COMPLEX OF HIGH-RESOLUTION SEISMIC TECHNIQUES FOR SURVEYING EXISTING AND UNDER-CONSTRUCTION OBJECTS

Andrey Konkov, Geodevice LLC; Nikita Ragozin, Institute Orgenergostroy; Vladimir Ignatev, Geodevice LLC; Alexander Oshkin, Moscow State University

This study is intended to highlight the possibilities of modern seismic equipment and techniques for near-surface applications in terms of increasing the signal frequency and, consequently, the resolution power in such surveys. Thus, the description and capabilities of vertical seismoacoustic profiling (VSaP), low frequency acoustic logging, reversed VSP (RVSP), and crosshole seismic testing (CST) are demonstrated. The use of these methods in a complex at one site allows obtaining the maximum resolution for near-surface seismic surveys. The implementation of such a complex is especially justified during the design and construction of high-risk and hazardous facilities: nuclear power plants, hydroelectric power plants, high-rise buildings, etc. It should be also noted that CST and VSaP techniques have no competitors in studies in dense development areas and mountainous terrains, where access to the surface is either difficult or impossible. Due to a high resolution in the entire range of depths of the object under study, this set of methods allows effective detecting of karst occurrence at large depths and (when realizing multiwave observations) studying in detail the physical and mechanical properties of the medium or objects inserted inside it. The methods may also be applied when performing non-destructive testing of construction sites, monitoring the formation of ice wall, carrying out injection operations. Periodic implementation of the complex of methods on the same site can successfully solve the problems of monitoring the rock mass state. It can also help in studying the issue of improving the seismic properties by creating a pile field at sites composed of dispersed and water-saturated soils. Carrying out the observations before and after the construction of pile foundation allows one to obtain a quantitative estimate of variations in seismic properties, what is especially important for working in seismically active areas.