

What are the differences between peek water jet cutting and peek laser cutting?

Comparing waterjet and laser cutting manufacturing processes is easy enough especially as they support many of the same industries. For waterjet cutting and laser cutting this is true and in their relatively brief history, both had their development in technology grow in the latter half of the 20th century. In cutting PEEK they hold advantages over each other. These differences between PEEK waterjet cutting and PEEK laser cutting do not conclude with one being the best method. Rather these differences highlight their strengths and advantages each has, giving options when considering your next precision project.

To understand the differences between PEEK waterjet and PEEK laser cutting, we need to review their processes on how each would process PEEK material.

- Waterjet cutting uses high pressure of water and abrasive powder materials to cut through hard and semi-hard materials.
- Abrasive media comes in numerous forms like garnet and aluminum oxide.
- The mixture is forced through a nozzle with stream diameter of about .004” mils.
- In addition to cutting PEEK waterjet cutting can cut stainless steel, aluminum, titanium, tungsten, plastics, stone, ceramics, copper and many more.

PEEK Laser Cutting is processed in the following manner:

- Ultraviolet laser technology with beam diameters as small as .001” mils or less.
- Focused light adjusted by speed of laser travel, the quantity of laser passes, the frequency and other variables.
- Laser head does not touch the material.
- In addition to laser cutting PEEK, it can cut polyimides, alumina ceramic, brazing alloys, stainless steel, copper, nitrile, beryllium copper, brass, tungsten, titanium, adhesive and epoxies and many more.

Both technologies do overlap on many of the materials they can cut although the process is completely different. The differences of each are more apparent on the following factors:

- Heat Affect: PEEK laser cutting does not induce any heat affect, nor for any materials cut in the process. PEEK laser cutting can have a heat affect and the most common is carbon residue. This can discolor the cutting edge and may need additional cleaning,
- Feature size: Laser cutting of PEEK or other materials will have options for smaller features like holes and radius cut due to a smaller cutting tools of .001” mils. Waterjet cutting has nozzle sizes as low as .004” mils.
- Material thickness: Waterjet cutting has a larger range of cutting thickness of materials as opposed to laser cutting and cut up to 12 inches of thick materials. However, laser cutting does have the ability to cut thinner gauges of materials starting from .0005” of an inch up to .160” inches, depending on the laser system.

- Geometry profiles: Waterjet cutting can produce accurate 3D parts and components, while laser technology is used primarily to produce flat 2D profiles.
- Waterjet jet cutting will have more cleanup of debris and abrasive particulates while laser technology does not produce large amounts of debris nor need extensive cleaning between project runs.
- Laser cutting can be processed in PEEK sheets or tubes for example. Waterjet cutting of PEEK would not cut tubes or rods well but will cut thicker sheets and blocks.
- Waterjet cutting cannot engrave on the surface, while laser cutting can engrave and cut through.

Determination whether PEEK waterjet cutting or PEEK laser cutting will be best for your next project, should take into consideration the differences of each technology and what will produce the desired outcome. Although in some cases, both will be able to produce the same parts geometry, there will be differences in the end will affect cost and throughput. Once these variables are known, you will have the foundation to move forward with your preferred provider.

What are the disadvantages of water jet cutting PEEK?

Water can be a powerful tool when harnessed for industry. You can witness the power of water from the ocean and how the coastlines are continually eroded year after year. During the last 200 years or so, water was used for this ability during the days of gold mining to excavate the soil. It was a system based on gravity and hydraulics having the flow of water travel through narrow and narrower pipes. It cut through the earth well but was unforgiving in its aftermath on the landscape. Modern waterjet cutting had its start in the 1970's but earlier examples started back in the 1930's cutting soft materials like paper. As waterjet cutting has refined its technology over the past 50 years and like many other technologies has it has advantages and disadvantages.

Waterjet cutting is different from laser cutting in that it uses the high pressure of the water to cut. Whereas laser cutting uses a beam of intensified focused light is the cutting tool. Waterjet cutting can use an abrasive method and a pure method. Abrasive waterjet cutting of PEEK or aluminum for instance would use the appropriate abrasive media like garnet or aluminum oxide that is mixed with the water to cut the material. For waterjet cutting of the pure method materials like rubber, paper or foam no abrasives would be used since they are softer materials. As there are advantages of using waterjet technology for your next project, some disadvantages should be considered such as:

- As materials get thicker, the length of the stream is longer and can lead to lesser accuracy of the cut profile.
- Waterjet cutting can take longer than other methods like laser cutting or other CNC machining methods.
- Manufactures using abrasive waterjet cutting acknowledge it can wear down localized tooling and hardware resulting in higher maintenance costs which can be added to the final per unit cost.

- Additional labor and time to are needed to clean up abrasive residue used. This can prolong the set-up and processing of orders.
- Limitation on cut feature size: For example, waterjet cutting of PEEK will be done with a stream diameter of about .004” mils, while PEEK laser cutting can be done on laser systems with beam diameters of .001” mils or less.
- Waterjet cutting of tubes, rods or wires is not recommended. Peek tubing for example would be efficiently and accurately cut with laser technology. PEEK sheets and blocks would be preferred for waterjet cutting. Cutting into tubes with using a waterjet would result in voids and produce inaccurate cuts.
- Waterjet cutting is not recommended on fibrous materials as the stream is not focused and may end with defects of the cut called nibs. Cutting harder metals like steel, tungsten or PEEK plastics will be fine.

Waterjet cutting has found a place amongst service providers. Keep in mind that waterjet cutting is great for cutting sheets and blocks of materials both on hard metallics and soft types though it has drawbacks to cutting tubes, rods and fibrous materials. Many who utilize this technology also have other CNC technologies like CNC laser cutting, CNC routing and CNC lathes. Together they complement each other by providing the best alternatives for each unique project. Consultation with experienced service providers will determine if your next project is best using waterjet technology or if another method is better suited for your project.

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