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Wastewater disinfection 101

If you're treating wastewater, it's important to stay on the cutting edge of disinfection technology. A variety of techniques must be employed to eliminate bacteria at wastewater treatment facilities before the effluent is reintroduced into the environment. Four of the more common disinfection technologies in use are chlorine, bleach, ultraviolet (UV) light and peracetic acid.

Many industrial wastewater treatment facilities in the U.S. use a combination of water treatment and disinfection processes, beginning with activated sludge treatment, which employs naturally occurring microbes that consume harmful constituents in a wastewater stream. Later-stage disinfection is usually accomplished using UV light, chlorine, bleach and in some applications peracetic acid, which is an emerging technology in the U.S.

Chlorine

Chlorine has been the traditional go-to chemical for wastewater disinfection but poses a number of environmental and safety concerns, as it is toxic and can be highly corrosive in high concentrations. Chlorine also has a brief shelf life, evaporating rapidly when in contact with air, light or high temperatures. Chlorine releases can threaten plant personnel and nearby communities and leave byproducts that must be disposed of.

Bleach

Bleach is another common chemical used in wastewater disinfection. Yes, it is the same stuff you put in your washing machine for whiter clothes. Bleach is similar to chlorine but much less toxic and corrosive. It was first used as a medical disinfectant in Austria in 1847 to help prevent the spread of "childbed fever," which often killed new mothers while recuperating from childbirth. Bleach smells like chlorine because that is one of its ingredients.

UV light

The UV process uses submerged ultraviolet lamps to instantaneously kill bacteria and other undesirable organisms as the wastewater flows through the light. More than 20 percent of the wastewater treatment plants in North America use this environmentally friendly technology. UV is fast, energy-efficient, cost-efficient, leaves behind no carcinogenic byproducts and is effective against chlorine-resistant protozoa. UV systems are often paired with pre-filters to remove sediment that can interfere with light transmission, preventing complete disinfection. If wastewater moves too fast, insufficient UV exposure can impair disinfection. If the wastewater moves too slowly, heat buildup can damage the UV lamps.

Peracetic acid

A fourth major disinfection technology, peracetic acid (also known as peroxyacetic acid or PAA), was first registered as an antimicrobial by the EPA in 1985 for indoor use on hard surfaces — such as in food establishments and medical facilities — and in the disinfection of cooling tower water, where it is effective against biofilm formation and Legionella bacteria. Its effectiveness against bacteria, viruses, funguses and spores has recently positioned peracetic acid as a major disinfection technology.

Advantages of peracetic acid include an absence of toxic byproducts, no or reduced quenching, and short contact time. Another advantage is peracetic acid technology takes up a relatively small physical footprint, which is important at facilities where expansion space is extremely limited. Peracetic acid is more expensive than chlorine and has increased safe handling requirements, but its advantages are many and costs should decrease as demand for the treatment technology increases.

Many industrial wastewater treatment facilities employ a combination of water treatment and disinfection processes.

Other alternative wastewater disinfection methods include ozonation, chloramination, brominization and iodinization.

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NEWS **UPDATE**

CITGO launches STEM Talent Pipeline educational program

HOUSTON — CITGO Petroleum Corp. is launching a new social responsibility program, the CITGO STEM Talent Pipeline, for students enrolled in elementary school through post-secondary education and beyond.

CITGO is kicking off the CITGO STEM Talent Pipeline with a series of grants for schools and educational organizations near its operational areas, including Houston — where its corporate headquarters is located — and its three refineries in Corpus Christi, Texas; Lake Charles, Louisiana; and Lemont, Illinois. The company is also providing scholarships for students pursuing higher degrees in STEM fields. CITGO plans to utilize the experience of its own employees through mentoring efforts as well.

"Around the country and in our own industry, we are experiencing a shortage of professionals with the technical skills necessary for our workforce to succeed. The CITGO STEM Talent Pipeline program seeks to address this challenge by providing students with the resources they need to excel in science, technology, engineering and math-related careers," said CITGO President and CEO Nelson Martinez. "CITGO has long been committed to enhancing STEM-related opportunities for students through college scholarships and support for science fairs, robotic clubs, field trips, mentorships and other hands-on experiences. Now, with the creation of our STEM Talent Pipeline, we are able to unify and formalize this dedication to education and workforce development."

To further the mission of the program, CITGO is working with the National Energy Education Development (NEED) Project to provide workshops for local educators near all three CITGO refineries. The NEED Project, which began on National Energy Education Day 35 years ago, trains teachers on how to provide comprehensive lessons on energy in the classroom with its portfolio of over 130 teacher and student guides.

For a full list of CITGO's recent STEM contributions, visit www.CITGO.com or call (832) 486-1489. ●