

Development of a Pyrolysis Reactor for Processing Waste into Fly Ash Carbon Charcoal as a Composite Base Material

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ABSTRACT

Mounting piles of rubbish, apart from causing environmental pollution, also increases the production of methane gas from rubbish. Waste recycling has not been able to reduce the amount of national waste due to the fact that waste collection using open dumping and landfill patterns still contributes 69 percent of the waste management pattern. The activity of sorting waste is still not a culture in Indonesian society. For this reason, the central government has strengthened the commitment and active role of regional governments in implementing waste management, including making waste an economic raw material. Various processing efforts have been carried out by both the government and the Indonesian people, but until now they have not been able to overcome the waste problem. Therefore, there is a need for breakthroughs in waste processing that can be usefully taken in liquid form for fertilizer, gas for energy, and solid form in the form of charcoal. This process is called pyrolysis, which is the process of decomposition of certain materials at high temperatures and takes place without limited air or oxygen. The aim of this research is to develop a pyrolysis reactor for processing organic and inorganic waste which produces waste in the form of charcoal which is the basic material for composites. We are developing this pyrolysis reactor using a 4D model which consists of 4 main stages, namely define, design, develop and disseminate. In this research, organic and inorganic waste were used as research subjects. Solid waste in wet or dry form is fed into the pyrolysis reactor. The energy used for heating uses a burner. The results of pyrolysis are liquid, gas and solid. Previously, the design and manufacture of the pyrolysis reactor and burner for combustion were carried out. This composite mold is for making bicycle frames using hand layup. This mold was made using 3D printing using PLA material. Because this bicycle mold has quite long dimensions, the mold is made by making pieces that will later be connected. The bicycle frame is reinforced with aluminum. The pyrolysis reactor can work well. Garbage can completely turn into charcoal powder. The bicycle frame mold was successfully made using 3D printing using PLA material. Next, the bicycle frame was analyzed using ANSYS software. Bicycle frames can be made using the hand layup process. The performance of the bicycle is good and strong enough to be used as a balance bike. The simulation results show that there is an average deviation in the geometric dimensions of the bicycle frame of 0.3 mm. There was an average deflection of 5.9% based on static load. There are similarities between the simulation and experimental results. The total weight of the composite balance bike is 3.1 kilograms.

Kata Kunci: Pyrolysis, organic waste, inorganic waste, charcoal powder, composite materials