

Pressure Fluctuations as a Diagnostic Tool for Fluidized Beds

**Quarterly Report
January 1 - March 31, 1998**

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Pressure Fluctuations as a Diagnostic Tool for Fluidized Beds

Technical Progress Report for the Period

January 1, 1998 - March 31, 1998

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Objective

The purpose of this project is to investigate the origin of pressure fluctuations in fluidized bed systems. The study will assess the potential for using pressure fluctuations as an indicator of fluidized bed hydrodynamics in both laboratory scale cold-models and industrial scale boilers.

Progress

In this past quarter, work has been completed on the fluidized bed combustor similitude study. The study was unable to conclusively determine that similitude existed when either the full set of scaling parameters or a simplification of the scaling parameters is used as determined by comparing nondimensional Bode and power spectral density plots. The differences may be attributed to improper dimensioning of the frequency or bed wall effects that occur in the small beds used in this study.

The effect of particle diameter, particle density, bed diameter, distributor plate and superficial were all investigated as they applied to the frequency of the pressure fluctuations this quarter. Particle diameter appears to have little effect on the peak frequency. Particle density tends to have a weak inverse relationship with the peak frequency. Particle density tends to have a weak inverse relationship with the peak frequency that allows the substitution of materials that have nearly the same density as the desired density in similitude applications. Under identical conditions, increasing the bed diameter tends to increase the frequency of the pressure fluctuations. It may be a wall effect in small beds that suggests that beds with larger hydraulic Reynolds numbers be used in similitude to avoid wall effects. The distributor plate has an effect on the peak frequency that is hard to determine the origin as hole spacing and diameter can change. In this study it appears that increasing superficial velocity generally increases the peak frequency.

A final report is currently be prepared and will include all work completed this quarter as well as the work done throughout the period of this grant. Projected completion is the end of May.