OZONE AND PESTICIDE REMOVAL

Removal of toxins from water and wastewater is a subject that is growing importance in India. The fact of discharge norms have became strict has brought focus to the removal of toxic products from wastewater. Municipal/potable/packaged water industries are also giving due importance to the acceptable levels allowable.

Pesticides are classified based on their target group like herbicides, insecticides, fungicides, rodenticides, nematicides etc. They are also classified based on their chemical structure like Organophosphates, chloro–phenoxy carboxylic acids, organo–chlorines, substituted urea, triazines to name a few.

Pesticides gain access to water and waste water due to the manufacturing process in wastewater or contamination of ground water through waste water discharge by concerned industries.

The technologies for removal of pesticide contamination will differ for potable and drinking water and for wastewater. The higher contents of these toxic products in some wastewater make it more difficult to remove. A combination of both physical and chemical methods followed by a biological step in one way is for the removal of pesticides from water. Physical methods include Nano Filtration, RO, Sand filtration and carbon filtration. Chemical methods include oxidation by ozone and AOP process and have been very successful in pesticide removal.

But it must be noted that nether physical methods or chemical oxidation can guarantee complete removal of these toxic products from wastewater. Chemical oxidation often result in incomplete destruction of pesticides and the by–products formed are still toxic in nature. Thus a combination of both physical as well as chemical oxidation is the right way to go for removal of pesticides and its by–products from wastewater.

Ozonation is probably the better way for pesticide removal. AOP process using OH free radicals have also been evaluated useful for pesticides removal (including ozonation under high pH of over 8.0). The EOP of ozone is a high 2.07, only lower than OH free radicals and hence found to be very effective in degradation of recalcitrant organic pollutants in water and waste water. In wastewater management the target of ozonation and AOP process is to detoxify the toxic products or at least convert them to easily bio degradable by products.

The complexity of the reactions of these toxic products and by products with ozone and OH free radicals make it very difficult determine the degree of degradation. Mineralization is very difficult and also the degraded by products could also be toxic. Due to this, Liquid Chromatography in many cases has not provided the correct results. Other measurements of TOC, DOC, COD could all provide some monitoring considerations. Toxicity assays are essential for an accurate determination.

Use of Biologically active carbon has found to be very use in pesticide removal. BAC has very large surfaces, well developed oxygen containing groups in well–developed internal pore structure.

The most common treatment steps consist of:

- **Step 1:** Primary treatment
- **Step 2:** Ozonation/AOP
- **Step 3:** secondary treatment preferably Biological
- **Step 4:** Tertiary treatment with Ozonation/ AOP
- **Step 5:** BAC filtration
- **Step 6:** Coagulation
- **Step 7:** Sand filtration

EDC–Micro Pollutants – A Concern Now

EDC´s are substances which impact hormone function in animals and humans. Different groups of persistent micro pollutants are daily released by human activities into the water cycle. EDC´s (Endocrine Disrupting Compounds), pharmaceuticals (antibiotics, hormones) and , x–ray contrast media, personal care products are groups of emerging contaminants all over the world. The role of ozone has been proven to be very effective in the removal of these micro pollutants.

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