Executive Summary

Improving Energy Efficiency in Pumps and Pumping System in Sana'a Water and Sanitation Local Corporation (SWSLC)

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This paper is concerned with "Improving Energy Efficiency in Pumps and Pumping System in Sana'a Water and Sanitation Local Corporation (SWSLC)". SWSLC is responsible for the delivery of water and sanitation services to the capital Sana'a. High consumption of energy consumed by the pumps is one of the major problems facing the SWSLC. Two kinds of centrifugal pumps are used in this utility, horizontal split and submersible pumps. Horizontal split pumps are used in four main pumping stations and submersible pumps are used for extraction of groundwater from wells. The large consumption of energy is consumed by submersible pumps. The study aims at evaluating the energy of 81 submersible pumps-sets which are operating by SWSLC. The solution of this problem will be through the assumption of two scenarios. The first scenario is the potential saving option due to pumps-sets replacement. The second scenario by using the modification in pumping system through these methods: throttle valve control, bypass control, modifying impeller diameter and variable speed drive (VSD).

The study reveals that, the average overall efficiency of all existing submersible pumps and the specific energy are 43% and 2.05 kwh/m³ respectively. By applying the first scenario above to replace the existing pumps-sets to the new pumps with optimal efficiencies 61% - 63%. The specific energy will reduce to 1.27 kwh/m³, which means a reduction of the annual energy cost from 6,192,301 USD to 4,360,212 USD. In other words, the annual savings in energy consumed by the submersible pumps will be 1,832,089 USD with maintaining the same quantities of water to the same head. In short, 29.59% of the total cost of energy consumed by the submersible pumps can be saved annually. In addition, the feasibility study of this scenario indicates that, the costs required to implement this option is 2,600,000 USD while the annual savings in energy costs would be 1,832,089 USD, which means that the payback period of recovery of capital cost will occur after 1.42. This savings in energy costs will impact on improving the performance of the SWSLC and general health of the community. Hence, improving energy efficiency will lead to improving of general health because the customers are obliged to use private wells due to the lack of water production by SWSLC wells during the maintenance times. As a result of this, certain health problems occur, such as impossibility of purification of private wells. In addition, the percentage of citizens who obtain the service will increase substantially, which will spontaneously improve their general health.

About the second scenario, applying the adjusting on pumping system by using these methods; throttle control valve, bypass control valve and modifying impeller diameter are completely useless in all of the fields. While using VSD to improve pump efficiency will be available only in Musaik and Asser fields, because the demand is changing during the day, while using VSD will be useless in Western and Eastern fields.