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INERTIAL MAPPING AS GEOTECHNICAL MONITORING OF PIPELINES

Wanderley C. Russo Jr.¹

TRANSPETRO
Rio de Janeiro, Brasil

Joao Maurício H. Goulart²

Jomaga
São Paulo, Brasil

RESUMEN

TRANSPETRO is responsible, among other activities, for the operation and maintenance of pipelines throughout Brazil. Preventive maintenance activities include patrols on the pipelines rights-of-way to identify, register, classify geotechnical risk and monitor changes in the ground surface or subsoil along the pipeline guideline and adjacent areas. Landslides can be induced by natural phenomena or by external interference, such as excavations and embankments. Particularly on the slopes of Serra do Mar, on the southern Brazilian coast, where rainfall is high and mass movements are common, the identification the geotechnical occurrences at the beginning of their development reduces the risks of social-environmental impact and maintenance costs of the pipelines. However, events such as soil creeping are difficult to recognize and evaluate correctly in periodic geotechnical patrols due to their very slow characteristic velocity. To overcome these difficulties, TRANSPETRO uses the Inertial Mapping methodology (MAPPI), which distinguishes typical "signatures" of pipeline displacement by comparing the spatial orientation of the pipeline (azimuth and inclination) in different survey periods of pigs equipped with an XYZ mapping module. The method identifies areas with indications of pipeline displacement and provides the length of the landslide, the maximum displacement and the rate of displacement of the pipeline, allowing a more accurate bending strain analysis induced by slow soil movements. The MAPPI methodology was successful as indirect monitoring of soil movements in several opportunities, proving to be better than geotechnical patrols to detect the beginning of the creeping soil. This paper presents the application of the MAPPI methodology in the identification of creeping soil, with the confirmation of the indications of pipeline displacements by Pipe Locator and the bending strain analysis induced by soil movements. Currently, MAPPI is a complement to the monitoring of pipelines rights-of-way with traditional geotechnical instrumentation, allowing faster and accurate decisions and generating operational, safety and monetary advantages.

¹ wanderleyrusso@petrobras.com.br

² joaomauricio.jomaga@petrobras.com.br