



Odor Control

H₂S / Sewer Gas Wet Scrubbing Explained

H₂S / Sewer Gas / Rotten Egg Smell Control

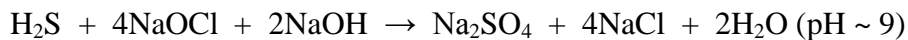
Hydrogen Sulfide, chemical formula H₂S, also commonly referred to as ‘sewer gas’ is frequently a nuisance problem at waste water treatment facilities – and a source of complaints from neighbors of such facilities.

Additionally, H₂S not only stinks, at high concentrations it incapacitates, blinds and eventually will kill if allowed to concentrate further. And as it is heavier than air, if not controlled it can under proper circumstances collect undetected in low places such as basements, septic tanks and even semi-enclosed areas to dangerous concentrations. And, nature is cruel – at dangerous concentrations H₂S is odorless!

So control, i.e., destruction, of H₂S gas has a significant safety benefit in addition to odor elimination.

Packed Bed / Wet Scrubber Control Option

There are several techniques available to destroy H₂S in a gas stream. Generally, packed bed / wet scrubbing is used when the air flow is relatively large, ~ 10,000 cfm or more, and the H₂S concentration in that gas stream is relatively modest, ~ 50 ppm_v or less. For such conditions counter-current or horizontal backed bed wet scrubber works well. The foul air containing the smelly gas is passed into and up through the packed tower as a scrubbing solution of an oxidizing agent at high pH is passed down and out of the tower. A typical oxidizer is simple bleach, sodium hypochlorite. The overall chemical reaction is:



The above odor control can be accomplished in a single stage scrubber. However, oxidizing agent (bleach) is the most expensive chemical agent used in the above example. And if only a single stage scrubber is used it must therefore be overdosed. So as a result often odor control at municipal WWTPs, and other locations, is achieved using two stages of packed bed / wet scrubbers in series. In such an instance the chemistry shown above is broken into two steps:

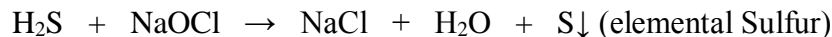
Stage 1: $\text{H}_2\text{S} + \text{NaOH} \rightarrow 2\text{Na}_2\text{S} + \text{H}_2\text{O}$ @ high pH, typically 10 or above

Stage 2: In this stage, the solubilized S⁻² is oxidized by bleach to sulfate ion (pH ~ 9)

The bleed or ‘blowdown’ of the 2nd stage is directed to the 1st stage sump. In this way no expensive oxidizing agent is sent down the drain. Rather, any residual NaOCl in the 2nd stage

blowdown is consumed oxidizing H₂S in the 1st stage scrubber. So 100% utilization of NaOCl (bleach) is achieved.

Note: In addition to the above chemistry, there is another reaction that occurs between H₂S and NaOCl:



When designing a packed bed / wet scrubber odor control system, if the inlet H₂S concentration is much above the 50 ppm_v that was mentioned earlier this last reaction needs to be considered when choosing a packing for the packed bed. The direct reaction between H₂S and bleach is generally only about 1% of the chemistry in the system. Elemental sulfur if present in sufficient quantity can tend to foul a packing. It will also possibly deposit on support rings, plug up spray nozzles and have other possibly deleterious effects inside the system.



What Raschig USA Can Supply to the Project

We would be pleased to design the packed bed required and to quote the volume of random packing needed for that bed. Typically 3.5” Jaeger Tri-Packs[®] are used. This packing allows for maximum air / water intimate contact within the tower. Also this packing is well established to be easy to pack very uniformly to form a consistent packed bed in a tower as well as to be fouling resistant. But based upon the specific needs of the project, other sizes of packing are available. Note this in the photo here.

Needed design data are:

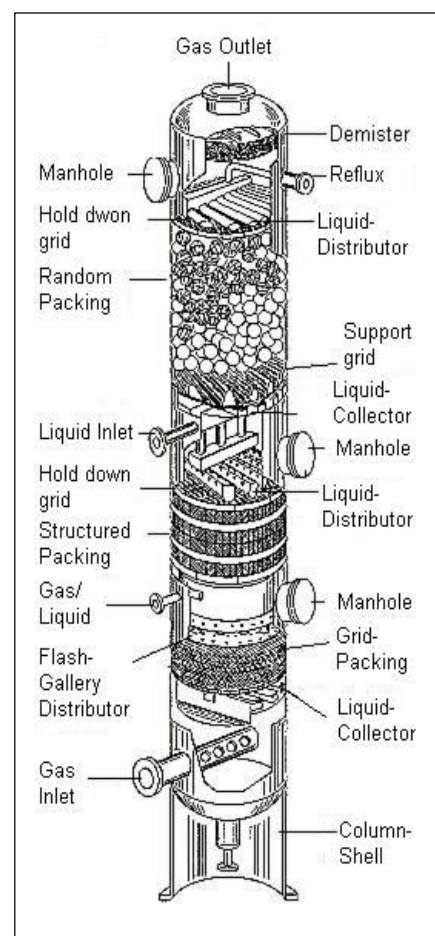
Air Volumetric Flow Rate

Air Temperature

Maximum Possible Concentration of H₂S in the Air Volume

Required Removal Efficiency

With the above data Raschig-USA can return a design that specifies tower diameter, packing choice and packed depth and needed controls for addition of bleach and caustic.



Tower Internals: Raschig USA also carries a full line of liquid distributors, packing support, mist eliminators and other tower internals. All of these items will be sized, if needed, based upon the specific needs of the project. If required in the project we will be pleased to quote these items.

Jaeger Tri-Packs[®] is a registered trademark of Raschig USA, Inc.

Design assistance is complimentary and quotations are provided with no obligation to order.

Contact: info@raschig-usa.com 817-695-5680 (Arlington, Texas USA)