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A Newly Horizontal Air-Staged Biomass-To-Heat-Energy Combustion Chamber: Part I. Development

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Pulp and paper industry in Malaysia are heavily dependent on fossil fuel. A newly horizontal air-staged biomass-to-heat combustion chamber was recently developed with oil palm kernel shell as the fuel. Parameters such as apparent residence time, stoichiometric ratio, refractory thickness, anchor of refractory were considered to determine the dimension parameters of the biomass combustion chamber. The determined inner diameter and height of the pyrolysis chamber is 575 mm and 1600 mm, respectively. The inner dimension, e.g., wide, length, height of the rectangular tar converter chamber are 724.1 mm, 1100 mm and 184.6 mm, respectively. The dimensions for wide, length, height of the combustible fuel gas-to-heat energy conversion chamber is 775 mm, 500 mm and 500 mm, respectively.

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U-shaped and Conventional HDD Designs Numerical Characteristics

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Hard disk drives (HDDs) play an important role in storing the electronic data in many industries as well as homes. The needs for faster data transfer speed, higher storage density and smaller in size of a HDD were increasing along the years. Higher rotational speed of the platter disk is needed for improving the data transfer rate. As the speed of the spindle motor increased, high-speed airflow would be induced and affected the head positioning accuracy and power consumption. Disk vibration would be induced when the airflow caused the pressure different in between the disks. Thus improvements or changes on the static and dynamic characteristics of the HDDs are required. This project was done by modifying the design of the internal compartments inside the HDDs. Improvements on the actuator arm were given more attention. New designs of actuator arm were being introduced and tested. The new arm design with the best performance will be chosen. Numerical software was used in evaluating the performance of each of the new actuator arm. Rotational flow simulation was applied on the new arm design with four different rotational speeds (5,400rpm, 7,200rpm, 15,000rpm and 20,000rpm). Three major parts were done in this project, which were the temperature, pressure and velocity. The performance of the new actuator arm will be used to compare with the performance of the commercialized actuator arm design. The aim for this project is to reduce the turbulent flow, which acts as the main sources of the disk flutter and vibration in the HDDs with higher revolutionary speeds.