



DIFFERENCE BETWEEN LASER AND PLASMA CUTTING

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Abstract: In this research I will talk about the differences between the two cutting processes . Laser cutting is mainly used to cut small and medium thickness plate. Plasma cutting is suitable for cutting all kinds of metal materials . It is mainly used to cut the medium and big thickness plate.

Keywords: laser, plasma, difference, thickness, cost

1. INTRODUCTION

The appearance and development of certain fields, led to the birth of the notions of reliability, maintainability, availability that scientifically reflect the behavior of products in the operation phase in relation to time. In this context, thermal cutting with plasma and laser makes a special contribution in promoting cutting-edge techniques, developing concentrated energy sources. Solving some fundamental problems and applying them to the construction of plasma generators in our country, have contributed to the use of plasma and laser worldwide and in Romania.

2. Research of the difference between laser and plasma cutting

Laser cutting machines represent the successful marriage of laser engineering physics and optics engineering with traditional motion and numerical control engineering. [1]

Laser cutting advantages and disadvantages:

Compared with the general cutting method , a laser cutting machine has some obvious advantages:

- small cut slots, the cutting surface can be used directly for welding without gridding.
- the cutting speed of the sheet is fast, it can reach 10m/min for the thin sheet .
- very good cutting quality : low surface roughness , low oblique cutting edge, small deformation
- high precision: positioning accuracy can reach 0.05 mm and re-positioning accuracy can reach 0.02 mm.
- wide cutting materials: in addition to cutting metal, it can also cut wood, plastic, rubber, PVC, leather and textiles.

A laser cutting machine has some disadvantages:

- high cost
- initial investment
- later maintenance requires higher costs

A plasma cutting machine has some advantages:

- in the process of cutting a medium thick plate, it can achieve very high cutting speed
- equipment investment is lower
- the later maintenance cost is also much lower

A plasma cutting machine has some disadvantages:

- poor perpendicularity of cutting surface : on the side of the cutting surface there will be a large oblique cutting edge , and the perpendicularity will be poor
- produce more cutting slag : the cutting slag will be produced during the cutting process at the bottom of the cutting surface. In order not to affect the quality of the post-process, this slag must be removed by grinding, which also increases the labor cost.
- generate harmful gases and arc light: the principle of plasma cutting determines the harmful dust and arc light will be produced during the cutting process.
- in the later period, it will consume more cutting nozzle, and the cost is very high

According to our previous experience, laser cutting machine and plasma cutting machine are compared as follows:

- The laser cutting machine does not damage the workpiece, while the plasma cutting machine has damage to the plate. Especially during the cutting process, when the torch and nozzle of the plasma cutting machine have problems, it will cause obvious defects to the plate.
- Because the laser beam is focused into tiny light points, so the cutting slot of the laser cutting machine is narrow. The cutting slot of the plasma cutting machine is slightly larger than that of the laser cutting machine.
- Laser cutting machine has faster-cutting speed: the speed can reach 10m/min of laser cutter which is much faster than the plasma cutter.
- The cutting surface of the laser cutting machine is smooth, without burr, with good cutting quality, is a non-contact cutting. The heat affected area of cutting edge when punching and shearing the material. Generally, the cutting edge does not need secondary processing, but the plate thickness is limited and the processing cost is high.
- The laser cutter has high precision: the positioning accuracy of the laser cutting machine is 0.05 mm and the re-positioning accuracy is 0.02 mm, but require higher the working environment condition. Although the machining accuracy of plasma cutting machine is not equal to that of the laser cutting machine, it has a low requirement for the working environment and strong mobility, and it has a wide range of cutting and requires lower skills for operators than that of the laser cutting machine.

In "Figure 1" I presented the cutting slot comparison for laser cutting and plasma cutting:

