APPLICATION OF NEURAL NETWORKS TO GAS - SOLID FLUIDIZED BED USING MATLAB

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ABSTRACT

Gas-solid fluidized bed, generally of aggregative nature, is marked by the non-uniform heat transfer co-efficient phenomenon.

A body immersed in a fluidized bed at a different temperature than itself will experience a rate of heat transfer many times greater than it would experience with the air alone. Fluidized bed provide nearly isothermal environment with high rate of heat transfer to submerged objects due to thorough mixing and large contact area between air and particles. An important characteristic of fluidized bed is high efficiency heat transfer coefficient. The turbulent motion and rapid circulation of particle in the fluid [7].

An Artificial Neural Network (ANN) also called Simulated Neural Network (SNN) or more commonly called Neural Network (NN) is an interconnected group of neurons that uses a mathematical or computational model for information processing based on a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network.

In more practical terms neural networks are non-linear statistical data modeling tools. They can be used to model complex relationships between input and output or to find pattern in data. The Artificial Neural Network (ANN) is a functional imitation of simplified model of the biological neurons and their goal is to construct useful 'computers' for real-world problems and reproduce intelligent data evaluation techniques like pattern recognition, classification and generalization by using simple, distributed and robust processing units called artificial neurons.

ANNs are fine-grained parallel implementation of non-linear static-dynamic systems. The intelligence of ANN and its capability to solve hard problems emerges from the high degree of connectivity that gives neurons its high computational power through its massive parallel-distributed structure. The current resurgent of interest in ANN is largely because ANN algorithms and architectures can be implemented in VLSI technology for real time applications. The number of ANN applications has increased dramatically in the last few years, fired by both theoretical and application successes in a variety of disciplines. This paper presents a survey of the research and explosive developments of many ANN-related applications. A brief overview of the ANN theory, models and applications is presented. Potential areas of applications are identified and future trend is discussed **[20].**

Measurements of heat transfer coefficient is made by the local thermal simulation technique **[7]** in a cold, square, bubbling, air-fluidizing bed (0.305 m x 0. 305 m) with immersed horizontal bare tubes. Studies were conducted with single horizontal bare , In line and Staggered tube bundles using the beds of small (average particle diameter less than 1 mm) particles sand of different sizes 305μm, 342μm, 405μm, 426μm, 561μm and large (average particle diameter greater than 1 mm) particles of Raagi 1400μm, Mustard 1800μm.

The fluidization velocity varied from 0.10 to 1.35 m/s and the static bed height was 28 cm for all experimental runs. The electrical heated brass bare tube of outer diameter 28.5 mm was located at the height of 26.5 cm from the air distributor plate.

Within the range of experimental conditions, the influence of bed particle diameter (Dp), fluidizing velocity (U), fin pitch (Pf) were studied **[7].**