

## Development of vibration test system to measure human biodynamic responses to hand-transmitted vibration (HTV)

### ABSTRACT

Workers commonly experience hand-transmitted vibrations (HTV) especially in industries involving power tools. Vibration exposure will differ by individuals where prolonged and unmonitored exposure can lead to the development of symptoms known as hand arm vibration syndrome (HAVS). A deep understanding of human response to HTV is required to provide feasible solutions to lessen its adverse effects. Research has been extensively conducted on exploring the vibration transmission to the hand-arm system. However, there is limited study on the effects of handles mounted on a damping material or suspension systems. The objective of this study is to develop a vibration test system to measure the human biodynamic response to hand-transmitted vibration. Engineering design theory were used to formulate the essential design requirements of the system. The evaluation and selection of concepts were done. The design was modelled, and frequency analysis was performed using Computer-Aided Engineering (CAE) software. The frequency analysis results showed the first 10 modes in the frequency range of 1320 – 5088 Hz and therefore will not have resonance issues in the 25 – 1250 Hz frequency excitation range as per requirement. The prototype design was shown to comply with the product design specification and final detail design drawings were approved for fabrication. In conclusion, an instrumented handle with a modular expansion slot had been appropriately designed to measure human biodynamic responses due to hand-transmitted vibration.

**Keyword:** Vibration test system; Human biodynamic responses; Hand-transmitted vibration

