WHY IS OZONE CONSIDERED A BETTER DISINFECTANT THAN UV

Water treatment technologies such as Chlorine and UV have been used for years together. Each of these technologies has its advantages and disadvantages. Most of the time chlorine and UV are also combined together. Ozone technology has been present for more than decades now. Ozone technology is now close to becoming a priority in water treatment. Quite often ozone is also used in conjunction with other technologies.

UV VS Ozone

Pathogens of concern in any water treatment system consist of Bacteria, Virus and Pro tozoans. According to available literature UV irradiation's effectiveness depends on the UV dosage applied.

Bacteria

UV is most effective against bacteria followed by protozoan and least effective against virus. The normal UV dosage suggested for water treatment is between 20 and 40 mJ/cm2. At this dose, most bacteria show a 2–4 log inactivation.

Disadvantage of UV: The potential for reactivation
Because UV irradiation does not immediately result in cell lysis, there is some opportunity for a UV inactivated cell to regain viability through repair mechanism. One such mechanism is called photo–reactivation. Following UV inactivation, exposure to wavelengths in the range of 350–450 nm (Present in sunlight) triggers an enzyme that can repair UV inflicted damage to the DNA of the bacteria Not all bacteria have this ability to reactivate and it has been found that reactivation decreases with increase in dose from 20 mJ/cm^2 – 140 mJ/cm^2. As most UV generators are designed at the lower range, the potential for reactivation is a reality.

Virus

Viruses are extremely resistant to UV irradiation. California 22 standards require a minimum of 140 mJ/cm2 dose for inactivation of polio virus, while rota virus needs a minimum of 50 mJ/cm2 dose for effective inactivation and adenovirus needs a minimum of 120 mJ/cm2 dosages. This is clearly lower than the dose recommended by most UV manufacturers.

Protazoan

UV is not considered a viable technology for inactivation of protozoan pathogens. Cryptosporidium and Giardia require large dosages for 3–4 log inactivations, thus making UV economically unviable for protozoan inactivation.

Water Quality

Water quality such as pH, dissolved ions and turbidity affect UV effectiveness:

- With higher pH, the possibilities of precipitation of carbonates in the water along with scaling of precipitates can foul UV lamps enough to reduce the effectiveness of UV inactivation
- High hardness affects UV lamps adversely as any scaling of these precipitates can foul the UV systems
- Any tubidity in the water reduces UV irradiation effectiveness

The Role of Ozone and Advantages over UV

Unlike UV, Ozone has a high germicidal effectiveness against a wide range of pathogenic organisms including bacteria, protozoa, and viruses and requires much lesser contact time than UV. Because of its high germicidal efficiency, ozone can be used to meet high inactivation required by water treatment systems with or without filters. Unlike UV, there is no potential for reactivation as Ozone results in complete inactivation/destruction of pathogens.

Apart from micro organisms, Ozone also has benefits, like: removes odor, removes color, no toxic–by products and makes chlorine use safe, unlike UV which has no effect on organics at very low doses.

This is precisely the main reason that in Europe and in America it is very common to use both ozone and UV in conjunction. The process called AOP is becoming more popular nowadays. If UV is to be used alone, than the dose should be above 140 Mj, when the reactivations ceases.

Contributed By: V. Baratharaj

OZONE TECHNOLOGIES & SYSTEMS INDIA PVT. LTD.
Tel: +91 44 4211 8266,
E–mail: otsilozone@gmail.com
Website: **www.otsil.net**