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VIBRATION ANALYSIS IN THE THERMAL POWER PLANT

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This lecture presents methodology for determination of the cause of excessive floor vibrations in a thermal power plant control room. Floor structure is a composition of a steel grillage and concrete slabs at 12m high level above soil. It was detected the floor vibration severity exceeds the threshold of permitted rate. After the full scale measurements were conducted on site, the results are arranged versus time and frequency domain. In parallel to site measurements a 3D modal analysis was performed in ANSYS. The outcome is a set of modal frequencies and modal shapes. Cross correlated analytical and experimental analysis formed a true picture of the excitation, response and their mutual interaction. The obtained results and appropriate conclusions profiled a remedy strategy to mitigate floor vibration severity.

Redesign of working space in a thermal power plant at the 12m high level shifted of a former stockroom into a new control room. The set of instruments and devices for the permanent condition monitoring of the turbine and generator set, as well for the other accessories is installed in the new control room. Severe vibrations of the floor, beyond the permissible threshold, disturbed a normal operation. The floor vibrations of the room occupied by individuals are usually treated as man induced vibrations. Very few scientific paper deals with detection of machine induced vibration on civil structure. Lack of published researches in this field justifies the complexity of the problem. In order to solve the described problem, it is necessary to have a true case study of increased vibration intensity. Substantial dilemma that arose in this case is whether the severe vibration is a reflection of excessive excitation from the turbine set and associated equipment or it is a resonant response of the floor structure, or else the problem is a mixture of both. This thermal power plant is of vital importance for the national power supply grid. Therefore it is absolutely out of question any kind of experiment with a start-stop operation in order to reveal main source of the severe vibration. Recognizing the true cause of excessive vibrations would ease the further steps in rehabilitation.

Keywords: modal analysis, vibrations, structural health monitoring.

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