

Development of wind tunnel for ultrafine palm oil fuel ash separator

Abstract

Palm Oil Fuel Ash (POFA) is a pozzolanic material that has great potential in concrete production. POFA sizes range from 1 to 10 μm is preferable. Thus, there is a need for efficient method to separate the POFA according to the sizes needed. This study explores the idea of using a simple wind tunnel as a separator for ultrafine POFA. The existing operation of the wind tunnel is simulated using ANSYS-CFX, a numerical modelling software. The identified weakness of the wind tunnel design is located at the hopper. The wind tunnel is simulated with a different air inlet velocity in order to visualize the air flow profile as well as air flow energy at the hopper. Different air inlet velocities has a similar air flow profile but the air flow intensity is different. For further study the modifications of the air flow profile were conducted. By altering the hopper angle shows that the air flow profile is changed. Based on the simulation results, the hopper at 60° yields the best flow characteristic. At angle 60° of the hopper, the air flow is mostly directed downward into the tunnel and the air flow energy is low. Therefore, it allows the POFA to be directed into the tunnel and reduced the ultrafine POFA losses at the tip of the hopper. This practical method utilizes a simple open wind tunnel that enables the process to be more efficient and cost efficient thus the production of ultrafine POFA can be increased.