

Commercial Laundering with Photohydroionization™

An Environmentally Friendly Advanced Oxidation Technology

By Ronald G Fink and Walter B Ellis

Commercial laundering with ozone has been around since the early 90's. The ozone systems touted reduced phosphate pollution, energy use, chemical use, cycle time and sewer costs while increasing fabric volume and life. In general, they did all of the above; however, with the new systems also came a battery of new problems.

About Ozone

Ozone or O³ is the result of oxygen (O²) reacting with an electrical discharge such as lightning, a spark, or an electrical current, or UV light radiation. Ozone is a colorless gas that has an odor similar to the smell of fresh air after a thunderstorm. Ozone is extremely unstable and cannot be stored. It must be generated at the site. It is 1-½ times as dense as oxygen and 13 times more soluble in water. Ozone is 150% more powerful than chlorine and is an oxygen-based friendly oxidizer.

The first problem was using ozone on colors and elastics. The high levels of ozone needed for cleaning also degraded colors and rubber based elastics. Accordingly, ozone systems were limited to whites such as bedding, towels, napkins and tablecloths.

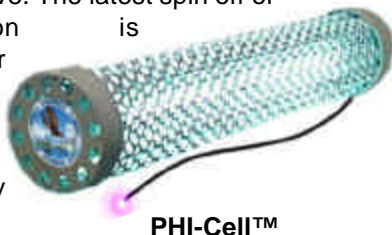
CHEMICAL OXIDIZERS (In order of strength)

- | | |
|-----------------------|-------------|
| 1. Fluoride | 6. Chlorine |
| 2. Hydroxyl Radical* | 7. Bromine |
| 3. Ozone* | 8. Iodine |
| 4. Hydrogen Peroxide* | 9. Oxygen* |
| 5. Permanganate | |

* Friendly oxidizers are oxidizers that revert back to oxygen and hydrogen after they react.

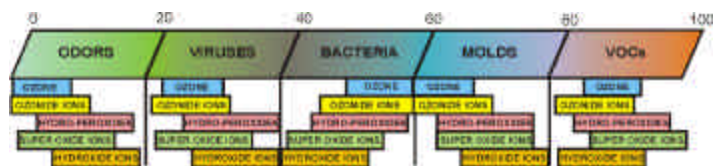
Then there was the staining problem (ketchup, blood, etc.), so some detergents were required. Maintenance was another problem as the high humidity of a laundry and the sensitive nature of corona discharge ozone generators led to corrosion and frequent failure. High levels of ozone also created off gassing safety problems in addition to material problems with rubber seals in the washing machine.

A relatively new technology, "Advanced Oxidation or Photocatalytic Oxidation" has been developed for pollution clean up at EPA Super Fund Sites. It works on relatively low levels of ozone combined with a titanium catalyst and ultra-violet light. The results are better than just ozone alone, and the system is less expensive. The latest spin off of advanced oxidation is Photohydroionization™ or the PHI-Cell™. This technology works on ozone generated from a broad spectrum, high efficiency UV lamp.



This same UV energy hitting a hydrated quad-metallic target results in the formation of ozonide ions, hydro peroxides, super oxide ions and hydroxide ions. This combination provides cleaning equal to and often better than very high levels of high-concentration ozone. Combined with a natural enzyme, the results are superior to classic, high-temperature detergent cleaning and the silver ions provide ongoing bacteria protection.

ORGANIC SPECTRUM



The bleaching problem is eliminated and equipment maintenance is very low (cell life is 25,000 hours). The ozone off gas problem and washing machine material compatibility is also eliminated, and the cost is just a fraction of traditional ozone systems.

The Commercial Laundry Photohydroionization™ System provides a water cleaning method to remove chlorine and organics thereby permitting the wash water to retain more oxidation gases. A Photohydroionization™ Cell creates friendly oxidizers of low-level ozone, hydro peroxides, free oxygen molecules and super oxide ions. These breakdown oils and grime while disinfecting the fabric and works best with energy-saving cold water. A byproduct of the Photohydroionization™ is pure oxygen aeration, which performs two functions. First, it enhances the enzyme action. Second, the aeration creates an effervescent cleaning action similar to club soda's cleaning action where escaping gases release grime and stains from fabrics. An active, natural blend of enzymes is added to aid in some stain breakdown. Silver ions are added to the oxidized water solution to provide silver's unique bactericidal ability. These Silver ions are also trapped in the fabric to provide ongoing protection against odor-causing bacteria.



The benefits of a Photohydroionization laundry system include:

- Increased fabric life
- Reduced bacteria counts
- Increased fabric volume
- Eliminates harmful detergents
- Eliminates allergies caused by detergents
- Saves hot water

Ronald G. Fink

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Walter B. Ellis

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Commercial Laundry Test

Photohydroionization™ vs. Brand name and Economy detergent

