



The XOGEN® advanced electro-oxidation treatment system.

# NEW TECHNOLOGY DRAMATICALLY CUTS WWTP GREENHOUSE GAS EMISSIONS

By Chumeng Wu

One contributor to climate change that might be overlooked by municipalities is their wastewater treatment plants (WWTPs). There are three major greenhouse gas emission sources in a conventional WWTP: carbon dioxide, methane and nitrous oxides are produced by aerobic and anaerobic bioreactors; carbon dioxide and methane are produced by the sludge digester; and, combusting digester gases on-site also produces carbon dioxide emissions.

Global warming potential is different from gas to gas. For example, the global

warming potential of methane is 21 times that of carbon dioxide, while the potential of nitrous oxide is 310 times that of carbon dioxide.

Generally speaking, in conventional WWTPs, bioreactors release about 0.25 kg of carbon dioxide per m<sup>3</sup> sewage treated. Digesters produce around 0.22 kg of carbon dioxide and 0.09 kg of methane per m<sup>3</sup> sewage treated. Combusting the digester gas produces an additional 1.87 kg of carbon dioxide per m<sup>3</sup> sewage treated. In total, the global warming potential of greenhouse gases from the treatment

plant is equal to 2.34 kg of carbon dioxide per m<sup>3</sup> sewage treated. This means a 3.8 MLD conventional sewage treatment plant will release 3,175 tonnes of carbon dioxide per year.

The XOGEN® advanced electro-oxidation treatment process primarily utilizes hydroxyl radicals and chlorine based radicals to oxidize organics, ammonia and bacteria in wastewater.

The process applies a pulsed current on a stack of electrodes that have been coated with specific materials for oxidative ion production. The electrodes utilize

**SINCE IT ELIMINATES THE BIOPROCESS AND DISINFECTS THE SEWAGE AT THE SAME TIME, NO BIOSLUDGE WILL BE PRODUCED.**

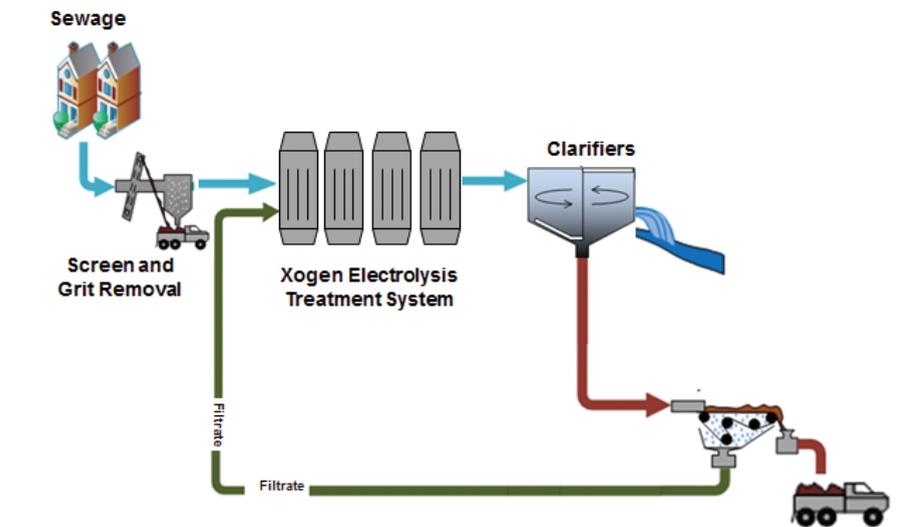
the existing ions within the wastewater to produce different kinds of oxidative ions. These quickly react with contaminants in the sewage, converting them to gaseous byproducts, including oxygen, hydrogen, nitrogen and carbon dioxide. This reaction and treatment occurs within five minutes.

The XOGEN electro-oxidation reactor is a modularized unit of the overall treatment system. The reactor is about 93 cm in height, 38 cm in length and 13 cm in width, weighs approximately 25 kg and can be easily handled by one person. The reactor shell is made of engineered plastic to provide sufficient strength to handle up to 104 Kpa pressure inside the reactor. The module is also heat and chemical resistant.

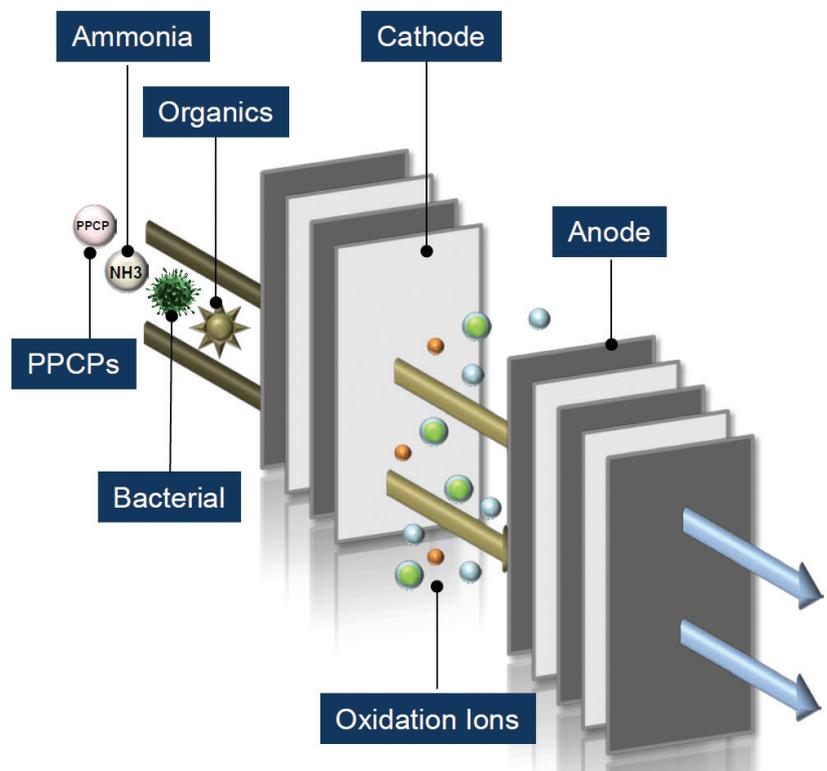
The core components of the reactor are the internal electrodes. Their effective surface area is about 1.6 m<sup>2</sup>. Electrodes used in the reactor are non-sacrificial, with an expected lifetime of 10 to 12 years. Design treatment capacity of each reactor is 3.8 lpm and multiple reactors can be linked together to become a treatment system according to required capacity.

The XOGEN advanced electro-oxidation system is a pre-engineered turnkey system that can be easily integrated into most WWTPs. The system will eliminate the primary clarifier and replace the bioreactors. Since it eliminates the bioprocess and disinfects the sewage at the same time, no biosludge will be produced. Therefore, the sludge treatment process can be simplified by eliminating the digesters.

Compared with conventional sewage treatment processes that produce a large amount of greenhouse gases, XOGEN's advanced electro-oxidation is a much cleaner and environmentally



*Application of XOGEN advanced electro-oxidation system.*



*The XOGEN advanced electro-oxidation process.*

friendly process.

Gas byproducts of the process contain only 2% carbon dioxide. The carbon dioxide emission rate is as low as 0.04 kg per m<sup>3</sup> sewage treated, which is 98% less than conventional wastewater treatment processes. At 3.8 MLD, XOGEN's process only produces 54 tonnes of carbon diox-

ide per year, while a conventional sewage treatment plant of the same size produces 3,175 tonnes per year. ■

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