Mist-erious acid carryover

Proper tower performance is integral to the successful operation of a sulfuric acid plant. Well-designed towers can increase plant uptime, improve production capabilities, reduce emissions, and lower maintenance costs. Poorly-designed towers can have the opposite impacts.

Performance differences can be illustrated with efficiency curves:

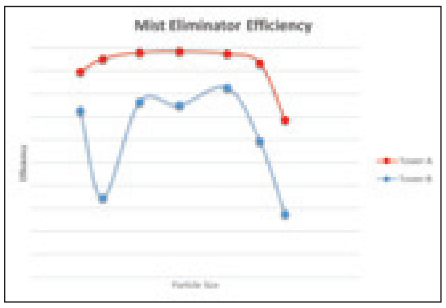

Fig. 1: Mist collection efficiency.

Emissions associated with Tower B above have a high mass mean particle size, a tell-tale sign of acid mist "re-entrainment" (since re-entrained particles are relatively large). Re-entrainment occurs when a portion of the captured mist draining by gravity from the fiber bed is regenerated into mist particles that are carried back into the gas stream (eventually resulting in downstream stack emissions and/or equipment damage).

How can re-entrainment vary so widely?

One possible answer is that not all mist

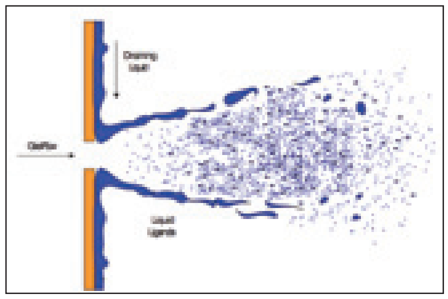

Fig. 2: Illustration of re-entrainment in an absorption tower.

eliminators use drainage media to prevent re-entrainment. Thus, the presence of a drainage layer as well as the design details associated with the drainage layer have a significant impact on re-entrainment and overall element performance.

The theory behind the impact of proper drainage media design is fairly well-known: the collecting media captures mist from the gas stream, and the drainage media provides open pathways for collected liquid to drain vertically downwards to the bottom of the element. The open liquid pathways

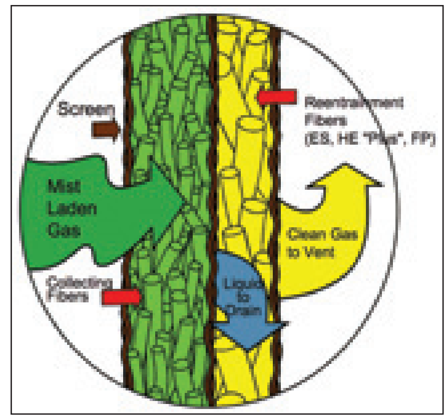

Fig. 3: Illustration of effective drainage media.

in the drainage layer suppress liquid film formation and film bursting, ultimately preventing re-entrainment.

Lab testing was conducted to evaluate the performance of different mist eliminator drainage media on acid mist re-entrainment in a controlled environment.

Results indicate that a drainage layer's capability to prevent re-entrainment is a complex function of many variables, such as fiber diameter, density, permeability, orientation, etc.

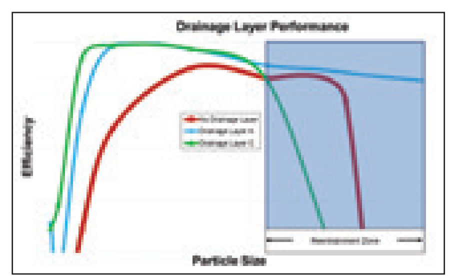

Figure 4: Laboratory test results for drainage layer optimization.

Though many drainage layers were tested, only 3 results are shown Fig. 4 for the sake of simplicity. In Fig. 4, Drainage Layer A (blue line) is a good choice for minimizing re-entrainment because its overall efficiency (as shown on the Y axis) is higher than many other designs, particularly for larger particle sizes (as shown on the X axis); this is indicative of low re-entrainment. By contrast, Drainage Layer C (green line) would be a poor choice for minimizing re-entrainment, as its overall efficiency for larger particle sizes is worse than using no drainage layer at all (red line).

Though it is not surprising that different drainage layer designs may have different performances, it is somewhat surprising to see that poorly designed drainage layers can produce results that are even worse than using no drainage layer at all!

MECS® Brink® Mist Eliminators utilize a bicomponent design with sophisticated drainage technology, supported by years of research and field experience. This results in a drainage layer that reduces re-entrainment, achieving lower exit mist emissions and better overall tower performance.

About MECS

MECS, Inc. (MECS) is the world leader in sulfuric acid plant and environmental technologies, providing engineering design, services and high-performance products for the phosphate fertilizer, oil & gas, chemical, and non-ferrous metals industries. Specific to the oil & gas industry, MECS offers unique state-of-the-art solutions for treating sour off gas from amine treaters and sour water strippers to achieve ultra-low emissions specifications. In place of or in addition to traditional Claus SRU / TGTU facilities, these solutions can incorporate wet gas scrubbing (DynaWave®), direct wet gas conversion to sulfuric acid (SULFOX™), and/or regenerative recovery of SO_2 (SolvR™). MECS is a wholly owned subsidiary of DuPont.

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