7th National Congress on Civil Engineering, 7-8 May 2013
University of Sistan and Baluchestan, Zahedan, Iran

ENERGY PRODUCTION BY WATER DISTRIBUTION NETWORK

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Abstract

Water Demand Management (WDM), try to emphasize on water network demand so that it can improve water distribution efficiency by application of different strategies such as Leakage control and pressure management. Pressure Reducing Valves (PRV) are often used in water network to reduce the downstream hydraulic losses in the network; therefore location of PRVs must be adequately selected so that they have maximum efficiency. PRVs is useful for reduceing excess pressure and prevention of leakage by spreading energy, but this excess pressure can be used to produce energy. Mini-Hydropower or pump as turbines (PATs) can be used for converting excess pressure to electric power. In the present paper PRVs and PATs were used within an area of Ahar water distribution network,Iran, by analyzing different scenarios, it is tried to show large potential of PATs for energy production and also explain how PATs can be competitive for generating hydropower from excess pressure in water distribution systems..

Keywords: water distribution network, Pressure reducing valves, pump as turbines, network pressure.

1. INTRODUCTION

Pressure is one of the most important factors for calculating unaccounted water in urban water distribution networks. The unaccounted water has defined in different ways. In [1], it is defined as difference between the total input water to the network and the total value of water which is not measured by meters. Another definition which is common between agencies and organizations, the amount of water consumed or is out of system which it's not being paid. Since the pressure have different effects on the network parameters such as hydraulic, reliability, network stability and leakage, so it is important to identify the trend of change of this parameter and determine the management method which has the most effective results. There are several ways to reduce extra pressure on the network, such as head reduction using different kind of valves [2, 3], and etc. More recently, the idea of intelligent pressure control in network is formed. In this paper, we used Pressure Reducing Valve (PRVs) and pump as turbines (PAT) to reduce loss in the network and utilized the extra energy in valve and turn it to electric energy. In this study, the especial method to reduce extra pressure and losses with PATs and produce electric energy is evaluated by EPANET and using Genetic Algorithm

2. TERMS AND PARAMETERS

2.1 Minimum Night Flow

The value of the measured flow in an isolated network at night and in minimum demand interval is named the minimum nigh flow. Each of the isolated networks is a part of the municipal water distribution network that input and output water flows through single or multi-path. These isolate reigns have many individual specifications such as the number of population, the number of dwellings, length of transmission and distribution lines, ratio of the pipe length to the number of ramifications, average of the area pressure, the