AEC-NASA TECH BRIEF

Direct Indication of Particle Size in Fluidized Beds

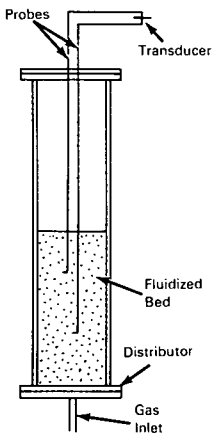

FIGURE 1

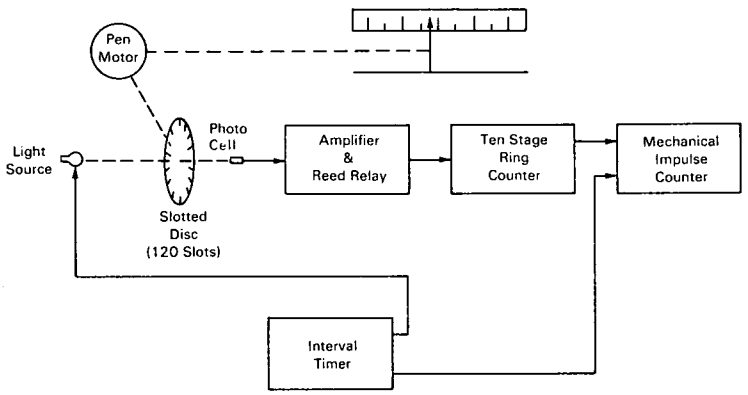

FIGURE 2

The problem:

To obtain a direct indication of particle size and particle size distribution in fluidized beds. This information is of interest in operations such as calcining, particle coating, and other processes where radioactivity or high temperatures make sampling of the beds difficult. Previous techniques of acquiring the data were cumbersome and time consuming.

The solution:

A technique for continuously monitoring fluidized beds to observe changes in particle size which is based on the relationship between bed particle size and the intensity and frequency of fluctuations obtained by differential pressure measurements. By measuring the length of the trace from a differential pressure recorder within a given time interval, an estimate of the average particle size of the fluid-bed material can be made. This trace length is converted to an "index" to facilitate comparison among different fluid-bed systems. A simple mechanical device provides a digital readout. Within certain limitations, these measurements of bed quality can be used to indicate changes in particle size.

How it's done:

The differential pressure measurement within the bed is taken on the apparatus shown in Figure 1. The differential pressure signal is ideally obtained from two fixed probes situated on the central axis of the bed and spaced about six inches apart in height. The probes are connected directly to a differential pressure transducer, which generates a multivolt signal for the recorder, from which the digital readout is obtained. The recorder also provides a graphic record of the pressure fluctuations.

The readout equipment, shown in Figure 2, provides a count rate or particle size index. The response of the recorder pen motor to the input signal also rotates the slotted disc mounted on the motor. The disc passes between a light source and photocell causing electrical

(continued overleaf)

pulses to be generated as the light path is interrupted. The output from the photocell is a series of pulses with a frequency proportional to the frequency and magnitude of the pressure fluctuations within the bed. The pulses are amplified to drive a reed relay, which in turn actuates the counting system. Count rates up to 300 counts per second can be counted at the maximum rate of pen travel of the recorder.

The particle size index (or count rate) may range from near zero at minimum fluidization velocities up to several thousand counts per minute with vigorous fluidization of coarse particles. The effects of changes in gas velocity, gas viscosity and solids density on the extent of fluidization have also been observed by this technique.

Notes:

1. Details in *Chem. Engring. Plant Notebook*, Jan. 15, 1968, p. 190. Additional information is available by K. S. Sutherland in "The Effect of Particle Size on the Properties of Gas-Fluidized Beds," ANL-6907, July 1964. This report is available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151; price: $3.00 (microfiche copies, $0.65).
2. Inquiries concerning this innovation may be directed to:

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Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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