

IPSA II ONSHORE OIL TERMINAL YANBU - SAUDI ARABIA

DYNAMIC COMPACTION & DYNAMIC REPLACEMENT



Category: Oil & Gas / Tanks
Developer: Iraqi State Company for Oil Projects (ISCOPE)
Engineer: Mac Lelland
Contractor: Mitsubishi Corporation
Area / Quantity: 200,000 m²



PROJECT DESCRIPTION

Mitsubishi Corporation was awarded a turnkey contract for the construction of the onshore oil terminal by SCOP. This terminal was to provide an alternative route for exporting Iraq's oil.

The construction site was located on the Red Sea, 300 km north of Jeddah and 50 km south of Yanbu.

The project included 10 crude oil storage tanks each 110.8 m in diameter and 20 m high, 2 smaller fuel storage tanks, turbo generators, fuel loading pumps, 4 substations, oil cooler facilities, pipe racks, potable water storage, water treatment plant, roads and a number of buildings such as administration, maintenance, warehouse, fire station, topping plant building and a mosque.

SOIL CONDITION / GEOTECHNICAL PROBLEM

The soil investigation and site observations indicated the presence of a loose calcareous and siliceous silty sand layer in the upper 5 to 6 m. There were also areas with a soft silty layer from the depth of 4 to 6 m.

An upper coral layer containing cavities was also identified near the shore.



The high groundwater level and seismicity of the region also added the probability of soil liquefaction.

MENARD SOLUTION

Due to the diversity of the problems; i.e. bearing capacity, total and differential settlements, creep and liquefaction, Menard proposed the implementation of a combination of techniques to treat the foundations. Dynamic compaction was used for the treatment of the granular material with less than 30% fines and for pre-collapsing the cavities of the coral layer. Dynamic replacement (DR) was used for the treating the soft silts. Pre-excavation was also used locally with DR to facilitate and increase penetration.

QUALITY CONTROL

Pressuremeter tests (PMT) as the main testing system, and SPT and CPT tests as comparison systems were carried out to define the initial ground conditions for optimizing the soil improvement works, and for verification of the results. Also, seismic refraction tests were performed.

The results of the tests demonstrated that the different geotechnical issues that the project was dealing with were all solved efficiently.

