

## Time Effective Structural Frequency Response Testing with Oblique Impact

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**Abstract :** Structural frequency response testing is accurate in identifying the dynamic characteristic of a machinery structure. In practical perspective, conventional structural frequency response testing such as experimental modal analysis with impulse technique (also known as “impulse testing”) has limitation especially on its long acquisition time. The high acquisition time is mainly due to the redundancy procedure where the engineer has to repeatedly perform the test in 3 directions, namely the axial-, horizontal- and vertical-axis, in order to comprehensively define the dynamic behavior of a 3D structure. This is unfavorable to numerous industries where the downtime cost is high. This study proposes to reduce the testing time by using oblique impact. Theoretically, a single oblique impact can induce significant vibration responses and vibration modes in all the 3 directions. Hence, the acquisition time with the implementation of the oblique impulse technique can be reduced by a factor of three (i.e. for a 3D dynamic system). This study initiates an experimental investigation of impulse testing with oblique excitation. A motor-driven test rig has been used for the testing purpose. Its dynamic characteristic has been identified using the impulse testing with the conventional normal impact and the proposed oblique impact respectively. The results show that the proposed oblique impulse testing is able to obtain all the desired natural frequencies in all 3 directions and thus providing a feasible solution for a fast and time effective way of conducting the impulse testing.

**Keywords :** frequency response function, impact testing, modal analysis, oblique angle, oblique impact

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