

## MATERIALS PROCESSING WITH LASER

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**Abstract:** This paper addresses to the laser technology of processing metallic materials. The paper shortly describes the main laser industrial processes that use laser radiation: cutting and welding. The new types of fiber or disk lasers, characterized by very good wall plug efficiency are well suited for high speed cutting or to precision welding. Laser welding has a wide aplicatibility in micro laser cutting or welding as well as in industrial processing of materials with thickness up to 20 mm. Nowadays many industry change their conventional equipments to the laser processing technology.

**Keywords:** Laser cutting, Laser welding, Stainless steel

### 1. Introduction

In the last decade the laser technology became a viable technology used for materials processing. Processes like laser welding, cutting or cladding are now widely used in different industrial applications.

### 2. Laser cutting

Laser cutting is an alternative to the conventional cutting methods. Until few years ago only CO<sub>2</sub> lasers were preferred as thermal source for laser cutting [1].

Technological boom registered by the laser technology, meaning increasing of the Beam Parameter Product (BPP) make possible the usage of diode lasers in the cutting processes. According to Rodrigues [2] by using a diode lasers DDL with a BPP of 24.6 mm mrad an acceptable cutting quality may be obtained, the cut profile been comparable with an CO<sub>2</sub> or fiber laser.

In laser cutting and drilling, the focused laser beam is directed onto the surface of the workpiece to rapidly heat it up, resulting in

melting and/or vaporization, depending on the beam intensity and workpiece material (fig. 1).

The molten metal and/or vapour is then blown away using an assist gas. The power density required is typically of the order of  $10^6$ – $10^7$  W/cm<sup>2</sup> for metals. Lasers can be used to effectively cut metal plates of thicknesses up to about 10 cm. The cut surfaces are roughly parallel and straight edged [1,3].

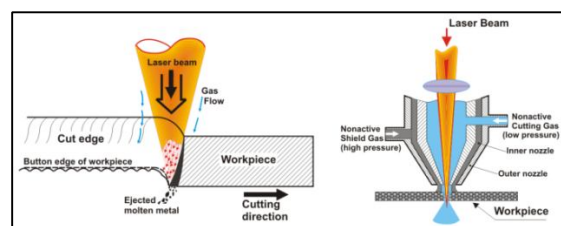


Figure 1: Laser cutting principle [3].

Laser cutting present a series of advantages in comparison with conventional process:

- High cutting speeds
- Narrow heat affected zone
- It is a non contact process
- Low contamination of the workpiece
- It is suitable for cutting of complex geometrical pieces with corner radius equal to laser beam diameter.