

Low Cost Laser Technologies

Two technologies seem promising for the future of low cost laser cutting.

Sealed CO2 Lasers

<http://www.synrad.com/library/articles/sealed.html>

by Dave Clarke, Synrad, Inc.

Edited from a version originally published in Industrial Laser Review, October 1996.

- laser bore (the area in which the plasma is constrained and lasing occurs) and gas supply are contained within a sealed tube, in contrast to higher power flowing gas systems that require external gas tanks, pumps, and filters
- RF (radio frequency) energy to excite the laser gas "waveguide design" confines optical energy into a small cross-section bore more efficient increased operating lifetime
- hybrid waveguide/ free-space configuration, U.S. Patent #4,805,182
- bore is larger than a true waveguide and acts as a spatial filter -high-quality output beam with diffraction-limited performance (important when cutting or drilling)
- large bore size, so plasma interactions with the bore walls are less important -lower tolerances necessary
- laser tube and electrodes are both extruded from aluminum and then welded in place -lower production cost -improved long-term reliability.
- elastomeric seal that has a known, finite gas leakage rate -lower-cost, more reliable -tens of thousands of operating hours -shelf lives well in excess of 10 years
- RF power supply. RF energy to CO2 laser power is approximately 15 to 20 percent conversion efficiency
- bore size and internal gas pressure determine frequency and optical risetime of the gas
- higher pressure gives faster optical response time (shorter laser pulses), but lower efficiency (due to surface losses in the waveguide mode)
- FCC authorized frequencies are 27.12 and 40.68 MHz
- cost of RF power will be the limiting factor in the development of these lasers approximately \$2/RF watt, which equates to \$150-200/laser watt
- sealed CO2 laser will deliver 1W of laser output per inch of bore length 25W laser will have a tube length of approximately 25-30 in
- very effective solution is to combine two lasers to produce a single output beam output beams are linearly polarized so they can be optically combined using a polarization sensitive beam combiner produces a randomly polarized output beam with an output power equal to the two tubes used

Fiber Laser Systems

- [SDL FD25 Series](#)