

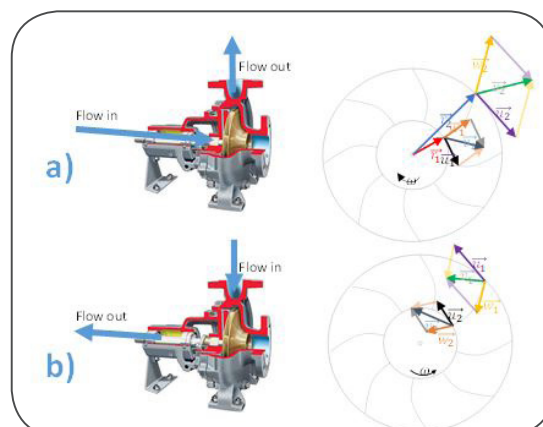


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Pumps working as turbines as an engineering solution for energy recovering in water distribution systems

At present, the society has become aware of the need to increase the energy efficiency of all the processes in which it is involved. Therefore, the use of renewable energy sources such as photovoltaic, wind, tidal, hydraulics among others is necessary in order to increase sustainability. Water distribution systems should not be oblivious to this trend, especially if one takes into account that these nets are large consumers of energy. In this sense, hydraulic is a renewable source of energy with a promising future, furthermore there is a very important recovery energy potential in our water distribution networks. This energy is partially lost on valves, which main goal of these systems is the control of the network, but pressure is reduced without recovering the inherent energy of this additional pressure in the system. Therefore, it is of paramount importance to adjust the pressure in irrigation or potable water distribution systems for consumption, but considering the possibility of recovering this energy by implementing some engineered system to do so. If these pressure reducing valves are replaced by pumps working as turbines (PATs) not only can pressure regulation be achieved, but also some kilowatts can be recovered, that otherwise would not be obtained. The operation of pumps as turbines requires considerations in the design of the machines. What in pump conditions is an inlet in turbine conditions is an outlet, and vice versa. This makes important changes in the velocity triangles occurring in the impeller, and therefore the total behavior of the machines achieve different performance. Nowadays, the determination of real curves is crucial, considering hydraulic losses inside the machines and different rotation speed for the current researches. The knowledge of these curves will help to develop real models, which determine the final efficiency of different PATs..



Notes:

Figure 1: Velocity triangles a) Pump behavior; b) Turbine behavior

Recent Publications

1. Pérez Sánchez M, Sánchez Romero F, Ramos H and López Jiménez P A (2017) Energy recovery in existing water networks: towards greater sustainability. *Water* 9(2):97.
2. Pérez Sánchez M, Sánchez Romero F J, López Jiménez P A and Ramos H (2018a) PATs selection towards sustainability in irrigation networks: simulated annealing as a water management tool. *Renewable Energy* 116:234-249.
3. Pérez Sánchez M, López Jiménez P A and Ramos H M (2018b) Modified affinity laws in hydraulic machines towards the best efficiency line. *Water Resources Management* 32(3):829-844.
4. Pérez Sánchez M, Sánchez Romero F, Ramos H and López Jiménez P A (2016) Modeling irrigation networks for the quantification of potential energy recovering: a case study. *Water* 8(6):234.
5. Romero Laura, Pérez Sánchez Modesto and López Jiménez P Amparo (2017) Environmental and energy problematic in the Mediterranean irrigation regions framework. *International Journal of Energy and Environment* 8(1):51-62

Biography

Petra Amparo López Jiménez is an Industrial Engineer at the Universitat Politècnica de València and PhD in the Department of Hydraulic and Environment Engineering (DIHMA) of the same university. At present she is Full Professor of Hydraulic Engineering at the Higher Technical School of Industrial Engineering (ETSII) of the UPV and Director of the DIHMA. Her teaching experience is wide, since 1997 she has taught in the ETSII in aspects of fluid mechanics, hydraulic machinery and dispersion of pollutants, being also her main areas of research. She is Director of 7 doctoral theses and a multitude of final works of master and degree. She has worked in more than 50 projects or research contracts and is author of 85 articles in magazine, among other teaching and research contributions in congresses and conferences.

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