

- Case Study: H₂S-removal from stripped groundwater at a brewery

I. Introduction of the Site and the System

The neighborhood around this brewery plant is very sensitive to bad odors. The plant is located close to a residential housing area and next to a busy road. The brewery installed equipment to pump and treat groundwater for the production of the beer. The groundwater contained a relative high concentration of hydrogen sulphide since the swamps are present in the area. The ground water stripped by two strippers and each stripper was connected to a bioreactor treating the odorous air from the stripper.

II. Design Comments

The following design criteria were encountered: An airflow of 34000 m³/h containing hydrogen sulphide concentrations of 31 ppm (max 60 ppm). Acceptance criteria was based on the following criteria:

Criterion 1: 90% removal of hydrogen sulfide at 60 ppm

III. Operation of the System

During the start-up a start-up kit is used. This 1000 liter vessel contains an acid resistant pump and a water level control. The vessel was first filled with water, nutrients and biology (the biology used is a combination of prepared inoculum and activated sludge) The pump recirculates discontinuously the water over the media in the bioreactor in order to have the micro-organisms grow on the inert media inside the bioreactor. During normal water with nutrients is discontinuously added to the upflow bioreactor. The water used in the bioreactor was the stripped groundwater after membrane filtration, which is also used as water source for the beer production. Addition of nutrient is therefore very important since During normal operation no special attention has to be paid to the bioreactor other than checking the blower operation, the water valves and the nutrient dosing system. The pH of the discharged water is continuously monitored and the fresh water with nutrients is automatically adjusted by the control system.

IV. Performance

During normal operation the plant operator checks weekly the bioreactor by visual inspection and alarm signals present. The bioreactor performance was measured by analyzing online inlet and outlet H₂S-concentrations (using H₂S-meter of Industrial Scientific; type STX70 calibrated at 25 ppm).

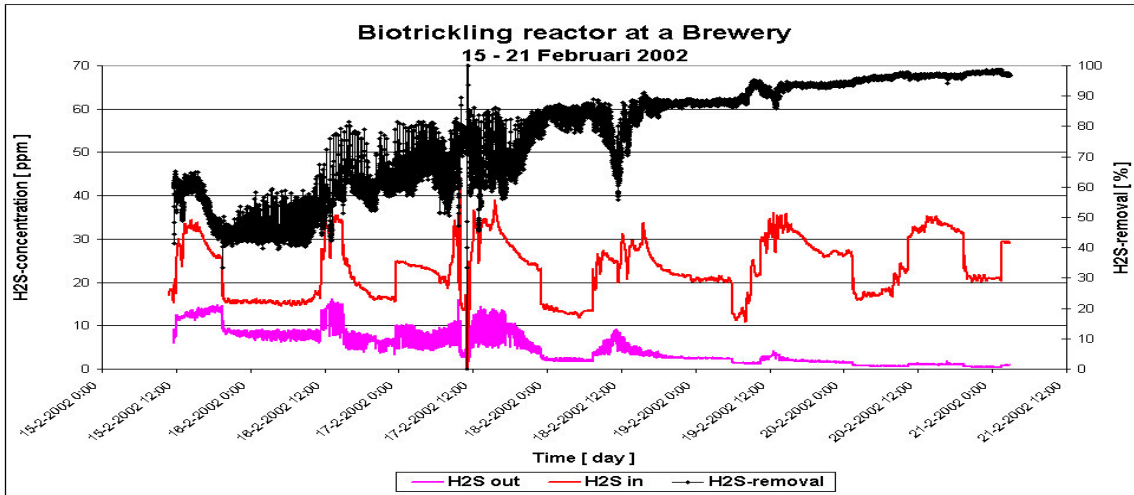


Figure 1: Biotrickling reactor treating H2S from stripped groundwater at a brewery.

V. Table

Reactor Type	2 PURSPRING Bioreactors TM
Owner and location	Brewery in Florida
Manufacturer	Bioway bv (Ede, The Netherlands)
Year of installation	Spring 2000
Type of air stream	waste gas from two strippers stripping groundwater.
Reactor dimensions and construction type	PURSPRING TM type PS2375 with control panel; housing material FRP with PVC lining inside for the protection against sulphuric acid.
Medium type	Permapac TM (structured, open, inert media, which is resistant to low pH conditions)
Height and number of layers of medium	2 layers
Air flow rate	app. 34000 m ³ /h
Pressure drop	< 400 Pa (< 1,6 inch WK)
Average bed temperature	Ambient air (5-35 °C)
Contaminants treated	Hydrogen sulphide
System controls	Automatic water and nutrient feed by PLC. Alarm generation for different unwanted situations like temperature, water pressure, water flow, nutrient flow, low pH and air pressure.
Design and acceptance criterion	90% removal at 60 ppm



Figure 2: Biotrickling bioreactors (right) treating odorous air from the strippers (left) at a brewery.