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Effect of copper nanoparticles on centrifugal pump

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Abstract

This experimental study presents fluid flow characteristics obtained for a non-ferrous metallic water nanofluid, copper-water mixture, through a one-horsepower centrifugal pump. The results obtained for three different pressures rise of 3.8, 4.2, 4.8 (bar) by pumping copper-water nanofluid through a constructed pump test unit, with the addition of 5g of copper nanoparticles to 20L of water are Head (m); 0.17, 0.33, 0.41; Flow Rate (m^3/s); 0.463070155, 0.285632676, 0.076961558; Brake Power (Kw); 0.0723825, 0.1050225, 0.041503 and Efficiency; 0.6899997, 0.6399991,0.5999997, while for 10g of copper in 20L of water are Head (m); 0.15, 0.28, 0.37; Flow Rate (m^3/s); 0.4606172, 0.2175568, 0.0949577; Brake Power (Kw); 0.0814823, 0.0914652, 0.0591155 and Efficiency; 0.6099998, 0.5699993, 0.5199997. The pump flow rate was observed to decrease as a higher head is attained while the head gained increases with an increase in pumping pressure. The head attained due to pumping was observed to reduce as the copper nanofluid concentration increases, while the pump vibration increases as the particle concentration increases. There was an observed temperature rise in the components of the nanofluid pump testing machine due to a rising temperature of the copper nanofluid during the pumping operations. Lastly, this experimental research clearly shows the impact of copper nanofluid on the pumping power, flow rate, head gained, pump speed, and pump efficiency.

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