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*A.L. Araújo, C.A. Mota Soares, et al. (Editors)*


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# GUIDED ULTRASONIC WAVE FOR MONITORING STRESS LEVELS IN PIPELINES

**[1]Jabid Quiroga Méndez, [1]Rodolfo Villamizar, [2]Luis Eduardo Mujica Delgado, [1]John Quiroga, [2]Magda Ruiz**

*[1]Universidad Industrial de Santander, Columbia*
*jabib@uis.edu.co, rovillam@uis.edu.co, john.quiroga@correo.uis.edu.co*

*[2]Escola Universitària d'Enginyeria Tecnica Industrial de Barcelona. Consorci Escola Industrial de Barcelona. Universitat Politècnica de Catalunya. BARCELONATECH. Departament of Applied Mathematics III, Spain*
*luis.eduardo.mujica@upc.edu, magda.ruiz@upc.edu*

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**Summary:** In this article, the pattern variation of the wave propagation in a pipeline is studied by means of Principal Component Analysis (PCA) and some extensions to indirectly evaluate the tensile stress in a pipeline. This method can be potentially used in-situ and real time for continuous condition monitoring. The test bench utilized in this research represents a mimic of an actual installation. A 1" sch 40 A-106 pipeline is supported at the free ends by fixed support. Then, a variable load is applied in the half of the length emulating the stress condition produced by a fault in the foundation. The mechanical and geometrical characteristics of the pipeline were considered to optimize the experiment configuration and the selection of the guided ultrasonic mode at a suitable frequency. A Picoscope® is used for signal generation (Gaussian pulse signal of nine cycles) and acquisition of the guided wave. A dedicated Matlab® software is implemented to perform processing of this signal. Data captured by the piezoelectric sensor for each load condition are projected into the PCA model-based. Results of each load scenario are presented and discussed demonstrating the feasibility of using this formulation in the evaluation of the tensile stress in pipelines.