Abstract

Deformations on structures such as buildings, dams, bridges and storage tanks occur due to own weight, oil pressure or atmospheric temperature. It is necessary to monitor and analyze the deformation effects and movements of these structures so as to ensure their safety and security. Vertical cylindrical tanks are used in industries for storing crude oil and petroleum products. These tanks require periodic surveys to monitor long and short-term movements, settlements of the foundation and other deformations for early warning. The deformation is usually as a result of age.

This project outlines the procedure of a geodetic monitoring system of a circular oil storage tank and presents an analysis of the observations to determine the values of the deformations.

To develop a reliable monitoring system for the oil storage tank, the deformation monitoring scheme consisted of measurements made to the monitored tank from 10 reference stations established around the tank. The circular cross section of the tank was divided into 12 object monitoring points distributed to cover the perimeter of the cross section. These monitoring points were situated at equal distances on the outer surface of the tank and located around the tank base. These object points located on the surface of the tank model its structure, thus accurately depict the characteristics of the tank. Any movements of the object point locations, (and thus deformation of the structure), can be detected by maintaining the same point locations over time and by performing measurements to them at specified time intervals.

After deformation analysis of the tank under study was done, which included computation and adjustment of three epochs of observations, results showed that deformation had not occurred.

MATLAB programs were developed that were used for adjustment and analysis of the test data, which can also be used for the adjustment of other deformation monitoring data.