Consolidation of Empirical Methods for Performance Prediction of Pump Used as Turbine

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Abstract

This paper presents the consolidated of existing empirical methods used to predict the increased factor of head and flow rate when centrifugal pumps operated as water turbines. Performance characteristics of the thirty four (34) centrifugal pumps are collected from the existing in the local market of Tanzania with specific speed ranged from 13 to 71 (m, m^3/s). Pump performance characteristics are converted to turbine characteristics based on the five head ratio and flow rate ratio empirical methods. Also, the study collects the empirical methods to estimate PAT efficiency. The Pump as Turbine (PAT) power varies significantly with pump horsepower. The study also validates the power estimated by using the head ratio, flow rate ratio and efficiency empirical methods with power prediction method. Furthermore, the study presents the comparison of the specific speed, power and efficiency in pump and turbine modes. The proposed methods of using empirical methods can be applied as the alternative solution and emphasizing to conduct experimental investigation of PAT for the specific hydropower site.

Keywords: empirical methods, increased factor, PAT