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setec

Transport and infrastructure
Energy / Civil Engineering
Structures

Methane terminal in Dunkirk
LNG tank foundations

Soil reinforcement

2010 - 2012

FRANCE - Dunkirk

Client

BOUYGUES TP

Owner

Dunkerque LNG (EDF)

Highlights

3 LNG tanks of volume 190,000 m^3 (90 m in diameter and 50 m high)

The Project

As part of the methane terminal project in the outer harbour of Dunkirk, TERRASOL was contracted by Bouygues to define the foundations solution for three LNG tanks.

These tanks are located over a stratigraphic context characterised by a very large thickness (90 m) of Flanders clay, a geological formation likely to undergo substantial settlement and affect the behaviour of the structures.

Key features of our mission

- Definition and supervision of geotechnical soil testing
- Interpretation of the results
- Settlement calculations
- Definition of the soil reinforcement system

Our Services

A large part of our work for this contract consequently consisted in building a reliable geotechnical model for the behaviour of the Flanders Clay.

This fitting was carried out according to two parallel approaches:

- use of finite-element calculations (Plaxis) to build a numerical model able to reproduce the evolution of the settlements measured over more than 20 years below the Gravelines nuclear power plant, located near the construction site;
- detailed analysis of the geotechnical data available on site, combined with a summary of the available literature on Flanders clay; comparison of the results of oedometer tests, triaxial tests with bender element, and cross-hole measurements revealed the variation of the compressibility of the Flanders clay with the deformation ratio.

The convergence of the two approaches (numerical model with back-calculation and function E=f(ε) deduced from testing) could be established by simulating the behaviour of a LNG tank with each set of parameters: the deformation and settlement distributions obtained were similar. This convergence of the results was decisive in establishing the reliability of the settlement values under the tanks.

To limit the settlements of the superficial alluvial layers and eliminate the risk of liquefaction, the soil was reinforced over a thickness of about ten metres using vibro-compaction and stone columns. A test plot was used to define the grid spacing of the treatment points.

terrasol
Immeuble central seine
42 - 52 quai de la rapee
75583 Paris cedex 12 France
Tél +33 1 82 51 52 00
Fax +33 1 82 51 52 99
info@terrasol.com