

Frequently Asked Questions about UV

Often we get questions about UV. I have collected these questions and my answers. The following are some selections. If you would like to submit a question, please send it to me at jbolton@iuva.org
Jim Bolton, Editor

Question 1: I am familiar with the Fenton's Reagent (hydrogen peroxide + iron salts at pH ~4) to destroy phenol in wastewaters. Why I do not see any data or publications on the use of Fenton's Reagent as an antimicrobial? The hydroxyl radical is so strong; it should kill microbes.

Answer:

Yes, Fenton's reagent would be very effective as an antimicrobial treatment of wastewater. The antimicrobial effect would probably arise more from the low pH (Fenton's works best at a pH of about 3) than from the generation of •OH radicals.

It is more a question of economics. Lowering the pH to 3-4 is very costly and increases the dissolved solids level of the water. I think that you would find that UV disinfection would be a much cheaper process than Fenton's treatment.

Question 2: How do I calculate the numbers of UV lamps for a system. I'm talking about low-pressure lamps. Why do some of the companies say that I need only 3 lamps where another company will use 10 lamps?

Answer:

The number of UV lamps required for a UV reactor depends on several factors including:

- Transmittance of the water at 254 nm (the lower the transmittance, the more lamps will be required)
- **Flow Rate (the higher the flow rate, the more UV lamps will be required)**
- **The path length of the UV in the reactor (if the irradiance is still high at the walls, UV is lost by absorption in the walls)**
- **Turbidity [if the turbidity is high (>2-5 NTU), UV will be absorbed and more lamps will be required]**

All of the above points assume that a certain minimum fluence (UV dose) will be required (e.g., 400 J/m² or 40 mJ/cm²).

The sizing of a UV reactor is a complex matter and usually requires an analysis of the irradiance distribution in the UV reactor using a calculational model. Alternatively, the UV reactor can be subjected to biosimetry analysis, using a surrogate, such as *Bacillus subtilis* spores.

The sizing of a UV reactor is not a simple matter - this is why UV companies employ engineers to design their UV reactors. There are also UV consultants who can help in the design