



MUNICIPAL WATER TREATMENT

IFM Designs and Builds an Emergency Potable Water Treatment Unit

With the algal bloom increase occurring in Lake Erie and the local concern of water quality, IFM was contacted by a local Municipal Water Department to build two Emergency Water Treatment Unit's (EWTU) to treat, produce and dispense potable water. These systems were each mounted in a small utility trailer for quick and easy access in the event of an emergency situation.

The algal blooms found in Lake Erie are photosynthetic blue-green algae, also known as Cyanobacteria. Cyanotoxins are byproducts of the multiplication and breaking of cyanobacterial cell walls. The cyanotoxins that are found in Lake Erie are known as Microcystins. Hepatotoxicity causing complications to the liver and even promoting liver cell death can occur if high concentrations of microcystins are present in drinking water.

Using this knowledge on cyanotoxins, IFM designed and built a unit to remove these contaminants. The first stage in the filtration process is a pretreatment system consisting of a twin alternating water softening unit which leads to parallel activated granular carbon cartridge filters. Carbon is often used in water purification due to its ability to absorb a wide variety of harmful contaminants.

The individual carbon granules in the cartridge filters attract impurities and once these impurities are chemically bonded to the carbon, they are not easily removed. Granular carbon was chosen over block carbon filters due to the surface area received from the individual carbon granules. Since the surface area is greater, contaminant adsorption is greater as well.

Following the granular activated carbon filtration, the water is fed to a Reverse Osmosis (RO) System. In this stage, water will be forced through a permeable membrane

into lower concentrations of dissolved solids, with the membrane rejecting toxins, ions and salts.

The processed water is then sent to a Permeate Holding Tank. This tank determines when the machine will turn on and off. A recirculation line on the tank allows the water to be disinfected and filtered continuously.



For the disinfection process, the permeate water runs through a reactor where it is exposed to ultraviolet light at 254 nm wavelength. When the UV light makes contact with bacteria, it instantly destroys the bacterial DNA. This eliminates the possibility of bacteria, viruses and protozoa reproducing / multiplying and leading to the infection or other health risks, and this occurs without the use of any harmful chemicals. The destroyed bacteria is then filtered out through a 0.2 micron filtration element.

After the filtration / disinfection process is complete, the processed water is then ready for consumer distribution upon demand. Since the unit is only necessary for emergency situations, the system is designed for quick startup and shut down procedures. If the unit is being shut down for an extended time period the equipment will be blown out and preserved with sodium bisulfite to preserve the membranes.

The system included a complete Operations and Maintenance Manual with detailed step by step start-up, operate and shut down procedures. The EWTU's also included field test kits to allow initial samples to be tested for pH, TDS and Microcystins. Operating procedures included initial and continuous Ohio EPA certified sampling methods to insure the units were dispensing clean, safe water to the city's patrons.