



Microseismic Monitoring of a Liquid Petroleum Gas (LPG) Storage Site in South Korea

ESG installed a microseismic monitoring system and provided monitoring services during the construction of the Pyongtaek LPG storage facility in South Korea. Results of continuous microseismic monitoring suggested that the storage caverns and tunnels were sufficiently tight to contain the liquid petroleum gas.



The storage of liquid petroleum gas (LPG) is increasingly being adopted by countries with little or no reliable energy resources, as a means of stockpiling resources to meet increasing energy demands. The use of underground caverns or tunnels as storage facilities is an appealing prospect for countries with limited land resources, but also for their cost efficiency, environmental benefits and safety compared to traditional above-ground storage containers.

Background

The site used to construct the Pyongtaek storage facility was located at the southern part of Lake Namyang, an artificial lake created by the Namyang dyke. Neighbouring butane storage caverns are in operation south-east of the site. Therefore, during the construction and operation of the Pyongtaek site, the client needed to ensure that there was no hydrogeological interference with this neighbouring facility as well as

Fig. 1: Map showing the location of the Pyongtaek LPG storage site

no impact on the stability of these existing facilities.

The most critical issue when storing petroleum gas underground is to ensure that the gas does not leak out of the cavern. Commonly, a water curtain is constructed to manage the groundwater pressure distribution around the cavern.

ESG Solution

Microseismic monitoring systems have been installed at many underground LPG and LNG storage sites to ensure containment integrity. Typically ESG's Paladin seismic recorder with accelerometers are installed from the water curtain galleries to provide high resolution seismic coverage of the caverns, providing operators with real time 3D event location display of any seismic activity occurring within the site.

ESG installed twelve surface sensors at the site including two triaxial sensors and ten uniaxial sensors and provides data processing and interpretation services to the site to summarize any seismicity occurring near to the storage facility.

Peizometers are also installed at various locations around the cavern to monitor the hydrostatic pressure around the water curtain, and correlate any associated fluid escape with seismicity that may be occurring within the cavern. Pressure data is automatically collected by the system, and presented graphically to the operators.

ESG continues to monitor microseismicity remotely at the Pyongtaek site to ensure the integrity of the LPG containment cavern.

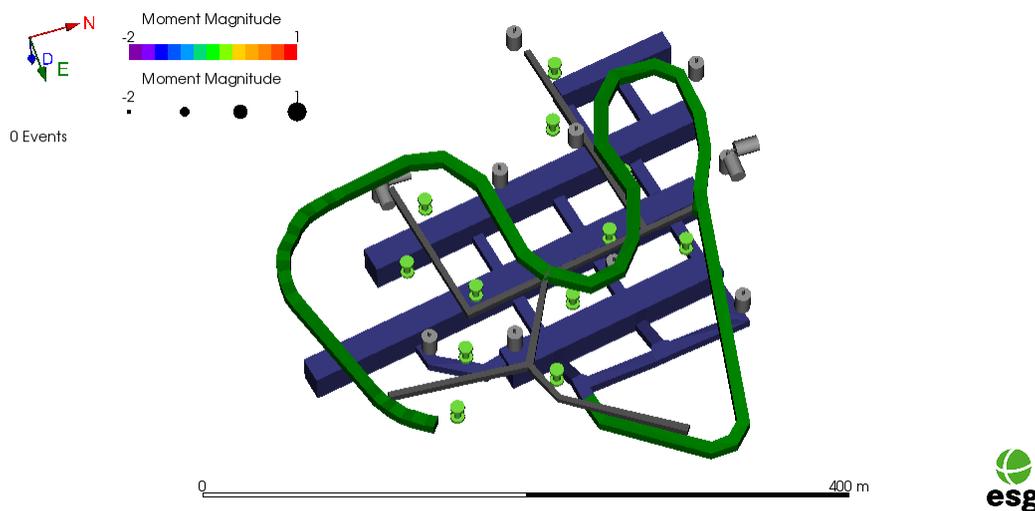


Fig. 2: Graphic of the Pyongtaek site geometry illustrating the location of the monitoring sensors