Application information

TMT 15® - MERCURY EMISSION CONTROL

Info 27 E - Wet flue gas scrubber application to lower Mercury emission

INTRODUCTION

Exhaust gases are produced from the burning of residual substances and coal. Due to the high combustion temperatures, a large number of pollutants, such as HCl, SO_2 and heavy metals (particularly highly volatile mercury) appear in the flue gas. Flue gas scrubbing removes or destroys these pollutants. After a dedusting step, the flue gases are scrubbed in an initial acid scrubber. This primarily dissolves the HCl and most of the mercury, which end up in the acidic scrubber water. The pH value in the acid scrubber should be held as low as possible, namely pH value ≤ 1 so that the mercury can be separated as a stable mercury chlorocomplex and so that no SO_2, which has a reducing effect, will be scrubbed.

A neutralizer, such as caustic soda solution, sodium hydroxide, or limestone is used to keep a second alkaline scrubber in the slightly acidic to neutral pH range. Here the primary object is to separate SO_2 and the residues of other pollutants. Since the acid scrubber doesn't remove 100% of the mercury, the alkaline scrubber also scrubs mercury, which the SO_2 will now reduce to metallic mercury. The metallic mercury reappears in the pure gas and is emitted.

CHEMICAL EQUATION

$$HgCl_2 + SO_2 + 2\,H_2O \xrightarrow{(Hg_2Cl_2)} Hg + H_2SO_4 + 2\,HCl$$

This reaction can be diminished by using TMT 15® in the alkali wastewater circuit. The ionic Hg will precipitate as a Hg-TMT compound and is eliminated from the reduction reaction.

CHEMICAL EQUATION

$$3\,HgCl_2 + 2\,TMTNa_3 \rightarrow Hg_3TMT_2 + 6\,NaCl$$

Mercury emissions can thus be reduced in a simple manner. This should be of particular interest to incinerators that are having problems meeting the new lower Hg threshold values (e.g., the 17th Federal Immission Control Act [*Bundesimmissionsschutzgesetz BImSchV*], daily average: 0.03 mg Hg/Nm³) or that want to improve Hg separation in their plant. It is not possible for TMT 15® to react with metallic mercury, which can be present in substantial quantities, especially when sewage sludge has been incinerated (low chloride concentration).

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APPLICATION

TMT 15® should preferably be dosed into the alkaline scrubbing circuit of the wet scrubbers of incinerators. The lower heavy metal load and better effective range of TMT 15® in this pH range make this a better choice than dosing into the acidic scrubbing circuit

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Empirical values obtained in practical application have shown that the dosing rate of TMT 15® is heavily dependent on the composition of the flue gas scrubber water and on plant parameters. A dosing rate of 500 ml TMT 15® per m³ of elutriated scrubber water is usually very effective in removing mercury. In addition to mercury, other heavy metals will also react within the matrix in question so that a stoichiometric dosing based on mercury will not necessarily produce the desired success.

The application that has been described can be integrated into existing scrubbing processes and without great installation cost as part of an operational test to study its effectiveness. The TMT 15® dosing rate appropriate for the plant can be found by reducing or increasing the dosing rate gradually. It is recommended that the selected dosing rate be tried for a period of 2–4 weeks to counterbalance effectively any fluctuations (such as Hg peaks) of the mercury in the scrubber water. Adsorbed mercury (such as in the scrubber's rubber coating) also makes this necessary, because the scrubbing system must first be in a state of equilibrium before any conclusions about effectiveness can be drawn. Measurements of the Hg emissions in the pure gas represent a relatively good method of checking the effectiveness of TMT 15®.

SUMMARY

Hg emissions can be easily reduced by dosing TMT 15® into the scrubbing system. The process can be used in both wastewater-generating and wastewater-free (spray dryer) wet scrubbing systems.

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