

Efficiency comparison of different techniques for drying coal

María Bernarda Alvarado Bawab

Facultad de Ingeniería
Institución Universitaria ITSA
Soledad, Atlántico – Colombia
maryalvaradoiqad@gmail.com

Farid Chejne Janna

Facultad de Minas
Universidad Nacional de Colombia
Medellín, Antioquia - Colombia
fchejne@unal.edu.co

Abstract— The drying process is a necessary unit operation in many industrial processes such as food, construction, chemistry, energy, cosmetics, and so on., the properties of the material to be processed and the operating conditions are important factors for the selection of equipment and use of resources. This article presents a comparison in terms of energy efficiency of different drying technologies, operating time and temperature, and grain size.

To take advantage of the energy contained in the biomass through processes of gasification and pyrolysis it is necessary to perform a pre-drying process as a pretreatment in order to increase the performance of the processes. The microwave assisted processes have been used in the industry because they allow to reduce the time of operation, to obtain greater yields to be selective and in some opportunities to provide economic savings.

This study presents a comparison of drying in a batch microwave oven and a convection oven with hot air. For testing the microwave oven, which operates at a frequency of 2.45GHz and 1kW of power, three pulses of microwave radiation and three height levels of the samples were evaluated. The energy consumption, sample temperature and weight were measured during the process. For tests carried out in the convection oven and conduction, three similar temperatures to those achieved in the microwave oven and the same height levels of the samples used were conditioned. From tests it was found that the drying process in the microwave oven remove greater proportion of the moisture contained by the samples; similarly, it was found that the energy efficiency of the energy supplied in the microwave oven is 0.1870kg/kWh, higher than achieved in the convection oven where energy efficiency 0.0007Kg/kWh was reached. To reduce experimental noise, relative humidity and temperature are monitored and strict for each defined protocol and runs were performed in duplicate.

Keywords— *dry; oven; coal; conduction; convective.*