

DIGITIZATION FOR REAL TIME GEOTECHNICAL AND HYDROTECHNICAL MONITORING FOR PIPELINE INTEGRITY ASSURANCE

Fabián Vásquez Miño (PhD)
Pipeline Geotechnical Sr. Engineer
Pluspetrol Ecuador B.V.
fvasquez@pluspetrol.net

Freddy Checa
SR. I&C ENGINEER
Pluspetrol Ecuador B.V.
fcheca@pluspetrol.net

The characteristics of the “Villano” pipeline system route (irregular geomorphology, geologic complexity, high levels of pluviosity, seismic risk, third parties interventions) have as consequence the activation and triggering of landslide events and fluvial events that put on risk the integrity of the oil-pipeline.

The performed landslide hazard assessment established that 26 sites along the pipeline’s right-of-way (ROW) require a systematic surveillance of the landslide activity and erosion processes. At all these points, following manual monitoring is being done:

- Take of inclinometer data installed in boreholes.
- Geodetic control.
- Manual take of crack-meters data.
- Vertical cable extensometers.
- Groundwater level monitoring in open piezometers.
- Micro-deformation of the pipe; measured with “strain gauges”.
- Climatic conditions registered with weather stations.
- Measure of pipeline route deviations with “Pipeline Current Mapper”.
- Multitemporal analysis of aerial and satellite optic imageries.
- Periodical review of seismic reports issued by Geophysical Institute of Quito.
- Bathymetries and measure of alluvial deposits thickness on sub-fluvial pipeline river crossings.

Due to the fact that the rate of slope movements is normally the basis for the prediction of a landslide event; only permanent measurements of the movements and of the direct influencing factors, like precipitation, groundwater level and others makes possible a quantification of the influence of these factors regarding the acceleration of movements. Permanent measures are the condition for a precise risk assessment and optimal protection measures.

The implementation of a real time geotechnical and hydrotechnical monitoring system is very important to become opportune landslide reactivation alerts, that allows to act in consequence, keeping the landslide under control, saving costs and avoiding pipeline ruptures and oil spills.

Clue words: landslides, real time monitoring, fluvial processes, alert system, pipelines.