

Development of a Smart System for Measuring Strain Levels of Natural Gas and Petroleum Pipelines on Earthquake Fault Lines in Turkiye

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Abstract : Load changes occur on natural gas and oil pipelines due to natural disasters. The displacement of the soil around the natural gas and oil pipes due to situations that may cause erosion, such as earthquakes, landslides, and floods, is the source of this load change. The exposure of natural gas and oil pipes to variable loads causes deformation, cracks, and breaks in these pipes. Cracks and breaks on the pipes cause damage to people and the environment due to reasons such as explosions. Especially with the examinations made after natural disasters, it can be easily understood which of the pipes has more damage in the regions followed. It has been determined that the earthquakes in Turkey caused permanent damage to the pipelines. This project was designed and realized because it was determined that there were cracks and gas leaks in the insulation gaskets placed in the pipelines, especially at the junction points. In this study, A new SCADA (Supervisory Control and Data Acquisition) application has been developed to monitor load changes caused by natural disasters. The newly developed SCADA application monitors the changes in the x, y, and z axes of the stresses occurring in the pipes with the help of strain gauge sensors placed on the pipes. For the developed SCADA system, test setups in accordance with the standards were created during the fieldwork. The test setups created were integrated into the SCADA system, and the system was followed up. Thanks to the SCADA system developed with the field application, the load changes that will occur on the natural gas and oil pipes are instantly monitored, and the accumulations that may create a load on the pipes and their surroundings are immediately intervened, and new risks that may arise are prevented. It has contributed to energy supply security, asset management, pipeline holistic management, and sustainability.

Keywords : earthquake, natural gas pipes, oil pipes, strain measurement, stress measurement, landslide

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