

Preface

The sustainable use of water and energy represents one of the major challenges of the majority of the nations worldwide. In the number of requirements for Water Supply Networks (WSN), a rational use of energy is becoming a key topic, especially considering the relationship between water pressure in the pipelines and leakage: an optimal pressure level in all branches of the network grants, both, the users' satisfaction and the water savings. On the contrary, pressure excesses are connected to an uncontrolled use of energy for water transfer and to the dispersion of large water volumes.

Pressure management in WSN is not only a primary research topic in civil engineering, but it is also a daily exigency of the network technical management. Appropriate strategies have been developed for the optimal location of Pressure Reducing Valves (PRVs) used for dissipating excess energy. In the meantime, in all states the maximum effort is present to reduce the energy required in pumping stations by increasing the pumps performances and by a better integration of the pumping system in the network.

The environmental benefit coming from the use of renewable sources of energies led in the last decades to a simplification of the connection of energy sources to the electrical grid. Nowadays, also very small power plants, presenting peak power of few kilowatts, are considered a valuable resource. Often the production by renewables is promoted via national feed in tariffs. The exploitation of small energy sources is even more convenient when the production is controlled by a energy user. This is the case of the water transportation and the dissipation points along the network start to be attractive for the transformation of hydraulic energy in electricity.

For the small available powers in the PRV location, in the design of the hydropower plant traditional turbines fail. The miniaturization of the turbine itself and of the turbine control increases the cost of the electromechanical devices. Therefore, an alternative was found in the use of pump working in inverse mode:

a Pump as Turbine (PAT). The main advantages of this technology are in the low cost and in the reliability of the electromechanical devices. PAT-based power plants are receiving an increasing interest in the international literature and the first pilot, and real plants have been realized. The scope of the book is to give the state of the art in the design of PAT technology, including, both, mechanical and hydraulic aspects.

Napoli, Italy
Tehran, Iran
Lisbon, Portugal

Armando Carravetta
Shahram Derakhshan Houreh
Helena M. Ramos

Pumps as Turbines

Fundamentals and Applications

Carravetta, A.; Derakhshan Houreh, S.; Ramos, H.M.

2018, XV, 218 p. 209 illus., 120 illus. in color.,

Hardcover

ISBN: 978-3-319-67506-0