Abstract

This study aimed to apply biogas with engine motor for producing electricity and to drive a small water pump on highland. Five experiments (Exp.) were conducted. Exp. 1 investigated the optimum ratio of air and biogas. The gas which was produced from 8 m^3 biogas unit in Royal Project Foundation was passed through hydrogen sulfide (H_2S) filter before using with 6.5 and 7.5 hp. gasoline engine pump. The result revealed that the optimum ratio of air to biogas for engine ignition was 2:1 to 4:1. It was equal to the concentration of methane gas at 12.6±1.25 to 21.0±2.06%. Exp. 2 investigated the volume of biogas needed to drive 7.5 and 6.5 hp. gasoline engines for producing electricity and for water pumping, respectively. The biogas plant, 1,500 m^3 in swine farm, Department of Animal and Aquatic Sciences, Faculty of Agriculture, Chiang Mai University was used in the experiment. The result revealed that the volume of biogas needed to produce 100 and 3,000 watt of electricity was 1.03 and 1.96 m^3/hr. respectively. The triple piston axial (3-cylinder) high pressure water pump with 1 inch diameter pipe needed 1.06-1.11 m^3/ hr. of biogas when the speed of the engine was 80-100%. The centrifugal pump with 2 inch diameter pipe needed 1.21-1.53 m^3/ hr. of biogas when the speed of the engine was 70-100%. These data are useful for estimating the appropriated number of animals and the size of biogas unit to fit the need of electricity and to pump water for each highland farm. Exp. 3 find out the suitable size of H_2S absorber according to Tangtaweewipat et al. (2011) method. The result revealed that the H_2S absorber with 15 cm diameter and 50 cm high tube or 8,840 cm^3 is the optimum size, because it can reduce 99.5-99.6% of H_2S concentration from biogas. Exp. 4 developed gasoline engine using biogas as a fuel to produce electricity and pump water. These developed engines were set up at the farmer houses in no electricity area and at breeder swine and dairy buffalo farms for floor cleaning. The result found that these developed engines can work properly. Exp. 5 evaluated the highland farmers' satisfaction towards the developed engines. It revealed that farmers were highly satisfied because they did not need to pay additional cost while their working hours were reduced.

Key words: Biogas, Alternative energy, Small engine, Electricity, Water pump, Highland