# Addressing high $H_2S$ contamination with hydroxyl technology

By Martin Slepkov

The Regional Municipality of Durham began operations at its Courtice Water Pollution Control Plant in December 2007. Located directly east of the Greater Toronto Area, the $163-million plant handles 68,200 m³/day via a 1050 mm force main travelling 6.5 km from the Harmony Creek pumping station. At the time, it was the largest project Durham had undertaken.

The Courtice WWTP is one of 11 the Region operates. Biological and chemical processes are used to reduce levels of organics, ammonia, phosphorus and chlorine discharged into Lake Ontario.

When the odour of hydrogen sulphide ($H_2S$) found its way into the headworks building, where the screens and grit classifier are located, as well as the headworks basement where the blowers and grit slurry pumps are found, plant staff investigated odour abatement solutions.

They measured $H_2S$ contamination in order to establish the location, source and loading of the odour. Using an Oda-Log® Type RTx logger they discovered the greatest odour source originated from the upper vault, where the force main from the Harmony site entered the headworks building. Within the upper vault, the logger measured a 24-hour hydrogen sulphide average of 58 mg/l, with a maximum of approximately 130 mg/l.

Odour abatement technologies used in WWTP operations traditionally employ highly engineered, custom designed and constructed systems. Such systems can be very expensive and require a lot of maintenance, chemicals, electricity and other resources.

Many times, these engineered solutions involve building additional infrastructure in order to house hardware, store chemicals, and capture and redirect contaminated air through a series of complex air handling and exhaust hardware, into a wide spectrum of media filtration devices. These include wet/dry/chemical scrubbers, or large scale bio-digestive systems. Using chemicals or "solution through dilution" exhaust stack discharge are often considered to be the answer.

*Hydroxyl generators were used in the HVAC system for chemical dosing rooms.*


*Hydroxyl generators installed on the upper vault.*

In April 2014, while attending the WEAO Technical Symposium and OPCEA Exhibition in London, Ontario, members of the Courtice WWTP came across Odorox® atmospheric hydroxyl generating technology.

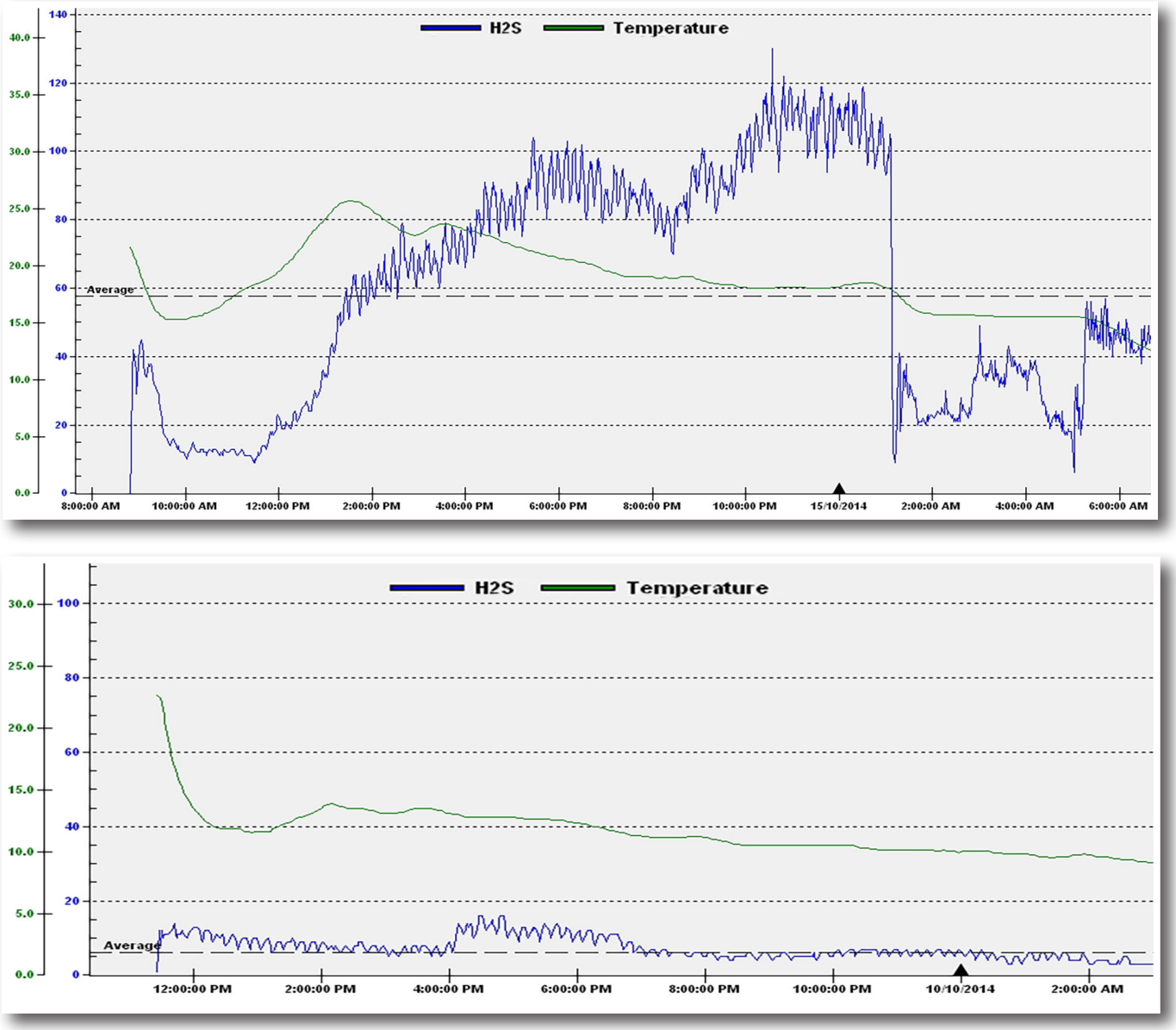
Empirical research conducted by third party, accredited and highly recognized laboratories, has proven that Odorox atmospheric hydroxyl generators produce the same steady state levels of hydroxyl radicals and other oxidants as produced by the sun's rays in our atmosphere.

