ANALYSIS & DESIGN OF A HYDRAULIC COMPACTION MACHINE TO PRODUCE ACTIVATED CARBON PELLETS

Akshay A. Wankhede

Dr. Yuyi Lin, Thesis Supervisor

ABSTRACT

Adsorbed Natural Gas (ANG) technology enables the efficient storage of natural gas in conformable tanks and is mostly developed to replace the heavy and high pressure Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) tanks for vehicles. Adsorption is the adhesion of the molecules of liquids, gases, and dissolved substances to the surface of the solid. The ability of the solid to adsorb depends on the chemical makeup of the solid and its physical structure. Nanopore activated carbon powder has a very large surface area because of its porous nature, which gives it the ability to adsorb large quantity of natural gas.

Comparing with CNG tank, the ANG technology stores the same volume of natural gas in the tank at a lower pressure, increasing the volumetric efficiency of the tank. The nanopore activated carbon powder need to be converted into pellets/briquettes in order to be densely loaded into the fuel tank. Currently, the process for producing these pellets is inherently slow taking more than one day to make a pellet. Therefore, a continuous process with a high production rate of the activated carbon pellets is extremely important for the successful application of ANG tank.

This research focused on the design and analysis of a special purpose compaction machine to produce activated carbon pellets from activated carbon powder at high production rate. These activated carbon pellets can be installed into the ANG tanks to store and contain natural gas at lower pressure, increasing the volumetric efficiency, and safety of the tank. All the technical requirements such as maximum die pressure required to form the pellet, optimum length of the pellet, structural behavior of the entire assembly, and engineering analysis of the machine were analyzed in the final design.