Ozone: The Ultimate in Sustainable and Green Wastewater Treatment

Paul Turgeon, CEO of Anue Water Technologies, tells us about his company's expertise in using oxygen and ozone for corrosion and odour control in wastewater containing H_2S and associated compounds.

Wastewater collection systems have long been subject to issues with odour and corrosion. Odours can cause obvious local issues, but corrosion is the greater issue, with its potential for environmental harm and systemic damage.

A major contributor to odour and corrosion in many systems is hydrogen sulfide (H_2S) and associated compounds. H_2S arises from the combination of anaerobic conditions and the presence of sulfites and sulfates in conjunction with the colonies of microorganisms (e.g. sulfate-reducing bacteria) on the inner walls of collection systems.[1] As well as its physiological effects (e.g. eye and throat irritation, headache, nausea at lower concentrations; nervous system and respiratory paralysis, and even death at higher concentrations),[2] H_2S becomes a corrosion risk when in contact with moist concrete or metals, in the presence of oxygen.

Historically, H_2S was controlled by directly treating the wastewater inside the collection system, for example by drip-dosing an oxidizing, sulfide-scavenging or pH-adjusting chemical, to prevent the formation or release of harmful compounds. However, these solutions typically fail to address the underlying presence of problematic microorganisms and require storage of bulk quantities of the chemicals used.

Ideally, the best treatment of wastewater odour and corrosion would cease sulfide production and quickly eliminate sulfides that are present, present no additional hazard to life or the environment, do no harm to the collection system itself, and create no additional challenges downstream. According to Paul Turgeon, Anue Water Technologies' CEO, such a solution is already available through the novel approach of introducing ozone and oxygen into collection systems.

Ozone is a naturally-occurring form of atmospheric oxygen. Instead of containing two oxygen atoms it has three and is represented by its chemical formula O_3. This third oxygen atom makes it a highly reactive molecule with a very high oxidation potential. Ozone can be generated by exciting a flow of oxygen with sufficient electrical or optical energy. This causes a certain proportion of oxygen atoms to split and recombine with other O_2 molecules nearby (Figure 1).

"Ozone has been shown to be an effective treatment for destruction of volatile organic compounds," explained Turgeon. "In fresh water the half-life of ozone is typically 10-20 minutes, but in wastewater ozone is entirely consumed in under 10 seconds." This is due to the high levels of potential reactants that are present in wastewater, including H_2S.[3]

"The simple structure of hydrogen sulfide makes it a very easy target for oxidation by ozone", added Turgeon. "And with the source of ozone generation being ambient air, it is the ultimate in sustainable and green chemical treatment."

Anue designs and manufactures a comprehensive range of systems, referred to as FORSe 5, that utilize oxygen and ozone for effectively inducing clean, sustainable and cost-effective treatment of odour and corrosion in wastewater collection systems. The direct treatment of the wastewater is achieved through a proprietary process of treating a factional flow of wastewater and returning this treated flow into the untreated flow, thus inducing change. This process is termed hydrodynamic infusion.

Furthermore, Anue has developed a system that generates ozone on-site, when and where it is needed. The technology simply takes air, separates the oxygen and nitrogen, and then processes the oxygen into ozone. The ozone reverts to oxygen when it reacts, so the system is highly sustainable and very efficient.

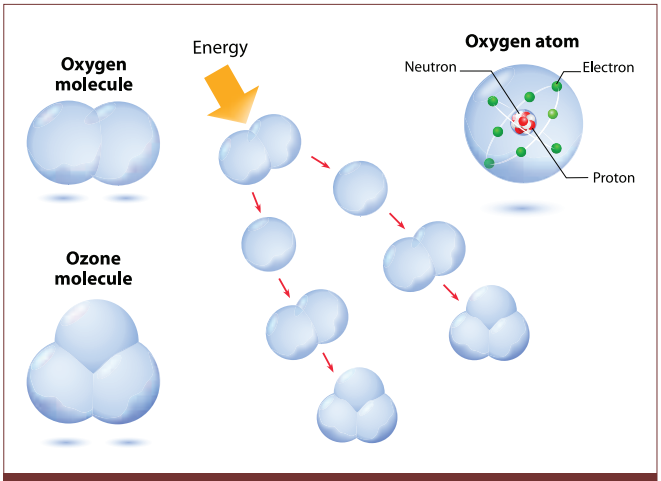

Figure 1 – Formation of ozone

"As well as being efficient and practical, a key point is that the system can be easily controlled remotely. It was this intellectual property that has brought ozone into play in the water management sector," explained Turgeon.

Anue's FORSe 5 system has been shown to reduce H_2S vapour levels, as well as total and dissolved sulfide levels, with no undesirable side effects. Compared with conventional drip-dosing techniques, which create technical and financial compromises (e.g. chemical storage and maintenance, infrastructure corrosion, clogging, and even facilitating the sulfide-producing anaerobic slime layer), ozone technology provides significant advances in effectiveness and decreases ongoing costs.

"Our researchers have written a white paper on the use of ozone and oxygen in treating watewater,[4] and we'd be more than happy to share it with anyone interested," said Turgeon. "Overall, the application of oxygen and ozone into the wastewater environment brings with it not only a much more technologically and cost effective means of treatment, but it's much more effective from a sustainability standpoint – an issue that is gaining in both technological and social importance."

REFERENCES

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