

Aspects and Concerns Related to Oil Pipelines in Soft Soils

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Oil and gas pipelines are linear structures that cross the most diverse geomorphological structures, including mountainous regions, with associated mass movements risks and coastal, lagoon or even river plains, with the possibility of the presence of unconsolidated soft soils, with the possibility of occurrence of settlements due to its own weight or various overloads.

Oil pipelines, when installed in areas with unconsolidated soft soils, represent the possibility of risks when there are constructions that result in transverse or longitudinal overloads, as these promote the increase of tensions to the soil, with the consequent consolidation of the unconsolidated layers. These deformations, when vertical, lead to displacement of the pipeline, where it loses support and receives overload from the soil over it. This loss of support can lead to excess stress in the pipeline structure. When there are longitudinal overloads far from the pipeline, lateral displacements of the pipeline may occur, also resulting in increased stress. Another situation, when there are longitudinal excavations to the pipeline in areas of soft soil, there may also be lack of definition and movement of the soil, generating displacements and increased tensions.

In this way, whenever there is interference with new roads, railways, that cross transversally or that are longitudinal to the pipeline, specific geotechnical investigations are necessary for the definition of the geological-geotechnical foundation models so that the adequate engineering solutions can be evaluated to avoid compaction and displacement of soft soils and ensure the integrity of the pipelines.

Brazilian experiences at road crossings with existing pipelines show the need to implement special protection and support devices. There have been historical cases of high deformations that have been observed in embankments on soft soils with existing pipelines.

The objective of the article is to present geotechnical risk situations in pipelines in soft soils, the expected behaviors and possible technical solutions to mitigate these risks, with the presentation of cases of protection works successfully executed in oil pipelines in southern Brazil.