Advantages of Fiber Laser

A White Paper by Bill Andre, Laser Product Manager
Industrial YAG (Yttrium Aluminum Garnet) lasers have been used for years for permanent marking of metals, plastics and similar materials. Historically the two main types of lasers used were YAG Lamp and Diode Pumped lasers.

The most recent addition to the YAG laser market is the Fiber Laser. The Fiber YAG laser provides improved optical performance, better system flexibility, longer up-time and higher reliability. Consider the power and reliability factors detailed below.

**Power Consumption** – (two eight hour shifts running 365 days at $.04/kW):
- Fiber = $39.71 Yearly (170W an hour)
- YAG Lamp and Diode Pumped = $1,401.60 Yearly (6kW an hour)

**Power Efficiency:**
- Fiber = Up to 50%
- YAG Lamp and Diode Pumped = 2-3%

**Reliability:**
- Fiber = 100,000 Hrs MTBF
- YAG Lamp and Diode Pumped = 10,000-20,000 Hrs MTBF

Some disadvantages of the YAG lasers are detailed below:
- Flash lamps have a limited life span and must be changed frequently. The average life span is 500-1,000 hours. Life of the lamp is directly dependent on the duty cycle.
- The Flash Lamp YAG is inefficient and power is lost as heat. To help control this, external or internal chillers are needed and require more maintenance. They also consume large amounts of power and are not energy efficient.
- The YAG lasers have a significantly larger spot size than a fiber laser, so require more lasing power to achieve the same result.
- YAG lasers have poor beam quality that is not symmetrical

Disadvantages of the Diode Pumped or Rear Diode Pumped YAG Laser:
- Diode Pumped and Rear Diode Pumped diodes have a limited life span and must be changed frequently. Thr average life span is 10,000-20,000 hours. The cost of a replacement diode pack is $15,000-$20,000, depending on the wattage of the laser.
- The significantly larger spot size than Fiber Laser requires more lasing power to achieve the same result.
- These types of lasers have poor beam quality that is not symmetrical.
- The diode pack maintenance requires factory-trained personnel.
- The optical path requires frequent adjustments to optimize power output.

Fiber laser marking is now making a significant impact on the industrial manufacturing market due to the following advantages:
- Low Cost.
- Low Maintenance.
- Increased efficiency.
- Reliability - Average life span of 100,000 hours.
- 50% smaller spot size which requires less power to achieve the same result.
- Exceptional beam quality that is round and concentric.
- No aligning of mirrors or beam path.
- Compact, lightweight system which is easier to integrate.

ID Technology’s Macsa F-Series Fiber Laser Coder is available in 10, 20, 30, 50 and 100 watt power. The combination of YAG technology with fiber optics has produced a smaller, more versatile, easy to operate, and longer-lasting system that delivers ultra-fast precision marking at lower operating costs.

For more information, contact ID Technology.
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