HIGH TEMPERATURE WET VENTURI SCUBBER LININGS

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The authors are commended for producing this paper covering an area of refractory design frequently reserved for the scrubber manufacturers. As shown by the illustrations, the calculations are relatively simple and determining the actual operating conditions may well be more difficult than the calculations involved.

A good example of this is determination of the internal refractory face temperature. Most refractory lined venturi scrubbers for sludge incinerators are designed for full irrigation of the internal surfaces. This means the internal face is continuously covered with a flowing stream of water and the actual internal face temperature is below 212 F regardless of the gas temperature. Under these conditions a single layer of fireclay brick is adequate protection for the rubber lining of the steel shell. A redundant type water supply system is considered mandatory, thus minimizing the possibility of loss of water flow. This seems to be a more practical design philosophy than attempting to design a refractory-insulation system capable of protecting the rubber lining when the refractory internal face is directly exposed to exceptionally high, and sometimes uncontrolled temperatures.

In regards to the sample calculations shown, it is not proper to list the radiation factor under the column labeled “K factor”. As used in the calculations it is a resistance factor rather than a conductance factor. It is also noted that the radiation factor is not a constant, as indicated, but varies with the radiating surface temperature. Therefore determination of the theoretical radiation factor is somewhat tedious and use of a constant, based on experience, is a reasonable simplification of the thermal calculations. The first formula shown in each sample calculation is incorrect and should read \( R = \text{inches/K + radiation factor} \). In Fig. 4, the use of alumina silicate paper between the acid brick and the “Pennguard” seems practical, but there is some question as to how to achieve the one-half inch thick layer of paper. If this material can be applied to any thickness desired, it would seem to be a better lining protector than “Pennguard” since it has a lower “K-value” and hence a higher resistance. Use of a 1.6 in. layer of alumina silicate paper would give the same thermal protection as the 0.5 in. paper plus 2-in. thick “Pennguard”.

In conclusion the author’s inspection supports the old adage that much refractory maintenance is required by mis-operation rather than incorrect refractory design.