



Flue gas desulfurization and humidification dehumidification in power plants

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ABSTRACT

Performance evaluation is presented for flue gas desulfurization (FGD), humidification and dehumidification desalination (HDD) of flue gases emitted from power plants. The proposed system is based on use of seawater for SO₂ absorption and removal from the flue gases. The FGD and HDD processes are separated in order to achieve the highest possible efficiency. This is because FGD requires low temperatures to achieve high rates of absorption and removal of SO₂. On the other hand, HDD requires higher temperatures to provide sufficient temperature difference and driving force for humidification and dehumidification. Analysis of both systems is applied to the emission rate data of power plants in Kuwait. The design results of the seawater SO₂ absorption column showed variations in the column height between 8.1–12.6 m as the power plant capacity was increased from 244–4173 MW. Analysis of the HDD system show that it might not be the optimum desalination alternative because of its limited production capacity. However, the process layout is simple and can be formed of two packed columns for humidification and dehumidification, which requires a small capital when compared to conventional thermal or membrane desalination.

Keywords: Flue gas desulfurization; Absorption; Humidification; Dehumidification; Modeling; Desalination

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