A sliding-window based signal processing method for characterizing clusters in gas-solids high-density CFB reactor

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Abstract

Particle clusters in CFB risers were identified from the instantaneous solids holdup signals by a new sliding-window based signal processing method. By shifting the sliding time window and calculating the mean and the standard deviation within it, a non-linear threshold curve for identifying the clusters was derived instead of the conventional constant threshold. The optimal sliding window size was determined as $W_b = 1024$ data points based on the bisection method on the entire piece of signals. Using the proposed method, a more realistic characterization of the clusters in both the HDCFB and LDCFB was obtained by considering the bulk fluctuation of the gas-solids flow. The clusters in the HDCFB have higher solids holdup and lower velocity than that in the LDCFB. The HDCFB is also found to have a greater number of loose clusters for better gas-solids contacting and exchanges in the center of the riser.

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