



Arc Lamp Lifetime

Today's state-of-the-art materials and manufacturing processes produce krypton arc lamps that yield long performance lifetime and stable operation. Under normal operating conditions, krypton arc lamps in a well-maintained Series 800 Nd:YAG Laser will give many hundreds of hours of satisfactory operation. For lasers that operate on a production line 24 hours/day, arc lamp lifetimes easily can exceed 1000 hours.

The actual lifetime of an arc lamp is greatly influenced by the manner in which the laser is operated. Perhaps the greatest influence on arc lamp lifetime is arc lamp ignition itself. The more often the lamp is started, the shorter lifetime it will yield. Users that start and stop their lasers several times a day may expect perhaps only 100-200 hours of lamp lifetime. Production-line operations wherein the laser is switched off only for periodic, routine maintenance (such as to change the arc lamp) can yield up to 2000 hours.

Another strong influence on arc lamp lifetime is the percent of the rated power of the lamp at which it is operated. Clearly a lamp that is operated at 75 % of its rated power level will yield longer lifetime than if it were operated at full (100 %) rated power.

Lee Laser rates arc lamp lifetime as follows:

- **Typical Lifetime:** 1000 hours (long-term, industrial applications, with the lamp operated at 70 % of rated power)
- **Guaranteed Lifetime:** 200 hours

The general maintenance condition of the laser is another major influence in arc lamp lifetime. Lasers that are well maintained in good condition always will provide longer lifetime. This means that the laser is serviced according to instructions that are contained in the Operation Manual, the optical resonator is maintained in good alignment (which allows the lamp to operate at a lower power level to achieve the desired beam output power), and the deionization water filter in the primary cooling system is changed periodically.

As an arc lamp ages, it will develop a white or gray residue inside of the glass envelope, particularly at the ends near the electrodes. This is caused by the sputtering of the arc lamp electrodes. The residue will reduce the lamp's efficiency to optically "pump" the YAG laser rod, so some gradual beam power reduction may be expected. Usually this beam power reduction can be compensated by an increase in arc lamp power.

Another indicator of arc lamp age is a noticeable increase in beam power instability. As the lamp ages, the sputtering of the electrodes causes uneven erosion at the tips of the electrodes. This uneven wear will cause the plasma arc to spatially wander about the tips of the electrodes, and result in an uneven optical pumping of the YAG rod. The uneven pumping causes beam power instability. Often, this also will produce unstable arc lamp power as viewed on the kilowatt meter on the front panel of the power supply.

The most common causes of poor arc lamp lifetime are:

1. frequent starting of the arc lamp
2. poor alignment of the laser optical resonator

For more information, refer to the following Lee Laser technical bulletins:

**Early Laser Arc Lamp Failure, Common Causes
Alignment of the Laser Optical Resonator**

Laser Maintenance and Servicing

Arc lamp lifetime can be improved by operating the lamp at a reduced power level.

From reports by many users we know that those which perform routine service and maintain their lasers in good operating condition always achieve the best arc lamp lifetime. Good operating condition includes periodic check of optical resonator alignment with a laser power (Watt) meter and other test instruments.

Also, the gold elliptical reflector should be checked for its condition, and the DI (deionization) water filter should be changed periodically to maintain the proper electrolytic level and oxygen removal (see Lee Laser bulletin, **Deionized Water Quality**).

Clearly, if the optical resonator is properly aligned and the gold pump chamber is in good condition, the laser will operate most efficiently. Less arc lamp power will be needed to produce the beam power necessary for your work.

Disposal of Used or Defective Laser Arc Lamps

Laser arc lamps are manufactured totally from inert materials: glass, stainless steel, tungsten and krypton gas. As such, used or defective laser arc lamps, including broken arc lamps, may be discarded without fear of any harm to the environment.

Users should consult your local or business environmental office or agency for the correct disposal procedure in your area.

Differences in Arc Lamp Appearance

Lee Laser purchases laser arc lamps from several different manufacturers. Each manufacturer may use slightly different design details for the internal electrode, so the lamps from one manufacturer may differ slightly in appearance from those of another manufacturer.

However, all of the lamps that are specified by Lee Laser for use in a particular laser model will have the same dimensions (length and envelope diameter), the same gas fill pressure and the same operating voltage (within manufacturing tolerances). As such, all of the lamps bear the same performance warranty by Lee Laser, regardless of manufacturer. Arc lamp manufacturers provide no warranty whatsoever.