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Development of Pico-hydropower Plant for Farming Village in Upstream Watershed, Thailand

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Abstract

Research on the development of Pico-hydropower plant for a farming village in Thailand was carried out. It is one aspect given by the national plan for the renewable technology development with wisely energy utilisation from natural resources included wind, water, solar energies, bio-gas, and farm waste according to the Ministry of National Energy reported, respectively. Some upstream watersheds in Thailand have potential for the development of large scale hydropower plants by means of dam constructions. However, most of proposed dam sites in the upstream watershed are located within the restricted area as for the forestry and environmental conservation zone according to the national environmental law of conservation. Pico-hydropower plant is more suitable for the economic and farming zones of such watersheds. A waterfall site in Ban-Yaeng Village, Nakornthai District in Phitsanulok Province which locates at the upstream of Wangthong Watershed (Sub-basin of Nan River) was selected as the pilot project for the construction of the hydropower plant. The appropriate technology using the centrifugal pumping machine as for the water-turbine connected to a 3-phase motor producing electricity of 380 volts at revolution of 1500 rpm was applied. The system was based on low cost of construction, local materials, and easy construction and maintenance systems. Its performance of the overall system by mean of the efficiency was found to be 52% resulted by the effective head of 8.4 meters, flow rate of 15 liters per second, and electrical power production of 644 watts which can be used for the light, some house-ware appliances, and some farming equipments. It can be applied to other small farming villages in any upstream watershed with enough head and flow rate in the stream over the year round in order to save investment cost for farming systems with the clean technology. However, it can be transferred to larger farming villages if higher head and larger flow rate in the natural stream or river were found which depended on the country and topography.

Keywords: Pico-hydro, renewable energy, farm village, upstream watershed, rural development.