EFFECTIVE METHODS OF FOUNDATION SCIENCE: GPS MONITORING OF FOUNDATIONS

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One of the areas of modern applied geodesy is deformation monitoring. This concept includes geodetic monitoring of settlements and deformations of foundations, as well as other important elements of buildings and structures.

Inquiry of the anamorphosis of engineering architecture equally bridges or buildings are important tasks for civil engineers. Of course, all civil engineering structures are susceptible to deterioration over a period of time. Particularly, deterioration due to changes in groundwater matched, phenomena: tidal and tectonic, landslide or other catastrophes. Continuous monitoring of such structures is so important as it provides information, determines the character of the construction, disclose risky areas and offers safety measures to be taken.

The foundation of a building is designed to support significant gravity loads and typically consists of concrete posts, trellises or caissons that are driven into the ground.

There are many methods for measuring the vibration or displacement of structures: accelerometer, laser interferometer and electronic distance measurement.

Accelerometer measurement is the standard method. It is very light, small in size and has a minimal effect on the properties of the vibrating system. However, this requires direct sensor contact with the structure and the necessary wiring to connect the accelerometers to the central recording device. The wiring may be damaged. An accelerometer does not have the opportunity to measure the swing of the total vibration of the structure because acceleration cannot be obtained.

Traditional methods are limited and do not meet the requirements of monitoring large structures in terms of continuity, real-time and automation.

Operational monitoring of large structures can be easily achieved using GPS technology. Over the past decade, GPS technology has undergone significant developmental advances.

- GPS technology overcomes the limitation of climate and measures the structure displacement in three-dimensional directions;
- GPS positioning belongs to satellite positioning,
- can measure the structure displacement in three-direction,
- has a high degree of automatization,
- this opens up the possibility of observing the dynamic characteristics of a large structure near real time

With the latest advances in complete integrated satellite constellation and the use of specialized satellite signal processing software, it is possible to obtain highly accurate measurement of base vectors with millimeter accuracy using a geodetic GPS receiver.

This information will always be available to the system manager in system modeю When a certain predefined shear level is exceeded, the response of the structure can be evaluated based on the achieved shear values or the changed dynamic characteristics. In case of an alarm, the system manager can have a solution, for instance, close the construction for next checkup.

It is clear that the GPS technique, in conjunction with modern analytical tools, can provide excellent data about the condition of structures and become part of a program of monitoring and inspection of major structures throughout the world.

Geodetic monitoring of buildings and structures is very important in the course of their operation. It helps to detect deviations from the norm in a timely manner.

Over a long period of time, monitoring can also provide an opportunity to detect "anomalies" or "innovations" that may signal unusual loading conditions or altered structural behaviour, which in extreme cases can lead to destruction.

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