

图书基本信息

书名：<<第11届国际电除尘学术会议论文集-Electrostatic Precipitation>>

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内容概要

Electrostatic Precipitation includes selected papers presented at the 11th International Conference on Electrostatic Precipitation. It presents the newest developments in electrostatic precipitation, flue gas desulphurization (FGD), selective catalytic reduction (SCR), and non-thermal plasma techniques for multi-pollutants emission control. Almost all outstanding scientists and engineers world-wide in the field will report their on-going researches. The book will be a useful reference for scientists and engineers to keep abreast of the latest developments in environmental science and engineering.

书籍目录

World-Wide Review Development of Chinese Electrostatic Precipitator Technology Multi-pollutants Simultaneous Removals from Flue Gas Some Technical Idea Evolutions Concerned with Electrostatic Precipitators in China Enhancement of Collection Efficiencies of Electrostatic Precipitators: Indian Experiments Fundamentals and Mechanical Design Modeling Mercury Capture within ESPs : Continuing Development and Validation Reduction of Rapping Losses to Improve ESP Performance Advanced Risk Analysis for the Application of ESP-s to Clean Flammable Gas-pollutant Mixtures ESP for Small Scale Wood Combustion Dust flow Separator Type Electrostatic Precipitator for a Particulate Matter Emission Control from Natural Gas Combustion Electrostatic Precipitator : The Next Generation Current Density and Efficiency of a Novel lab ESP for Fine particles Collection Five Stages Electrostatic Precipitator Principles and Application Application of STAAD in ESP structure design Electric Resistance of Boiler Flue Gases and Collection Efficiency of ESP Non-static Collection Process of the Electrostatic Precipitator Study of Using Mixed Discharge Electrodes and Mixed Spicing of Pole to Pole for Electrostatic Precipitator Experimental Investigation on the Collection of Fine Dust with High Resistivity by a Bipolar Discharging ESP Designing ESP Systemically to Reduce Dust Emission Research on Vibration Period Optimization of Electrostatic Precipitator Study on the Dust Removal Efficiency Formula of EP with Efficiency Enhancing and Energy-saving Research and Application of the Extensive Resistivity and Efficient Electrostatic Precipitator Application and Research on Technology of Longking Brand BEL Model ESP Electrode Shape and collector plate Spacing Effects on ESP Performance Resistance and Airflow Distribution of Rotary Plate Onset Voltage of Corona in Electrostatic Filters as Influenced by Gas Flow An Initial Exploration for Coulomb ESP Aerodynamic Effects and ESP Models Effect of the EHD Flow on Particle Surface Charging and the Collection Efficiency of Submicron and Ultrafine dust Particles in Wire-plate Type Electrostatic Precipitators Electrohydrodynamic Turbulent Flow in a Hybrid Particulate Collector CFD Simulation of Electrostatic Precipitators and Fabric Filters State of the Art and Applications Numerical Modeling of the Electro-hydrodynamics in a Hybrid Particulate Collector CFD Numerical Simulation of ESP Airflow Distribution and Application of Flue Gas Distribution Study and Application of Numerical Calculation Method for Gas Flow Distribution of Large Scale Electrostatic Precipitator Experimental Study on Optimization of Electric Field Performance for Electrostatic Precipitator by Using Finite Element Method Analytical study on ZT Collecting Electrode Model EE Technology in 1#125 MW Unit of Electrostatic Precipitator Application for GUODIAN Kaili Power Plant Model EE Technology in 2#600 MW Unit of Electrostatic Precipitator Application for GUODIAN Kaili Power Plant Numerical Simulation of Influence of Baffle in Electric Field Entrance to Form Skewed Gas Flow A numerical Simulation for Predicting Influence of Flow Pattern in Electrostatic Precipitator on Exit Re-entrainment Loss Fine-Particles and Their Agglomeration Research Progress of the Control Technology of the PM₁₀ from Combustion Sources Enhanced Fine Particle and Mercury Emission Control Using the Indigo Agglomerator Emission Reductions at a Chinese Power Station On-line Measurement of Hazardous Fine Particles for the Future APC Technology A Novel Method for Particle Sampling and Size-classified Electrical Charge Measurement at Power Plant Environment Agglomeration Modelling of Sub-micron Particle During Coal Combustion Based on the Flocculation Theory Integrated Control of Submicron Particles and Toxic Trace Elements by ESPs Combined with Chemical Agglomeration Electrical Operation and Power Sources Flue Gas Conditioning and Back Corona Upgrading of Existing Electrostatic Precipitator Hybrid ESP & FF Precipitation Wet Electrostatic Precipitation Industrial Applications for Coal-fired Boilers Industrial Applications for Steel Industries FGD and SCR for Coal-fired Power Plants Non-Thermal Plasmas Applied Electrostatic

