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OPTIMIZING DATA AND TECHNOLOGY TO DRIVE DOWN GEOHAZARD RELATED PIPELINE FAILURES

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RESUMEN

Ongoing technology developments, data analysis improvements and advanced survey techniques have led to a wealth of information that can be used to manage the geohazard threats that pipelines are exposed to. But in order to drive down the number of failures that continue to occur from ground movement events, improvements are required with regards to optimizing the available data and selecting the best management strategy for the particular threat.

The most effective approach may focus more on the stability of the soil in the pipeline right of way or on the predicted response of the pipeline subject to external loads. The former includes routine patrols of the right-of-way, periodic aerial surveillance and geotechnical instrumentation to detect any indication of ground movement. The later makes use of in-line inspection equipped with inertial measurement unit (IMU) for the detection of flexural deformation along the entire length of the pipeline and on information relating to the ability of the pipeline to withstand axial strains. Selecting the correct approach requires a thorough understanding of the prevailing threat, noting that this may not be the same along the full length of the pipeline.

Once external loads affecting the pipeline have been identified, it is necessary to evaluate, in detail, the level of threat and define mitigation actions to avoid an increase in loading and prevent failure. This process requires regular monitoring of the strain levels and pipeline movement over time to have a clear picture of the evolution of the loading mechanism and to monitor the effectiveness of any mitigation methods used, such as drainage controls and ground reinforcement works.

In this paper a methodology for the evaluation of geohazard loading based on bending strain and pipeline movement data is presented. The importance of understanding the effects of coincident threats in terms of a potential reduction in strain capacity is discussed with a particular focus on how combined evaluation of pipeline curvature data and high resolution caliper data can provide an improved understanding of the probability of failure.

Finally, the methodology is applied to two case studies in the Andes Mountain Range to demonstrate how multiple data sets can be combined and used to prioritize locations for preventative action. Due to the presence of dense vegetation in this area, this included the use of available LiDAR (Light Detection and Ranging) survey data to relate the findings from the ILI with the terrain condition.