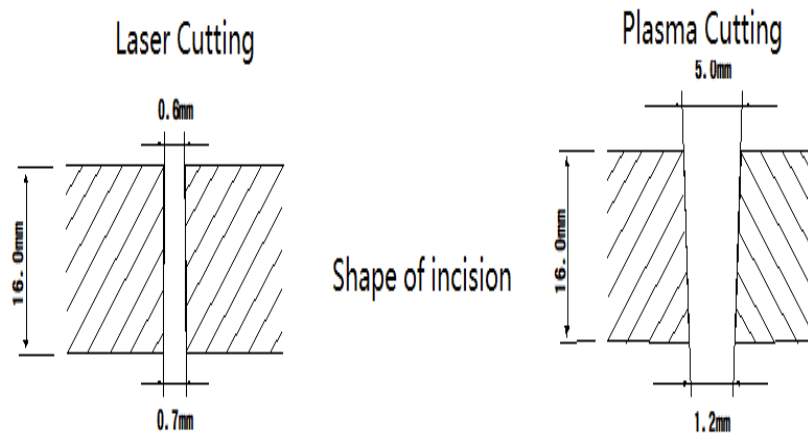


Figure 1: The cutting slot comparison for laser cutting and plasma cutting

In "Figure 2" I presented the relationship between plate thickness and cost

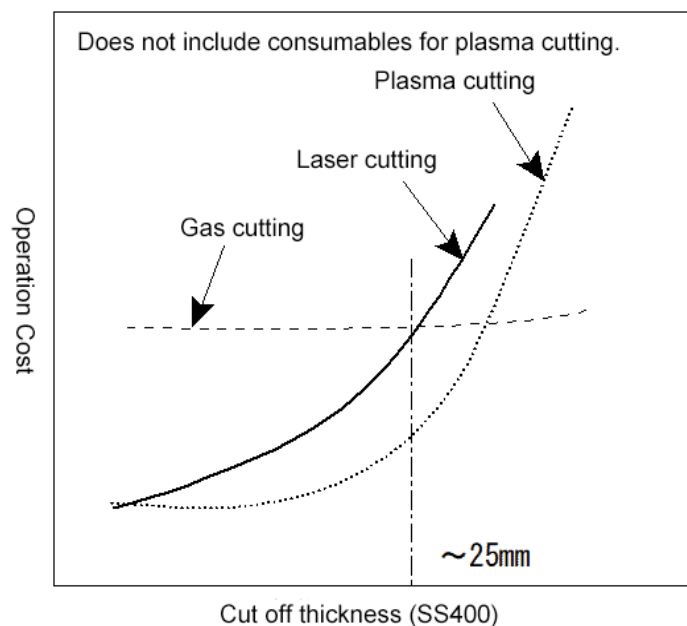


Figure 2: The relationship between plate thickness and cost

In “Figure 3” I presented the incision width and cutting precision of various cutting methods

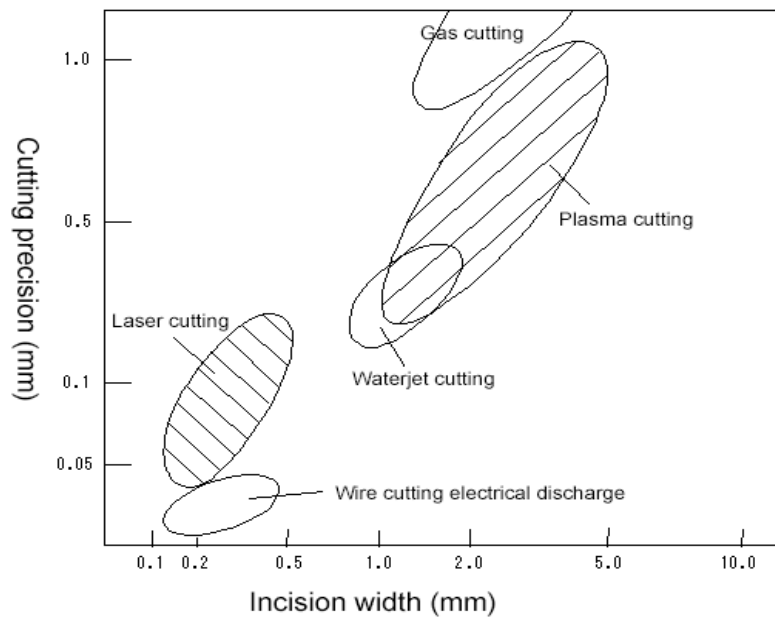


Figure 3: The incision width and cutting precision of various cutting methods

In “Figure 4” I presented the cutting conditions of various cutting methods.

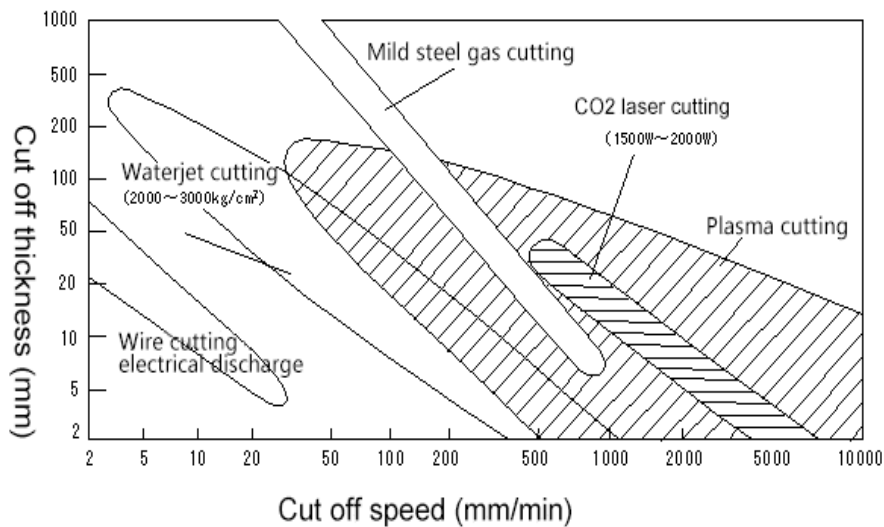


Figure 4: Cutting conditions of various cutting methods

3. CONCLUSION

Both laser cutting and plasma cutting are capable of cutting metal work pieces. As previously explained, though, they work in completely different ways. Laser cutting uses amplified laser light, whereas plasma cutting uses plasma.

REFERENCES

[1] Caristan C., Laser Cutting Guide for Manufacturing, Society of Manufacturing Engineers , Dearborn - Michigan, 2004.