



Sulfur Dioxide – SO₂ Acid Gas Wet Scrubbing Explained *Scrub at Neutral pH!*

SO₂ Acid Gas

Sulfur Dioxide, chemical formula SO₂, is produced in a number of industrial processes – such as smelters – as well as the result of burning coal. When present in air it often causes an acrid odor. The smell is also irritating to many people. And most significantly, from an environmental view, is the fact that SO₂ in the atmosphere is a precursor of sulfuric acid (H₂SO₄) which is a cause of acid rain.

Packed Bed / Wet Scrubber Design and Chemistry *No Need to Operate at High pH*

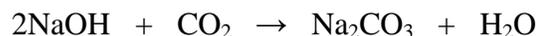
Sulfur Dioxide reacts with caustic per the following reaction:



So it is common practice to add caustic, NaOH, to the scrubbing liquor based upon pH control. But often in industry one finds that the pH set point is often as high as 10. *This is excessive and will result in unneeded and wasteful chemical consumption!*

Explanation: When initially started, the scrubber sump should have a strongly caustic solution. However, as SO₂ is absorbed into the solution and reacts per the above reaction, a 'buffer solution' based upon the bisulfite ion, HSO₃⁻ sets up. With a blowdown based upon ~ 4% total dissolved solids, this buffer is extremely stable at pH = 7. So this should be the set point used for the caustic addition system.

If a higher pH set point is used, there is no increase in efficiency of SO₂ scrubbing achieved. The only result will be excessive consumption of caustic due to over dosage of chemical. And additionally at pH = 10 and above some caustic will also be consumed by reaction with Carbon Dioxide:



At pH = 7 the above reaction is not significant, so in addition to not overdosing caustic no chemical is lost the CO₂ reaction when SO₂ is scrubbed with a pH neutral set point.



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

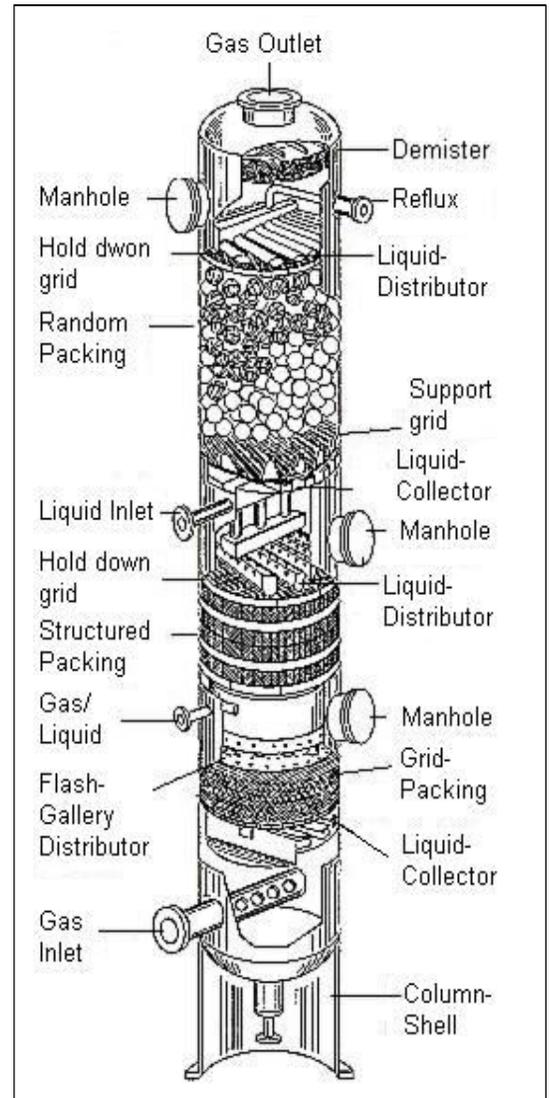
Maximum Possible Concentration of SO₂ in the Air
Volume

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 caustic.

Tower Internals: Raschig USA also carries a full line of liquid distributors, packing supports, 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.
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