

# CASE STUDY

# AZZURO

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## SPECIFICATIONS

Application:  
Biogas Emission from Oil Seed  
Extraction Plant in Antwerp,  
Belgium

Air flow:  
160 m<sup>3</sup>/h, approx. 10,000 to  
20,000 ppm H<sub>2</sub>S

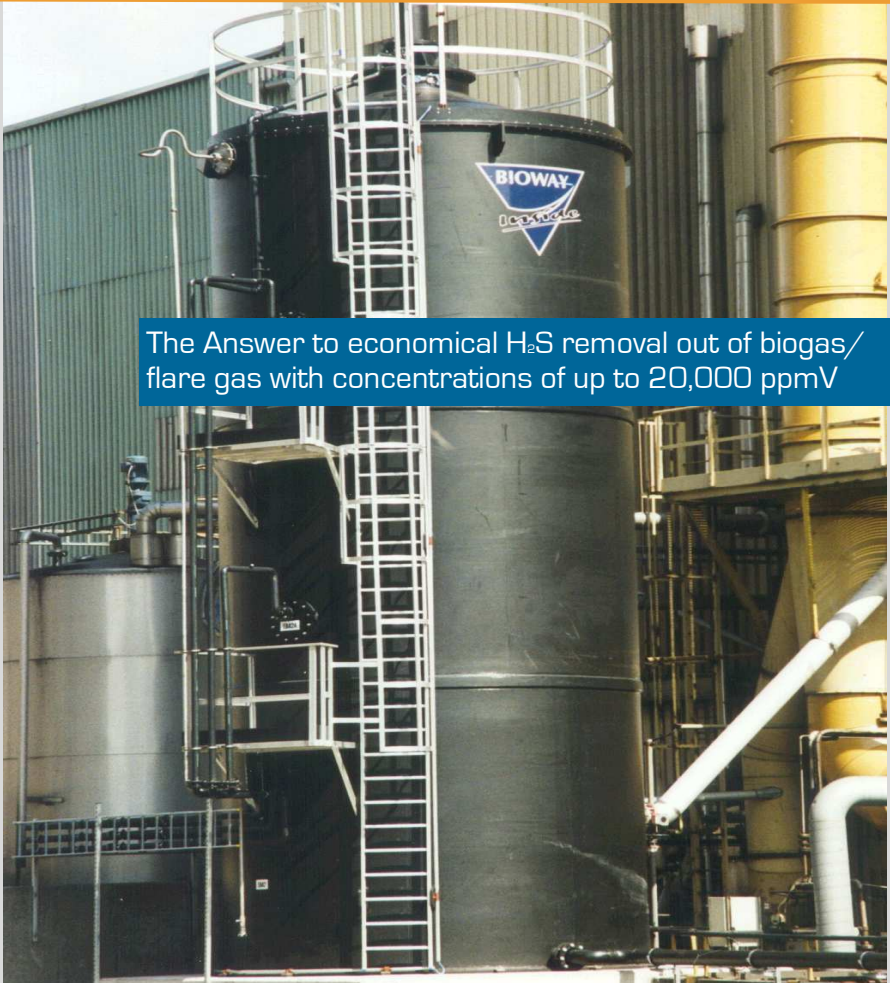
Contaminants:  
5 g/m<sup>3</sup> VOCs (hexane and  
pentane)

System configuration:  
1 x Torrenta

Reactor material:  
HDPE

Media material:  
PermaPac

Year installed:  
2001



The Answer to economical H<sub>2</sub>S removal out of biogas/  
flare gas with concentrations of up to 20,000 ppmV

## CASE STUDY: CARGILL, ANTWERP - BELGIUM

### INTRODUCTION

A seed extraction production plant producing vegetable oil products emitted a gas containing several compounds like H<sub>2</sub>S, hexane, and 2-methylpentane. The characteristics of the waste gas were quite extreme: Up to 16,300 ppm H<sub>2</sub>S, 60 °C, and almost 0% oxygen. The waste gas was diluted in order to achieve biologically acceptable conditions. Since the regulations demanded a decreased emission level for H<sub>2</sub>S a biological treatment system, the Torrenta bioreactor was applied.

#### *Torrenta Bioreactor*

The bioreactor operates with a combination of process water, fresh water and nutrients. The system is controlled by electro conductivity, which allows a minimum of water usage.

***No other chemicals have to be added!***

### H<sub>2</sub>S REMOVAL

The amount of H<sub>2</sub>S present in the waste gas depends on the type of seeds being processed:

The extraction of rapeseed results in much higher H<sub>2</sub>S concentrations than extraction of soybeans. Most of the time processing of rapeseed occurred resulting in very high H<sub>2</sub>S concentrations. The removal efficiencies for H<sub>2</sub>S were over 98%.

Early 2002, the process switched between rapeseed and soybeans every two to three weeks.

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Compound	Concentration - In mg/m <sup>3</sup>	Concentration - Out mg/m <sup>3</sup>	Removal Efficiency %
Hexane	107	40	63
2-Methylpentane	131	55	58
3-Methylpentane	66	26	61
Methylcyclopentane	23	8	65
Total VOC	327	129	60

**Table 1:** In and outlet concentrations and removal efficiencies for VOCs at 1,600 m<sup>3</sup>/h and 1,800 ppm H<sub>2</sub>S

### VOC REMOVAL

VOCs of the extraction process were removed at an efficiency of 60% (table 1). This was higher than expected since the operational pH of the bioreactor was very low: pH 1.3. The VOCs at the given concentrations did not negatively affect the bacteria involved in H<sub>2</sub>S oxidation since the removal efficiency was very high. Moreover, the Torrenta bioreactor contains micro-organisms that can degrade the VOC compounds of the extraction process.

### CONCLUSION

The Torrenta bioreactor showed an excellent removal efficiency (> 98%) even at high and fluctuating H<sub>2</sub>S concentrations: 200 - 1,800 ppm. The H<sub>2</sub>S-oxidizing bacteria were not influenced by the presence of hexane and 2-methylpentane. These and similar compounds were biologically degraded to an extent of 60%.