

Using Pump as Turbine in Urban Water Networks to Control, Monitor, and Simulate Water Processes Remotely

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Abstract : Leakage is one of the most important problems that water distribution networks face which first reason is high-pressure existence. There are many approaches to control this excess pressure, which using pressure reducing valves (PRVs) or reducing pipe diameter are ones. On the other hand, Pumps are using electricity or fossil fuels to supply needed pressure in distribution networks but excess pressure are made in some branches due to topology problems and water networks' variables, therefore using pressure valves will be inevitable. Although using PRVs is inevitable but it leads to waste electricity or fuels used by pumps because PRVs just waste excess hydraulic pressure to lower it. Pumps working in reverse or Pumps as Turbine (called PAT in this article) are easily available and also effective sources of reducing the equipment cost in small hydropower plants. Urban areas of developing countries are facing increasing in area and maybe water scarcity in near future. These cities need wider water networks which make it hard to predict, control and have a better operation in the urban water cycle. Using more energy and therefore more pollution, slower repairing services, more user dissatisfaction and more leakage are these networks' serious problems. Therefore, more effective systems are needed to monitor and act in these complicated networks than what is used now. In this article a new approach is proposed and evaluated: Using PAT to produce enough energy for remote valves and sensors in the water network. These sensors can be used to determine the discharge, pressure, water quality and other important network characteristics. With the help of remote valves pipeline discharge can be controlled so Instead of wasting excess hydraulic pressure which may be destructive in some cases, obtaining extra pressure from pipeline and producing clean electricity used by remote instruments is this articles' goal. Furthermore, due to increasing the area of network there is unwanted high pressure in some critical points which is not destructive but lowering the pressure results to longer lifetime for pipeline networks without users' dissatisfaction. This strategy proposed in this article, leads to use PAT widely for pressure containment and producing energy needed for remote valves and sensors like what happens in supervisory control and data acquisition (SCADA) systems which make it easy for us to monitor, receive data from urban water cycle and make any needed changes in discharge and pressure of pipelines easily and remotely. This is a clean project of energy production without significant environmental impacts and can be used in urban drinking water networks, without any problem for consumers which leads to a stable and dynamic network which lowers leakage and pollution.

Keywords : clean energies, pump as turbine, remote control, urban water distribution network

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