

LASERS (The Controlled Light Tool has many Uses)

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In business and industry today, the need for flexibility and soft-tooling (non-contact) are vital to producing or recording products for this dynamic and ever-changing world. Laser systems have been found to be very useful in highly competitive industries such as automotive, aerospace, and advanced manufacturing because they can solve part manufacturing and identification problems. Laser systems are generally used for material processing (cutting, welding, drilling, and mold work) and product identification (marking).

The invention of the laser can be traced back to the work of Schawlow and Townes and their work on microwave spectroscopy and radar systems in the 1940s and early 50s. Their work resulted in developing the Laser for which they both shared in the Nobel Peace prize in Physics. Their invention has affected almost every section of our modern society, including consumer electronics, entertainment, information technology, science, medicine, industry, law enforcement, and the armed forces.

Laser Common Uses

We see lasers in use everyday and generally are not aware of them, they are especially used in:

- Bar code readers in supermarkets to read the bar codes on items at the cashier counter.
- Consumer electronic products such as compact disc players for movies and entertainment.
- Laser Printers for our computers.
- Laser pointers and hand-held laser counters for taking stock.
- Medical purposes for surgery, dentistry, and eye care and correction.

The Industrial Laser

The **laser**, the acronym of **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation, is a unique tool that can cut, weld, drill, produce cavities, heat treat, and mark a wide variety of materials. Lasers have found many applications in material processing, surveying, identification and tracking, medicine, spectroscopy, communications, and precision measurement.

Laser Principle

The laser beam is a very narrow, intense beam of coherent (united) light that can be controlled over a wide range of temperatures at the point of focus, from slightly warm to several times hotter than the surface of the sun. Conventional lasers behave like light wave copiers: An

initial light wave is copied again and again to form a single, uniform and intensive wavetrain. This happens in a fluorescent light, where mercury atoms are supplied with excess energy by electron bombardment. They get rid of this energy again by emitting light.

Types of Lasers

There are several types of lasers used for medical, business, and manufacturing purposes such as solid, gas, liquid, and semiconductor. The main parts of any laser include a power supply, a lasing medium (suitably contained), and a pair of precisely aligned mirrors. One of the mirrors has a totally reflective surface, while the other is only partially reflective (about 96%).

Laser Measurement and Inspection

Lasers are playing an ever-increasing, important role in inspection so necessary for statistical process control. Lasers are able to do what quality control standards require, that is, to perform 100% inspection with 100% accuracy at full production speeds. Some of the more common purposes of lasers in gaging/inspection are:

1. **Dimensional Measurement**- Measuring a part as it is being made, to see if it is correct and adjusting the process on the spot, if necessary.
2. **Laser Probes** - Coordinate-measuring machines, using laser scanning probes, can scan contoured surfaces 50 times faster than non-contact probes.
3. **Nondestructive Testing** - the use of lasers has created a new field of nondestructive testing known as holographic interferometry that is used to inspect machine tools, tires, computer components, automobiles, and aircraft parts to find defects.

Laser Marking/Bar Coding

The initial use of laser-based systems for on-line product marketing was in food packaging, where it was used to monitor shelf life and trace products in case of recall. It quickly found applications in electronic industries for the non-contact coding of small fragile electronic components because it was two to twenty times faster than other methods. The laser marks do not have any effect on the product being marked, and the marks do not deteriorate.

Bar coding, one of the best data collection systems, can be used on almost anything that can be counted (taking inventory), packaged (supermarket labeling), and tracked (letters and packages in courier services).

Industrial Applications

Gas discharge lasers, having mirrors with high reflectivity, are widely used in metrology applications such as laser micrometers and image recognition systems. The laser beam is directed from a fixed mirror toward a rotating mirror that flashes the beam quickly across the transmitter lens causing the beam to scan through the work area in a linear or parallel fashion.

Laser Machining

Materials that can be machined with lasers include plastics, rubber, glass, ceramics, stone, silicon, marble, granite, foam and composite materials. Many different types of metals can be machined with lasers, including: aluminum, brass, bronze, cast iron, copper, nickel, nickel alloys, precious metals, hardened metals, steel, tool steel, stainless steel, steel alloys, and titanium.

Laser Hardening

The high-speed transformation hardening of steels is a major application of lasers. The advantage laser heat-treating has over conventional methods is that it is fast and localizes its heat in a small area.

Laser Welding

In laser welding, the weld's depth and width can be controlled. Any material that can be welded using conventional methods can generally be welded faster and better with a laser.