AVAILABLE ENERGY ASSESSMENT IN WATER SUPPLY SYSTEMS

HELENA RAMOS[1], DÍDIA COVAS[2], LUIZ ARAUJO[3] and MARIA MELLO[4]

[1] *Professor*, Civil Eng. Dept., Instituto Superior Técnico,
Av. Rovisco Pais, 1049-001 Lisbon, Portugal
(Tel: +351 218418151, Fax: +351 218418150, e-mail: hr@civil.ist.utl.pt)
[2] *Assistant Professor*, Civil Eng.Dept., Instituto Superior Técnico,
Av. Rovisco Pais, 1049-001 Lisbon, Portugal
(Tel: +351 218418152, Fax: +351 218418150, e-mail: didia@civil.ist.utl.pt)
[3] *PhD student*, Civil Eng. Dept., Instituto Superior Técnico,
Av. Rovisco Pais, 1049-001 Lisbon, Portugal
(Tel, Fax: +351 218418150, e-mail: araujols@civil.ist.utl.pt)
[4]Manager of Hidropower Company, Lisboa, m.mello@hidropower.pt

Within European Union priorities, the problematic of available water sources have paid attention through the development of an integrated policy to reduce and control pressures and consequently leakage. The use of pressure reducing valves in water distribution systems is to uniform and control the pressure by separating water pipe systems in district meter areas (DMA) identified by pressure classes accordingly to the topographic development of the zone where the system is implanted. Each DMA is supplied for a guaranteed pressure range or by interconnected reservoirs or even by using pressure reducing valves in each active DMA entrance. Since water supply and distribution systems have serious problems of leakage, the pressure control is fundamental for an optimised and sustainable system management.

In drinking pipe systems Pressure Reducing Valves (PRV) are used as dissipative devices for pressure control through a localized pressure drop. The use of micro-turbines or pumps operating as turbines (PT) seem to be an alternative and sustainable solution to either control the pressure as well to produce energy. This type of solution generally well accepted within renewable energy sources can be adopted as a mitigation method to control the systems loss, in particular the excess available energy which would be dissipated and the rupture occurrence. The existence of high topographic gradients are favorable to adopt these solutions, avoiding the use of high pressure pipe classes with the consequent minimization of costs and the benefit associated to energy yielding, which although depends on the daily consumptions is always a guaranteed energy.

Experimental research is carried out in the Hydraulic Lab of the Department of Civil Engineering at IST, to analyze the hydraulic system response under steady and transient state conditions, as well as the development of comparative analysis between real PRV and PT.

The problematic of waste available energy must paid attention through the implementation of continuous monitoring systems, in particular in drinking and irrigation systems. Furthermore, an integrated policy of water and energy systems management must be developed by using optimization analyses, as well as to encourage water companies to implement it.

The use of renewable energy sources within drinking system seem to be a valuable alternative solution to profit excess available energy instead of the use of dissipative devices. This is a clean project of energy production without significant environmental impacts, with a guaranteed discharge which can be used in multipurpose systems, without constraints for consumers or other water uses.

Keywords: drinking systems, pressure reducing valves, pressure control, energy production, pump as turbine.

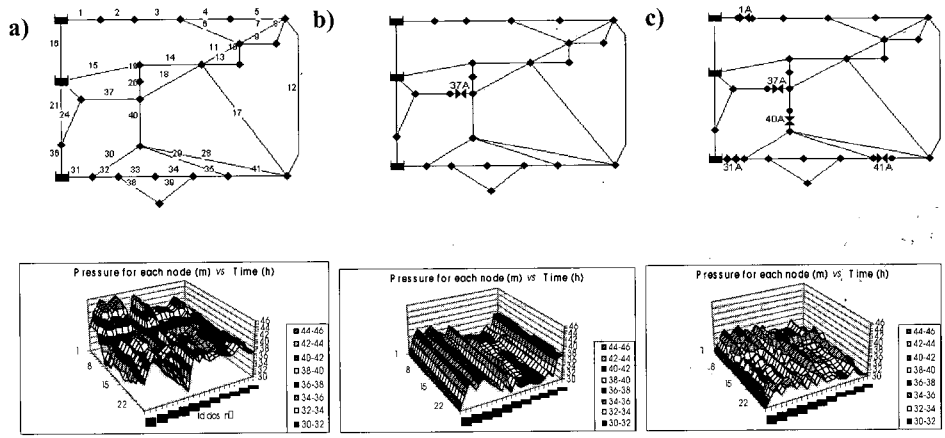

Fig. 1 Pressure control in drinking systems: a) – system without control; b) and c) – effect of 1PRV and 5PRV, respectively, with hour open regulation

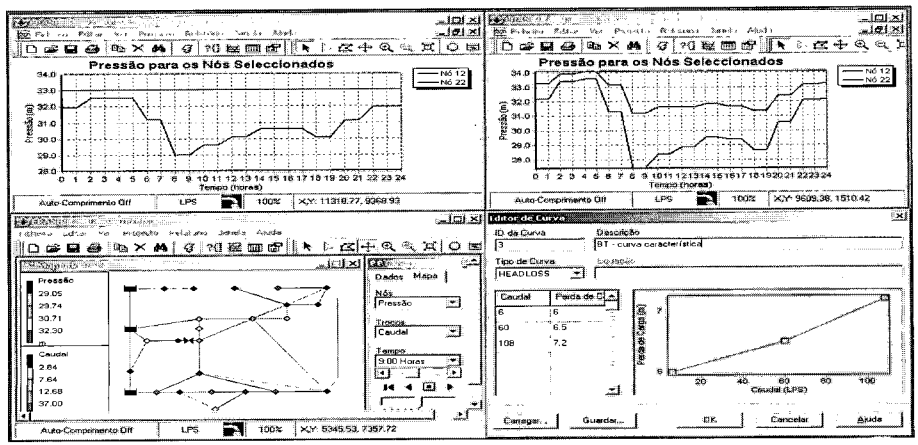

Fig. 2 Simulation of a PRV operation (left-top) and a Pump/Turbine PT (remaining graphs)