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Episode 46 Do It Right with UV Light (Part 2)

Michael Urbans and Jesse Rodriguez discuss UV technology.

Pretreatment

- It's just especially important to have a good filtration system so you get good UV transmission.
 - The quartz sleeve can be coated with high hardness that will plate out on the bulb.
 - Hardness less than 7 grains per gallon
 - Manganese or iron can coat the lens transmitting UV light.
 - Manganese less than 0.05 ppm
 - Iron less than 0.3 ppm
 - Turbidity should be less than 5 NTU - no color in the water.
 - pH between 6.5 to 9.5

NSF Certification [Learn More About NSF and UV](#)

- The test created for ultraviolet units certifies the dosage of the systems.
 - Dose is 40 millijoules per centimeter squared.
 - They require a low UV dose alarm set point. NSF tests water quality down to 50 percent.
 - An NSF certified UV must achieve a 3-log or 99.9 percent reduction of E. coli coliform bacteria at the end of the lamp life with 50 percent ultraviolet transmission.
 - It takes the standard 30,000 dose and lowers that flow rate capacity. The system must be rated at a minimum of 40,000 microwatts, 40 millijoules, at a UVT of 50 percent at the end of lamp life.
 - A good safety factor is to get a 99.9% reduction.

Operation

- There is a difference whether the system is rated for the UV dose at the beginning of lamp life or at the end of lamp life. Typically, the difference is between 9,000 to 12,000 hours.
- Lamp life for a residential unit is approximately 9,000 hours lamp life, about 12 months.
- Lamp life for a commercial unit can be up to 12,000 hours, about 18 months.
- Typically, the monitoring control box for the ultraviolet in a residential application will give a notification at 30 days left to change the lamp. And again, at the end of the 30 days, or "you better change it out right away" notification.



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Applications

- UV will kill disease-causing microorganisms. It's a matter of the required dose for the targeted organism.
- UV light, in combination with other filtration or other means of disinfection such as ozone, can produce an oxidation process called advanced oxidation where UV light emits hydroxyl radicals – which is even stronger than ozone or UV as a standalone can destroy chemicals very hard viruses.
 - For example - Using peroxide in the water circulating at about seven times the flow rate will oxidize and reduce some chemicals such as 1,4-Dioxane and make them basically filterable.
- The brain-eating amoeba's scientific name is [naegleria fowleri](#). It is a free-living protozoan that can cause a fatal disease, primarily amoebic meningoencephalitis.
 - This contaminant is in the protozoan cyst category. Studies have shown a range as high as 120 millijoules per centimeter square is required for a 3-log reduction. That's about four times the dose of a standard residential system.
- Will an ultrafilter, which is .025 micron followed by post-ultraviolet work?
 - State and federal agencies are considering this a “multi-barrier” approach to disinfection. What they want is a combination of a couple of methods of disinfection, so one supports the other.
 - Ultrafiltration combined with ultraviolet light is a good installation for removing and destroying this amoeba.
- HVAC - Ultraviolet light transmits very well in the air.
 - There is a different design for HVAC systems.
 - This ultraviolet is put in the ducting system of the HVAC system near the condenser coils.
 - The ultraviolet light shines down and keeps the coils a little bit cleaner, and then it kills the airborne bacteria as it passes.
 - The UV should be placed on the side where the air is blown through the house.
 - The size of the HVAC system and SCFM air movement are required to specify the UV.
- UV is a particularly good disinfectant for Legionnaire's disease.
- Ultraviolet light can be used on public water as a safety margin, even if you're on a municipal water supply where there are multiple boil water alerts.



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Do's & Don'ts

- Look at your application. What is the water source? Is it well water, is it municipal water? Each water use defines the type of equipment and the standards to be applied.
- Size the UV system by the flow rate and UV dose to achieve reduction of microorganisms.
- Look at the service and maintenance aspects. Don't just install it but maintain it over the years.
 - Even if the lamp is on and there is a blue glow, this doesn't mean there is enough UV intensity after one year.
 - Make sure to change out the lamp on an annual basis.
 - Clean the quartz sleeve when changing out your lamps. Take out your quartz sleeve, put it on a white paper towel. If there is any colorization on the quartz sleeve, clean it off. If can't be clean it off, replace it.
 - Don't buy a bulb, buy a kit- the quartz sleeve, the bulb, and an O-ring.
- Quartz sleeves are very delicate. One little snap and they break.
- Make sure there is enough clearance to bring the bulb and quartz sleeve out of the unit.
- When tightening the end nut, the compression nut seals the quartz sleeve inside the chamber, turn it down and hand tighten. "Hand tight and a quarter turn."
 - Do not use a wrench on the end nut.
 - Hand tight gives a 120-psi seal.

<https://www.wqrf.org/map.html>

USGS Water Data Map

<https://dashboard.waterdata.usgs.gov/app/nwd/?region=lower48&aoi=default>

WQA National Convention

<https://www.wqa.org/convention>

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