

ABSTRACT

Telkom University has developed an automatic hammer mill machine that is used to grind raw materials for making briquettes. The raw materials used in the production of briquettes at Telkom University come from two organic wastes, namely coconut shells and palm oil. Both organic wastes have the potential to be used as fuel because they are proven to produce high calorific values with ever-increasing volumes of waste. In line with this, an effective waste treatment is needed to increase the productivity of making briquettes. Improving the quality of briquettes is strongly influenced by the particles or raw materials used, so it is important to ensure that the milling process for the raw materials for making briquettes produces an output that meets requirements. After making direct observations on the milling process, there are obstacles that arise that cause the productivity of the briquette production process to be hampered. In the coconut shell milling process, 30% of the input material is stuck on the screen and does not grind perfectly.

In redesigning the crusher module for this hammer mill, the Ulrich-Eppinger method was chosen as the steps to solving the problem starting from the concept development stage, the product architectural design stage, and the detailed design stage. The results of this study will refer to the results of selected machine design tests using Altair EDEM simulation to be able to determine the interaction between the input material and the design of the 3D model of the screen and blade components, as well as the flow of material in the milling machine from input material to powder to determine increased productivity in milling briquette powder.

The result of the selected design in this study is concept B with the highest score of 4.13, so this concept is used as a reference in realizing the proposed design. The validation process was carried out by simulating Altair EDEM on coconut and palm shell particles using the B concept design with Y-shaped blade specifications which were considered capable of increasing grinding performance by providing more contact points and increasing the impact force on the material. The simulation results yield data on the time of grinding the coconut shell at 0.26 s and the grinding of the palm shell at 0.20678 s, the particles have reached the

desired degree of fineness. In addition, the achieved particle size or diameter of each mill for the average diameter of coconut shell particles in 1 s is 0.384 mm and the average diameter of palm shell particles is 0.316 mm which is closest to the size of the briquette powder to be achieved, which is close to the particle size distribution of 40 mesh or <0.40 mm. By using a 40 mesh screen distribution reference, in the simulation results, all particles were successfully filtered by the screen as much as the input entered.

Keywords: hammer mill, briquette powder, crusher machine, Altair EDEM, Ulrich-Eppinger Method