These oxidants react with volatile organic compounds (VOCs), water vapor and other volatilized chemicals such as $H_2S$, free ammonia and chloramines, to generate the same mixture of organic byproducts produced in nature. These byproducts continue to be oxidized until they yield $O_2$, $CO_2$, $H_2O$, etc. Laboratory studies further proved that the oxidants and byproducts were safe. Independent toxicology studies showed treated animals were no different than untreated animals.

Hydroxyl radicals can totally decompose VOCs, both within the irradiation chamber of the Odorox machine and throughout the treatment space. It is a process that is very well understood and documented in over 25 years of chemical literature. Decomposition of volatile organic and inorganic compounds by hydroxyl radicals involves a complex series of free radical oxidation steps, that gradually result in the loss of individual carbon atoms, to eventually form $CO_2$.

After a few discussions and site visits, in partnership with the Courtice team, Hydroxyl Environmental proposed a "demo-to-sale" arrangement. Automated Odorox MVP14™ atmospheric hydroxyl generators were installed on top of the upper vault. These generators, with a very small footprint, sat on a grate outside the treatment space, exposed to outdoor elements.

Once installed, average daily $H_2S$ levels were reduced to less than 10 mg/l, with a maximum of 51 mg/l. These results met the buying criteria set by the Region. Additional units to totally elim-




*Top graph shows $H_2S$ levels (in ppm) in the upper vault without the Odorox system running. Bottom graph shows greatly reduced $H_2S$ levels with the system running.*

inate contamination loading are under consideration.

Atmospheric hydroxyl generating technology does not consume any chemicals, sprays or masking agents, has no filtration media devices and uses very little energy.

Since installing the hydroxyl generators, Courtice WWTP staff have experienced a reduction of odour contamination in the headworks building. Additionally, the Region began to identify that the level of corrosion activity has been reduced in the basement where the blowers and grit slurry pumps are located. Smaller hydroxyl generator units in other spaces that have indoor air quality issues or potential high corrosion concerns have been added. These include control and instrumentation rooms and pumping stations.

The Region installed two Odorox IDU™ units onto HVAC air handlers that supply fresh air into the sodium bisulfite and ferrous chloride chemical storage area and pump rooms. WWTP staff have noticed a drastic reduction in odour and corrosive contamination within these treatment spaces.

Durham Region was pleased with the results of this initial pilot study. Hydroxyl generation technology successfully mitigated several different types of odorous substances in a cost-effective manner. With the small footprint, low consumable costs and almost maintenance free equipment, the Region will keep this technology in mind when planning for future developments.

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