

Laser beam welding



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Introduction:

Laser Beam Welding “LBW” is a contemporary welding process that is a high energy beam that continues to expand into new industries and new applications because of its advantages like deep welding and reduced heat inputs. Profound Manufacturers sought to automate the welding process caused the expansion of the laser beam welding process to include computers and more sophisticated technology to increase the product quality and more accurate control of the welding process.

From More than 20 years ago, when laser welding was in its early life was used primarily for bizarre applications where no other welding process would be suitable. Nowadays, laser welding is an imperative part of the metal toil industry.

How It Works:

The Focal point is aimed on the work piece surface that will be welded. At the surface the large concentration of light energy is converted into thermal energy. The surface of the work piece starts melting and steps forward through it by surface conductance. For welding process, the beam energy is maintained below the vaporization temperature of the material. In Fig. 1 the laser beam is directed on the work piece.

“ To the point that the laser beam contacts the work piece, all the components that direct it are transparent, refractive or reflective, absorbing only small amounts of energy from the ultraviolet light.” The laser power supply is capable of delivering a “ pulse” of light that has accurate and repeatable energy and duration. When the “ pulse” of laser energy is

focused into a small spot at the surface of the work piece, the energy density becomes enormous. The light is engrossed by the work piece, causing a “keyhole” effect as the focused beam “drills” into, vaporizes and melts some of the metal. As described in fig. 2.

As the pulse ends, the liquefied metal around the “keyhole” flows back in, solidifying and creating a small “spot” weld, moving the work piece or the laser emitter along the surface of the work piece creates a series or spot weld that is called a “seam”.

Similarities And Differences To Other Welding Processes

When compared to other welding processes, laser welding has some similar as well as some unique characteristics Like GTAW (Gas Tungsten Arc Welding), laser welding is a fusion process performed under inert cover gas, where filler material is most times not added. Like electron beam welding, Laser welding is a high energy density beam process, where energy is targeted directly on the workpiece. Laser differs from both GTAW and EB (electron beam) welding in that it does not require that the workpiece complete an electrical circuit. And since electron beam welding must be performed inside a vacuum chamber, laser welding can almost always offer a cost advantage over EB in both tooling and production pricing.

Advantages Of Laser Welding

One of the largest advantages that pulsed laser welding offers is the minimal amount of heat that is added during processing. The repeated “pulsing” of the beam allows for cooling between each “spot” weld, resulting in a very small “heat affected zone”. This makes laser welding ideal for thin sections or products that require welding near electronics or glass-to-metal seals. Low <https://assignbuster.com/laser-beam-welding/>

heat input, combined with an optical (not electrical) process, also means greater flexibility in tooling design and materials.

Industries Served:

- 1- Aerospace.
- 2- Defense/military.
- 3- Electronics.
- 4- Research & development.
- 5- Medical.
- 6- Sensors & instrumentation.
- 7- Petrochemical refining.
- 8- Communications & energy.

Laser Safety

“ Lasers emit a very concentrated beam that can be visible or invisible. In general, most lasers used for welding are invisible. This beam of infrared light could focus onto the skin or eye unless safety precautions are observed. Industrial laser systems are fully interlocked to prevent any danger to operators. Most are equipped with National Center for Devices and Radiological Health covers that contain the actual laser operation, permitting people working nearby to perform normally.” With proper design and careful precautions, laser systems are no more dangerous than other welding systems or similar machine tools.