With light through thick and thin – laser cutting

There is hardly any material that can stand up to the focused light beams of a laser. A laser can cut through steel plates, vaporize hard reactor steel and slit the hardest material found in nature: the diamond. Laser beams have proven themselves to be a jack-of-all-trades; they can be used on extremely thin and light materials as well as thick materials. Lasers did not make their way into sheet metal processing until the seventies. Laser technology went on to establish itself in the manufacturing process and became very significant within a few years not least because of mechanical engineering which played a major role in the development of the laser. By the middle of the eighties, laser manufacturers had developed their own laser units which they integrated into machines. CO_2 gas lasers, in particular, were put into practice. For this reason, we will concentrate our discussion on the subject of cutting with a CO_2 laser.

A laser is practically useless on its own. It needs a guiding hand and must be implemented in a system or machine. It must be directed to the point where the energy is needed.

When cutting sheets and plates with a laser, a focused laser beam is the only tool used and is supplemented by a cutting gas. The material is melted in a confined area. It then melts or vaporizes. The resulting slag or metallic melted material is then blown out using a gas stream. A kerf is produced.

This slitting process has certain advantages as opposed to alternative processes such as plasma cutting, punching and nibbling, wire-EDM or water jet cutting:

- Cutting with a laser beam allows metal to be processed without physical contact and use of force.
- In contrast to punching and nibbling, nearly any contour can be created without a tool change.
- Slitting is done precisely with a small kerf and at a high speed.
- The high processing speed results in a minimal heat-affected zone. This leads to very little workpiece distortion which is for all intents and purposes negligible in sheet metal processing.
- Cutting surfaces produced by a laser have very little roughness. The thinner the sheet, the smoother the edge.

Today, bur-free cuts are the rule when using conventional types of steel. Consistent and precisely-defined laser power, excellent beam quality, polarisation, and gas purity are the main factors contributing to high quality cuts.

These are important factors in producing consistent and reproducable cut quality.

Due to the enormous advancements made in lasers and cutting technology, laser cutting has also become a genuine alternative to other processes when economical factors are taken into consideration. If one considers the almost limitless flexibility in this application, it is safe to say that laser cutting will increasingly displace conventional processes.