Pneumatic jig: Effect of airflow, time and pulse rates on solid particle separation

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ABSTRACT

This paper aims to provide insights into the factors contributing to the efficiency of separation of solids particles in pneumatic jigging. A batch pneumatic jig was constructed at the University of Nottingham, UK, for solid waste recycling. Synthetic materials (density tracers), colour coded for density, were used as the bed materials in a series of experiments. The bed was analysed layer by layer using image analysis technique, utilizing colour difference among density tracers to calculate separation efficiency. In general, the pneumatic jigging movement depends on two important factors which are airflow rate and pulse rate. The former lifts the bed, and the latter creates intermittent air current. Airflow rate, pulse rate and time were studied to identify the significant parameters affecting separation efficiency in pneumatic jigging. Any changes in one of these parameters could influence separation efficiency. Process optimization was performed using Box–Behnken design to determine optimal conditions for obtaining high percentage of separation yield. Results from the software (Design-Expert® 7.1) suggested that optimal conditions could be attained at a pulse rate of 120 rotations per minute, time of 7 min and airflow rate of 30 cm/s, with the produced yield expected at 82.4%. Actual experiments generated a separation efficiency of greater than 80% by varying the tested parameters.

KEYWORDS:

Pneumatic jig; Solid particle separation; Synthetic materials