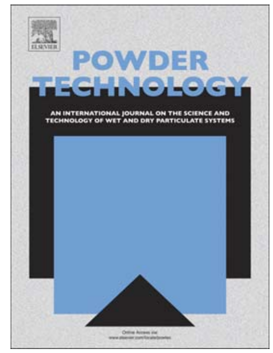


# Fluid dynamics study on a dual fluidized bed cold-flow model

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## Abstract

The construction and testing of a cold flow model was carried out aimed to study fluid dynamic behaviour of a dual fluidized bed pyrolysis. The modelled plant is able to convert various plastic wastes into high caloric fuels by pyrolysis in a bubbling fluidized bed section. A second turbulent fluidized bed provides the heating energy needed for the pyrolysis process. The cold-flow model had been designed and build according to Glicksman´s criteria and is geometrically miniaturized on a scale of 1:3 in relation to the hot facility. These principles allow likewise the transformation of the results from the model to the pilot plant conditions.

Pressure along the unit, the global solids flux rate and the amount of bed material loss through the product outlet were measured for operation under different values of pyrolysis fluidization rate ($\varphi_{FP}$) and combustion fluidization rate ($\varphi_{FC}$). The fluidization rate is calculated between 0 for minimum and 1 for sedimentation velocity.

It was found, that at low fluidization rates the bed density is much higher at the lower part of the combustion riser than at the upper part. With increasing $\varphi_{FC}$ the pressure in the whole system rises and the distribution of the bed material in the combustion gets more even. $\varphi_{FC}$ is also highly correlating with the global solids flux and rises with it until $U_{se}$ is reached and pneumatic transport appears. Increase of the solids flux increased the bed expansion in the siphons and the pyrolyser and leads to a higher loss of material.

The raise of $\varphi_{FC}$ has no major influence on the combustions pressure profile. Small changes in the combustions pressure profile result from the amount of bed material accumulated in the pyrolysis reactor not available for the global circulation. This also influences the global solids flux. With increasing $\varphi_{FP}$ the amount of bed material and the height of the bubbling bed decreases. The amount of bed material loss raises drastically with increasing $\varphi_{FP}$. However, the loss can be used to somehow classify the loss on particle diameter, Thus, the caloric value of the product gas can be adjusted by enriching soot while the lager particles are kept within the system.