CONTROL OF EMISSIONS IN SCRUBBER

INTRODUCTION

A scrubber from a wastewater treatment plant in a city in Colombia, worked with soda (NaOH) and sodium hypochlorite (NaClO) to treat the H_2S gas coming from the purification of the waters. The use of these substances resulted in high costs in the process, occupational risk and high environmental impact due to dumping. By 2018, the replacement of conventional chemistry by environmentally friendly biotechnologies was proposed to reduce the concentration of H_2S at the output of the equipment and thus mitigate the consequences of the use of these substances.

BACKGROUND

The Scrubber object of this study worked with soda (NaOH) and sodium hypochlorite (NaClO). According to plant operators, the efficiency of the equipment had decreased to a great extent. In addition, the handling of these substances represented a risk for the personnel in charge of the operation of the equipment and for the environment.

The use of conventional chemistry in the Scrubber operation, made maintenance costs by corrosion higher; these had to be done every 6 months and they were rigorous, the pH and ORP sensors (oxide potential reduction) had to be calibrated continuously, and the water of the recirculation tanks was changed frequently by the formation of creams on the surface.

FIGURE 1. Scrubber.

FIGURE 2. Storage tanks for conventional chemistry product.

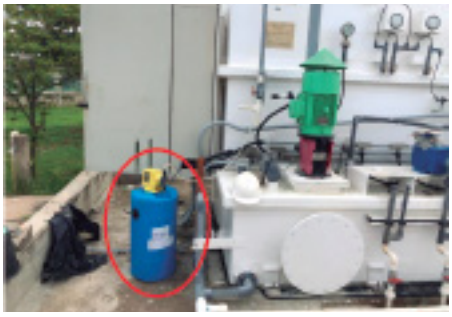

FIGURE 3. BOC storage and dosing tank.

SOLUTION FROM BIOTECHNOLOGIES

The technology of organic biocatalysts (BOC) accelerate and improve the efficiency of chemical reactions. The products contain a mixture of catalysts and biological oxidation stimulating factors that are friendly to the environment. The BOCs are used in systems of activated sludge, WWTP, composting, anaerobic digesters, sewerage and odor control. BOCs eliminate the unpleasant odors associated with decomposing organic matter.

Soda (NaOH) and sodium hypochlorite (NaClO) were replaced by BOCs. Biocatalysts present a high efficiency in the control of VOCs and reduce gases such as H_2S, NH_3 and mercaptans. Furthermore, they are not toxic or caustic, and are safe to handle, which reduces the risk of the process.

The BOCs micronise the oxygen to increase its bioavailability, helping to oxidize the hydrogen sulfide molecules (H_2S), following the following reaction:

$$H_2S + 2O_2 \xrightarrow{BOC} 2H^+ + SO_4$$

$$2H_2S + 2O_2 \xrightarrow{BOC} 2H_2O + 2SO$$

RESULTS

At the input of the equipment, H_2S values of up to 3002 ppm are presented. With the BOC dosage, a high removal efficiency with a value of 7 ppm is evidenced. The use of biotechnology to reduce the concentration of HS gas was reflected not only in the improvement of the efficiency of the process but in other aspects such as a decrease in the frequency of maintenance of the equipment, reduction of occupational risks and reduction in the load pollutant of the wastewater discharge.

There was also a reduction of 86% in terms of product consumption in kilograms, and a reduction in costs per consumption of 41%. The decrease in water consumption is also noticeable, as the water exchange times in the recirculation tanks are extended. Using the conventional chemistry there was a weekly water consumption of 28.84 m; With the implementation of biotechnologies this was reduced to 4.12m 3, which represents a saving of 85.75% of water consumption per week.

It should be noted that the implementation of a solution using biotechnologies has other benefits such as savings in dosing equipment and infrastructure. The storage and dosing of large amounts of soda and hypochlorite required a system and infrastructure that takes up a lot of space (Figure 2). In contrast, the dosing and storage system for the BOC is reduced to tanks that require less space (Figure 3).

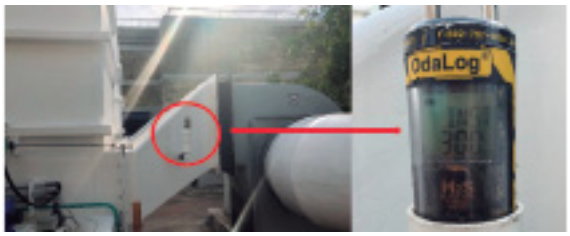

FIGURE 4. Scrubber entry (left) and measurement of H_2S with Odalog equipment.

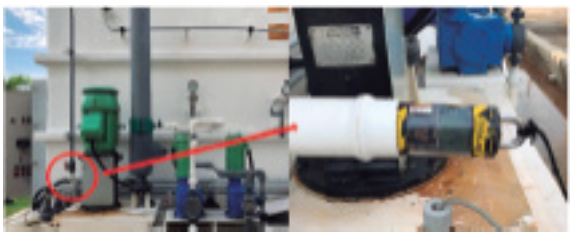

FIGURA 5. Salida al Scrubber (izquierda) y medición de H_2S con el quipo Odalog.

CONCLUSION

- There was a decrease in emissions of toxic gases from Scrubber thanks to the action of biocatalysts.
- Biocatalysts, unlike conventional chemistry, improve the conditions of the existing microbiology in the system, allowing the degradation of organic waste and thus making the process more efficient.
- The biocatalysts do not generate residues that can adhere to the packaging or the equipment, therefore, it is not necessary to perform frequent maintenance of the equipment. There was also a lower frequency of equipment maintenance due to corrosion.
- The costs for calibration of pH and ORP sensors (Oxide Reduction Potential) are reduced or unnecessary since the biocatalysts do not alter the pH of the wash water.
- The water exchange times in the recirculation tanks are extended; therefore, there is a saving in water consumption and there is no formation of cream or supernatant.
- The use of biocatalysts significantly reduces occupational risks. Because it is a harmless substance, it does not affect the health of the people who handle it. There are no complaints from operators about the emission of irritant gases.
- The environmental impact caused by the discharges to the sea of water with a high content of soda and hypochlorite was significantly reduced.