

SERVICE BULLETIN	
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Water as a Coolant for Lasers

Product

Diode arrays, Pump Modules, and Laser Systems

Category

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Water

Tap water, fresh water (from rivers, wells, and such), ocean/sea water, and even rain water all have dissolved ions, suspended solids, and organic (some live and some dead) materials. Some of the most common ions are calcium, magnesium, sodium, chlorine and carbonates. The suspended solids can be almost any material from the water delivery system, solids of the carbonates, or organic materials. The organics themselves can be live microbes or inactive byproducts of the microbes.

Distilled water is water that has been passed through a distillation process. This process typically kills any live microbes and removes most of the solids and ions. This water can be used as a base material for a laser coolant. However there is no way for the water to maintain purity over time. The wetted surfaces in the laser coolant system will release ions to the water over time and microbial growth will occur in the water. A filter can help remove the solids in the water, but will not remove the microbes or the ions. Corrosion will occur as time passes due to the ions in the water.

Deionized water is essentially water that has been passed through a reverse osmosis filter (like those advertised attachments for the faucet) that is designed to remove ions. This water is a good choice as the base material for a laser coolant. However it suffers from the same problem as distilled water in that if it is not maintained, it will degrade over time leading to corrosion and microbial growth.

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Corrosion

If preventing corrosion is the objective, deionized water is the better choice. Since it is the ions that allow water to conduct electricity (and the type of corrosion we are interested in is a galvanic/electrical process), then tap water is in fact more corrosive to metals than deionized water. The ions in regular water facilitate the movement of electrons that cause corrosion

Microbes

All water can support biological growth given time. The water typically becomes contaminated over time by various microbes. So while water "purifiers" can improve the flavor of tea and coffee, etc. Don't assume that it is biologically pure. Even distilled water, water collected from the water vapor of boiled water, can be biologically contaminated if left sitting around open to the air.

Laser Coolant

While deionized and distilled water start out as good materials for a laser coolant, they do not maintain purity over time. They must be actively replenished and cleaned. Since the water will need to be refreshed in a few days or a week, a series of filter systems and controls can be used to maintain the resistivity of water as well as UV lamp systems to continuously kill microbes. These systems work, but are an added cost and complication to the coolant system.

Another method for water purity control is to use a metal passivation material that protects the wetted surfaces of the laser system and a biocide that destroys any microbial growth. The metal passivation prevents ions from the wetted surfaces from being released to the coolant and the biocide controls the growth of microbes. Eventually the materials need to be refreshed. This is typically over the course of months instead of days or a week. Optishield plus addresses all the concerns above.