

# Measurements of Strain on 310 mm Torque Converter Turbine Blades

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An automotive torque converter was tested in order to determine the effect of converter operating condition and turbine blade design on turbine blade strain in the region of the inlet core tab restraint. The converter was operated over a wide range of speed ratios (0 to 0.95) at constant input torque and a stall condition for two input torques. Foil-type strain gages in combination with wireless microwave telemetry were used to measure surface strain on the turbine blade. Strain measurements were made on two turbine blade designs. The steady component of strain over the range of speed ratios suggests the effect of both torque loading and centrifugal loading on the turbine blade tip. The unsteady strain was greatest at stall condition and diminished as speed ratio increased. Greater input torque at stall condition resulted in both greater steady strain and greater unsteady strain. The spectral distribution of strain over the range of tested speed ratios displayed an increase in low-frequency broadband fluctuations near stall condition. A blade-periodic event is observed which correlates to the pump-blade passing frequency relative to the turbine rotating frame. Reducing the blade-tip surface area and increasing the inlet-tab root radius reduced the range of steady strain and magnitude of unsteady strain imposed near the inlet core tab restraint over the range of operating conditions.