

Biological H₂S Biogas Scrubbers

Application of H₂S Scrubbers

Biogas H₂S scrubbers are used to reduce the content of hydrogen sulphide (H₂S) in biogas and landfill gases providing a cleaner and less corrosive gas for engine combustion.

The content of H₂S in the raw biogas can range from 1000ppm up to 50,000ppm and under combustion will convert into sulphuric acid leading to severe corrosion of the engine and a considerable reduction in its operational life. Income will be lost during overhauls and break downs which will also require substantial expenditures.

The leading gas engine manufacturers can specify a max. 250 ppm H₂S in the biogas to enable full warranty's to be provided. The biological H₂S scrubber can meet these requirements and even better with any flow volume and H₂S content of raw biogas.

The H₂S scrubber will reduce H₂S levels to an absolute minimum and is an essential part of the engine life providing operating stability, reliable and economical operation.

The 'Biological' H₂S Scrubber

The Scrubbers can be offered in 4 different designs:-

- Modular 20 or 40 foot steel containers for up to 2.5kg H₂S/h removal.
- PE design for small projects comprising a tank and process kiosk for up to 2.5kg H₂S/h removal.
- FRP design for medium size projects comprising a tank and a process kiosk for up to 10kg H₂S/h removal.
- Site constructed tanks and process equipment for above 10kg H₂S/h removal.

The Scrubbers are simple and robust consisting of one or more acid resistant tanks with packing media. The liquid content of the tank is constantly re-circulated and sprayed across the media. The biogas passes upwards through the media and the H₂S is biologically converted to sulphate in a series of oxidations.

The Scrubbers are to be cleaned at least once a year to retain operational efficiency avoiding any possible clogging. A facility and procedure is provided to allow cleaning of the tanks in less than a day without the need to remove any of the packed media.

Process description

The H₂S is removed from the biogas in a biological process, NO CHEMICALS ARE REQUIRED. The sulphur oxidation bacteria are of the Thiobacillus family and need the following:-

- Place to live and multiply (on a packed media inside a closed acid-proof tank)
- Sulphur (the H₂S containing biogas)
- Oxygen (supply of atmospheric air)
- Moisture (soft water or gas condensate)
- Nutrients (liquid NPK nutrient or digested sludge liquors)
- Temperature between 25-60 deg C

Supply of water and nutrients

In most cases the Scrubber is supplied with soft water and liquid NPK nutrient. However, on some plants it is also possible to use biogas condensate or liquors separated from the digested sludge. These liquors must be free from particles and without chemicals.

Effluent from the Scrubber

The effluent from the Scrubber is an acidic solution of sulphate (the sulphur is bound as sulphate-S). The pH value of the effluent will be between 0,5-6,0 depending on the source of water and nutrient. Even with a low pH value the effluent is not very corrosive as it corresponds to max 3% H₂SO₄.

Normally the effluent from the Scrubber is mixed with the treated sludge or separated liquors from the digesters and recycled to the fields as S-fertilizer. The sulphate-S is readily available to the plants and S-fertilizers with sulphate-S have a higher value than S-fertilizers with elemental-S. The reason is that elemental-S needs to be oxidized to sulphate-S before it can be used by the plants. The time for oxidation will depend on the climate but it might take 2-3 growing seasons before the plants can use the elemental-S.

It is also possible to bind the sulphate as gypsum. This will require that the effluent from the Scrubber is mixed with slaked lime. This will react with the sulphate and produce gypsum. As the specific gravity of gypsum is approx. 2.3 it will settle rapidly. The gypsum can be taken out by means of simple sedimentation in a settling tank or pond and used e.g. for soil enrichment at a composting facility.

