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Wetting System for Absorbing Tower Candle Filters to Abate Start-Up Stack Plumes and to Prevent NO_x Problems

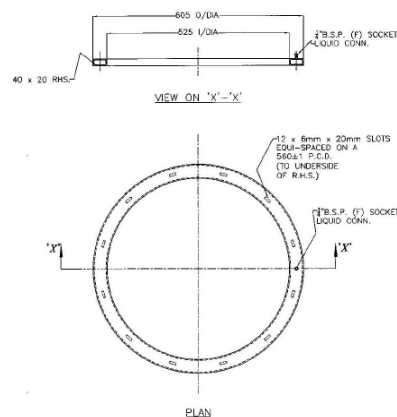
There is often a visible plume seen at the stack of a Sulphuric Acid plant during start up conditions, which can be a mixture of uncollected mist and condensing SO₃ slippage. The Begg Cousland Wetting System (which can be applied to both hanging and standing types of Brownian Diffusion filters) is an excellent method of artificially providing enough fresh H₂SO₄ to the fibre bed to reach standard mist collection efficiency, and to allow absorption of free SO₃ into the acid saturating the fibre bed.

There are also operating and performance difficulties affecting mist eliminators in plants where NO_x levels in the gas generate Nitrosyl Sulphuric Acid in the acid saturating the fibre bed. The Begg Cousland Wetting System is an efficient way of ensuring that there is enough fresh acid in the fibre bed at start up to prevent the formation of Nitrosyl crystals, which significantly increase pressure loss until they can be dissolved over time (sometimes they never dissolve). When used for a period at shutdown of the plant, the fresh acid can flush out remaining Nitrosyl acid to prevent crystal formation as the fibre beds dry out (which will give serious pressure loss problems again at start up)

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Spray nozzle wetting can sometimes be achieved with Standing Type candle filters, co-currently by spraying directly below the candle filter up into the centre, and/or counter-currently by spraying downwards from a nozzle mounted in the top of the candle filter. These systems are often subject to blockages of the nozzles, which makes them unreliable.



The photo above shows a Wetting Ring installed in the top flange assembly of a Begg Cousland Hanging Type Candle Filter. The drawing on the right shows the channel form of the ring, with the top feed connection and the bottom outlet slots which touch the top of the fibre bed.

When used in start up conditions, the saturation of the fibre bed is achieved within 30 minutes, avoiding hours of visible plume problems. Saturated candle filters are well known for their ability to act as back-up absorption beds, when free SO₃ leaves the tower packing, so the pre-saturated fibre will be able to prevent that condensable emission as well as having normal filtration efficiency as soon as you want.

The dissolving of NOHSO₄ requires a mix of suitable acid strength and sufficient temperature in the tower, which takes time and effort to achieve any result. By preventing the formation of the NOHSO₄ crystals, at start-up, at shutdown, and even on the run in normal operation, the Wetting System can save wasted energy and operating concerns. As NOHSO₄ is known to promote aerosol formation, there can be a fuming effect from candle filters poisoned with Nitrosyl acid, leading to unexpected stack fumes.

In summary, what are the features and benefits ?

1. Blockage free feed of fresh H₂SO₄ directly into the top of the fibre bed, which flows naturally by gravity down the full length of the filter.
2. Avoidance of (prolonged) stack plumes at start up
3. The prevention of NOHSO₄ crystals formation and consequent pressure loss problems.
4. The prevention of condensable fumes causing visible emissions unconnected to basic mist removal efficiency

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