon metal, low-carbon, as well as such metals as cast iron, titanium, stainless steel and various non-ferrous alloys [3].

Advantages of plasma cutting, compared with other methods of cutting metal, are:

- 1) any metals are processed – ferrous, non-ferrous, refractory alloys, etc.;

- 2) cutting speed of small and medium thicknesses several times higher than the rate of flame cutting;
- 3) small and local heating of the cut billet, excluding its thermal deformation;
- 4) high purity and quality of the cut surface;
- 5) process safety (no need in cylinders with compressed oxygen, flammable gas etc.);
- 6) a complex figured notch is possible;
- 7) the absence of restrictions on the geometric form [4].

Due to the merits of the plasma cutting method, the scope of using such a process in commensurability with economic efficiency is extremely wide on an industrial scale.

Plasma cutting has versatility, which provides its application not only in relation to steel, copper, aluminum, cast iron, brass, bronze, titanium and other metal but can also be applied to several sheets of metal simultaneously.

Automation of the plasma cutting process has made it possible to widespread this technology by attitude towards the aircraft, nuclear, military and other industries. The improvement of the process and the reduction of the heating region at a temperature of several thousand degrees allow it to be applied in a sufficiently accurate comparison with similar processes. Modern technologies allow to lift plasma cutting to a new level, its efficiency and profitability in its range of operations does not know equal. Thus, the use of plasma cutting as a high-precision, effective, safe and universal process of metal processing, has wide boundaries in the modern machine-building industry and where metalworking can not be avoided. In addition, plasma cutting is also a highly environmentally friendly process [5].

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