

**Title: Surge damping analysis in pipe systems: modelling and experiments****Author(s):** Ramos, H (Ramos, H); Covas, D (Covas, D); Borga, A (Borga, A); Loureiro, D (Loureiro, D)**Source:** JOURNAL OF HYDRAULIC RESEARCH **Volume:** 42 **Issue:** 4 **Pages:** 413-425 **DOI:** 10.1080/00221686.2004.9641209 **Published:** 2004

**Abstract:** The current study focuses on the analysis of pressure surge damping in single pipeline systems generated by a fast change of flow, conditions. A dimensionless form of pressurised transient flow equations was developed, presenting the main advantage of being independent of the system characteristics. In lack of flow velocity profiles, the unsteady friction in turbulent regimes is analysed based on two new empirical corrective-coefficients associated with local and convective acceleration terms. A new, surge damping approach is also presented taking into account the pressure peak time variation. The observed attenuation effect in the pressure wave for high deformable pipe materials can be described by a combination of the non-elastic behaviour of the pipe-wall with steady and unsteady friction effects. Several simulations and experimental tests have been carried out, in order to analyse the dynamic response of single pipelines with different characteristics, such as pipe materials, diameters, thickness, lengths and transient conditions.

**Document Type:** Article**Language:** English**Author Keywords:** surge damping; energy dissipation; elastic or non-elastic behaviour; pressure oscillations**Keywords Plus:** POLYMERIC ADDITIONAL PIPE; UNSTEADY-FLOW; ENERGY-DISSIPATION; TRANSIENT; FRICTION; TURBULENT; NETWORKS; QUASI-2D**Reprint Address:** Ramos, H (reprint author), UTL, Dept Civil Engr, Inst Super Tecn, Av Rovisco Pais, P-1049001 Lisbon, Portugal**Addresses:**

1. UTL, Dept Civil Engr, Inst Super Tecn, P-1049001 Lisbon, Portugal
2. ISEL, Dept Civil Engr, Lisbon, Portugal
3. Natl Lab Civil Engr, LNEC, P-1799 Lisbon, Portugal

**E-mail Address:** hr@civil.ist.utl.pt, didia@civil.ist.utl.pt, aborga@sapo.pt, dloureiro@lnec.pt**Publisher:** INT ASSOC HYDRAULIC RESEARCH, PASEO BAJO VIRGEN DEL PUERTO, 3, 28005 MADRID, SPAIN**ISSN:** 0022-1686