

Speciality H₂S scavenger and odor control chemistries mitigated Asian refinery from fatal accident and achieved environmental compliance

CASE STUDY | Oil & Gas

| Challenge

A refinery complex in Southeast Asia received multiple complaints from the surrounding community related to the continuous release of pungent-smelling and sour gases. This condition resulted in serious threats to withdraw the refining license, incur heavy penalties and even shutdown all refining operations by the local municipal government. The Veolia team was asked to investigate, conduct a site audit to find root causes and propose mitigation solutions for these gas release problems.

| Solution

An investigation was conducted to identify the potential sources and nature of the odors. Several key areas were checked, including crude feed lines and the tank farm. The survey highlighted a strong H₂S toxic gas and mercaptans odors as the primary sources, mainly originating from fuel oil and light slop oil storage tanks. Table 1 captures some field values for H₂S levels measured in the gas phase of these tanks using H₂S testing dragger tubes.

Table 1: H₂S levels measured

Tank	H ₂ S level atGauge Hatch Tested by Drager tube	Content
Tank A	100-300 ppm	Fuel Oil
Tank B	200-300 ppm	Fuel Oil
Tank C	500-600 ppm	Light Slop

The gauge measured H₂S levels at the top hatch of the tanks that exceeded the regulatory control limit of 10 ppm. The measured values for H₂S levels were as high as 600 ppm, causing serious EHS risks to operators, the nearby community and the surrounding environment.

According to Occupational Safety and Health Administration (OSHA), hydrogen sulfide gas causes many health effects. Workers are primarily exposed to hydrogen sulfide by breathing it. The effects and impact on human health depend on how much hydrogen sulfide intake and for how long, as outlined in Table 2.



**EHS
Concerns
Eliminated**

**No Lawsuits
or
Heavy Penalties**

Table 2: OSHA guide for the impact of H₂S doses on humans

H ₂ S Level	Impact on Human
100 ppm	Immediately Dangerous to Life and Health (IDLH)
200-700 ppm	Marked conjunctivitis, respiratory tract irritation after a one-hour exposure
500-700 ppm	Loss of consciousness and possible death in 30-60 minutes
700-1000 ppm	Rapid unconsciousness, death

Veolia's site investigations showed two main contributors to odors experienced: H₂S gas odor and light hydrocarbon (mercaptan etc.) odor. The following treatment programs were recommended to mitigate and control the problem:

ProSweet* S1761, an amine-based specialty chemistry designed for H₂S control in sour streams, was continuously fed to scavenger H₂S. The scavenger was injected into the lines feeding the fuel tank, where the high H₂S levels were recorded. The recommended dose rate of ProSweet S1761 ranges from 10-20 ppm based on fuel oil flow rate.

ProSweet OC2560, an odor neutralizer made of specially formulated volatile oils, was also recommended to control non-H₂S odors mainly from light hydrocarbons and mercaptans. The odor neutralizer is to be blended with water at a ratio of 1:1000 to 2000, depending on the severity of odor detected and continuously sprayed at the vent source of the tanks. Figure 1 shows a schematic for the recommended chemical injection points at the tank farm site.

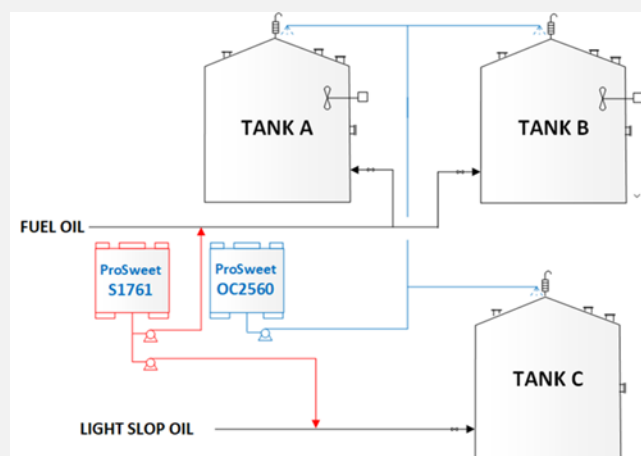


Figure 1: Injection scheme of H₂S Scavenger and odor neutralizer

Following deployment of Veolia's specialty chemicals, the operator reported significant control on process H₂S and odors.

H₂S levels were reduced from as high as 600 ppm to below 10 ppm. This reduction translates to up to 60 times reduction in H₂S level compared to before product deployment and falls within industrial target limits of allowable H₂S levels of 10 ppm.

Table 3: Comparison of the baseline (no treatment) vs. with H₂S & odor neutralizer treatment program

Tank	Baseline (No treatment)	With treatment
Tank A	500-600 ppm	< 10 ppm
Tank B	200-300 ppm	< 10 ppm
Tank C	100-300 ppm	< 10 ppm

Figure 2 captures performance monitoring trends for H₂S levels in the site tank's vapor space.

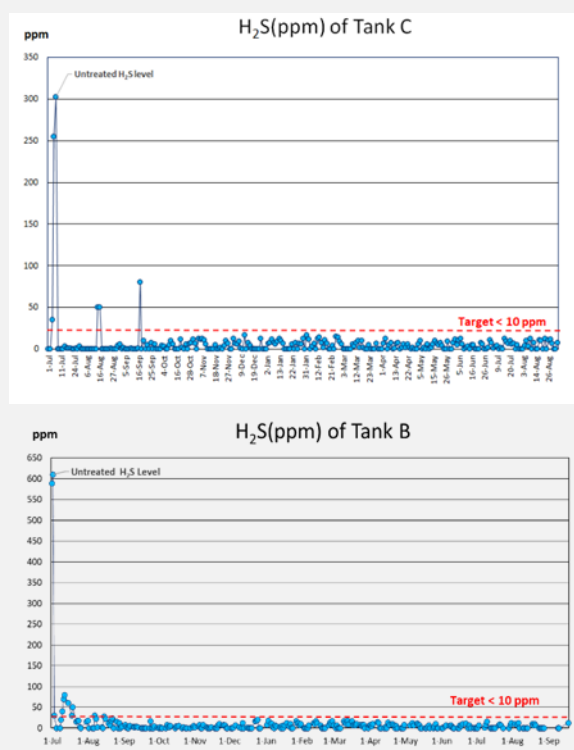


Figure 2: H₂S level after implementing an odor treatment program

The refinery also did not receive a single complaint from the neighborhood on nuisance and noxious odors.

| Results

As a result of Veolia's treatment program, the refinery complex:

- Eliminated EHS concerns for operators and the neighborhood community due to toxic H₂S and odor release.
- Met fuel production KPI and maintained compliance with government and industrial limits for H₂S and odor release specifications.
- Maintained the license to safely operate.
- Experienced no economic losses due to shutdowns or deferred production due to exceeding production limits of H₂S.
- Faced no lawsuits or heavy penalties.

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