

DEVELOPMENT OF MECHANICAL EXCITER FOR DYNAMIC TESTING OF HEAVY STRUCTURES AND FOUNDATIONS

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ABSTRACT

The dynamic characterization of large supporting structures like Turbo Generator (TG) foundation decks and base frame/pedestals is essential before erection of the set due to heterogeneous nature of concrete and many uncertainties during erection of substructure to super structure. The full scale forced vibration testing is a useful tool for obtaining the dynamic characteristics like natural frequency, damping and dynamic stiffness. Several excitation systems like electro-mechanical and hydraulic systems are in vogue for exciting the deck of the TG sets. A full scale forced mechanical vibration testing system is designed and developed to suit the test requirements of force and frequency in triaxial directions. The design to meet the above requirements had been carried out based on the principle of counter rotating eccentric masses inducing sinusoidal forces.

After design and manufacture of the mechanical exciter system it was tested on a rigid foundation using velocity seismo probes and spectrum analyzer. The system was run at different eccentric loads and the vibration velocity components corresponding to rotating speeds in both vertical and horizontal directions were recorded. The spectrums of the recorded data showed that the system is working satisfactorily meeting the functional requirements. The system is tested for the excitation of large bearing test rig. Transient plots (Bode plots) for the vertical rotor support structure are obtained which distinctly indicated the resonant frequencies of the structure. Testing of a TG deck of large steam turbine generator is also carried out and satisfactory results obtained.

Keywords: Resonance, Compliance, Mechanical Shaker, TG deck, eccentric mass, sinusoidal forces