章节摘录

C_p is the time-dependent gas-phase concentration of mercury adjacent to the particle surface, which is assumed to be in equilibrium with the solid-phase mercury concentration at the particle surface. Although fly ash is known to have varying adsorption capacities for mercury [13, 14], for simplicity, the present algorithm does not address fly ash adsorption of gas-phase mercury. The comparisons between the present algorithm and full-scale ACI results are limited to the additional mercury capture observed to occur across an ESP during ACI. Our previous analysis [8] concluded that even under idealized conditions, wall boundary mass transfer of gas-phase mercury to the ESP plate electrodes is slow, contributing a relatively small portion of the total mercury removal within typically sized ESPs; the dilution of the powdered sorbent on the ESP plate electrodes by the much larger ($\sim 10^2$) amounts of fly ash further diminishes the contribution of this removal mechanism. The model, as described previously [8-12], employs the following assumptions: 1. No mercury adsorption by native fly ash; 2. No mercury adsorption by internal ESP surfaces; 3. Powdered sorbent is uniformly distributed throughout flue gas at ESP inlet; 4. Powdered sorbent mass concentration (g/m^3) varies only in the streamwise direction within the ESP; 5. All particles attain their theoretical maximum particle charge; 6. Fixed value of electric field voltage (54 kV). The algorithm also employs additional assumptions regarding particle dielectric constant (very large), particle sphericity (perfect), flue gas pressure (atmospheric) and thermodynamic properties (ideal) and particle losses due to agglomeration, and rapping reentrainment and sneaking for the ESP (neglected). For all model results, the algorithm uses sorbent physical properties equal to those of NORIT Hg powdered activated carbon (PAC), primarily because of the many full-scale tests in which it has been used. In addition, and unlike other sorbent manufacturers, NORIT has made the detailed particle size distribution for its product readily available, which we have shown previously [10] has a strong influence on in-flight mercury capture. Fig. 1 shows the measured particle size distribution of the NORIT Hg PAC and the two curve fits (above and below 35 μm) used to represent it in the model. Because flue gas composition is known to affect the rate and capacity of any sorbent to adsorb mercury, a lumped capacitance-mass transfer model of in-flight mercury capture would require some measure of the mercury adsorption capacity of a given sorbent at a particular site. Several of the early full scale tests reported fixed bed equilibrium adsorption capacity for the NORIT PAC; however, subsequent full-scale tests eliminated this measure, for reasons and with implications that will be discussed. In the absence of site-specific mercury adsorption capacity measurements for the NORIT Hg sorbent, estimates are used for the equilibrium adsorption capacity based on coal rank, an approach whose results and implications also will be discussed. A collection of eleven full-scale tests of sorbent injection into cold-side ESPs using NORIT Hg sorbent constitute the field data against which the model results are compared: Six DOE-NETL-sponsored tests (Monroe 4, Leland Olds, Miami Fort 6, Brayton, Pleasant Prairie (PPPP), Meramec 2) and five proprietary, privately funded tests referred to here as Plants A through E. Table 1 presents a number of key parameters from each test program at each site. For DOE-NETL tests, many of the parameters can be found in the quarterly and final reports associated with each test program. In some instances, missing parameters were deduced from the available information (e.g., obtaining mean flue gas velocity from ESP geometry and design ESP specific collection area, SCA) or gleaned from diagrams and blueprints requested from the site operators.

3 RESULTS

Figs. 3 to 5 present comparisons between the model results and the full scale ACI results at the eleven sites. Of the eleven full-scale ACI results, two—those from Brayton and Pleasant Prairie—provide on-site measurements of equilibrium mercury adsorption capacity of the NORIT Hg powdered activated carbon, using a fixed sorbent bed applied to a slipstream of the local flue gas. The present model requires as input a value for the equilibrium adsorption capacity of the sorbent, which determines the rate at which each sorbent particle approaches saturation during mercury adsorption, which in turn determines the rate at which the gas-phase mercury concentration at the particle surface ($C_p(t)$) approaches the far-field value ($C_v(tD)$ (see Eq. 1)). In the absence of measured, site-specific equilibrium mercury adsorption capacity at the other nine sites, a rough assumption was made that sites burning similar coals would exhibit similar equilibrium mercury adsorption capacities for the same sorbent.

Although mercury adsorption kinetics are clearly much more complex than this assumption implies, it permits validation of the model against real sites rather than two, and in its imprecision provides an opportunity to assess the degree to which each site's performance deviates from the ideal, mass-transfer-limited result.

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