

# **Development of Automatic Balancing Machine for Turbo-Charger of Automobile Engine**

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Automatic real-time detection of rotational unbalance in turbo-charger for automobile engine was conducted to monitor and correct the unbalance made in the process of manufacturing. It is always necessary to limit the maximum allowable level of unbalance because an excessive unbalance of turbo-charger causes a severe vibration and reduces product life and reliability of turbo-charge. This paper describes a real-time detection method of unbalance mass of turbo-charger using vibration signals from two air bearings. Vibration due to the unbalance of complex 3D turbo-charger was described using the continuous distribution function of mass and modal analysis, from which the influence coefficient matrix was defined at two discrete planes along the rotational axis. Coefficients of the matrix were identified and estimated experimentally using a reference turbo-charger well-balanced without unbalance prior to inspection. An experimental balancing machine to operate turbo-charger and measure the unbalance vibration was also developed for implementation and verification of the detection method. Residual unbalance of turbo-charger samples obtained from manufacturer was determined and corrected to evaluate the performance of proposed detection method and balancing machine. It is found from experimental results that the unbalance of turbo-charger can be detected very fast and removed effectively by the developed balancing machine to reduce the vibration of turbo-charger significantly.