

Evaluating Residual Stress in Various Work Pieces



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Using an RS-200 residual stress measuring system and strain gages from Micro-Measurements, the residual stress in various work pieces, like large gears, shafts, and machine foundations, was measured to quantify the effectiveness of relieving these stresses using Vibratory Stress Relief equipment.

Company/Institute: Le Quy Don Technical University

Industry/Application Area: R&D in Mechanical Engineering

Product Used:

- [RS-200](#) Milling Guide for Residual Stress Measurements
Don't miss this [video on RS-200](#)
- [EA-06-062RE-120](#) Strain Gage
- [P3](#) Strain Indicator and Recorder

The Challenge

Vibratory Stress Relief (VSR) is a technique that uses vibration equipment to excite a part at a resonant frequency, which reduces the working residual stresses in the part and enhances service life. Le Quy Don Technical University has a project to evaluate the effectiveness of VSR. Measuring the before and after residual stresses is one of the challenges to demonstrating this effectiveness.

The Solution

The hole drilling method is a well-established technique for determining residual stress magnitude, and is the subject of an ASTM standard (ASTM E837). This is a semi-destructive technique that requires a small hole to be drilled into the part to locally relieve residual strains. These strains are sensed by specially designed strain gages bonded around the hole.



Figure 1: RS-200 Milling Guide for Residual Stress Measurements

The measured strains are then used in standard equations to compute the residual stresses. The Micro-Measurements RS-200 drilling system combined with special Micro-Measurements strain gages designed specifically for the task of measuring relieved strains are efficient, accurate tools to acquire necessary data. Using H-Drill software makes computing the stresses from the measured strains simple. ASTM E837 is the foundation for H-Drill computations. Using this special equipment and software with the P3 strain indicator, we have successfully evaluated the residual stress near welds and also in cast work pieces. Measurements were made before and after VSR treatment to verify the effectiveness of the stress relieving process.



Figure 2: Evaluation of Residual Stress on workpiece using RS-200 Residual Stress Milling Guide and P3 Strain Indicator and Recorder

The User Explains

Micro-Measurements residual stress equipment, gages, and instrumentation, plus expert guidance on using this technology by the Micro-Measurements Applications Engineering staff, supported our project to evaluate Vibratory Stress Relief technology and helped make it successful. Data were



efficiently collected, analyzed and graphed, clearly showing the reduction in residual stress after VSR.

***“By using equipment from Micro-Measurements
and following instructions from their experts,
we have measured residual stress and
successfully promoted a technology for
reducing residual stress”***

Acknowledgement

Le Quy Don Technical University is a leading university in Vietnam in areas of education and research development in mechanical engineering, information technology, electronics and telecommunication. This group focuses on advanced manufacturing technologies and evaluating life service of work pieces.

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