

**Error induced by local yielding around hole in hole drilling method  
for measuring residual stress of materials**

Lin, Yi- Cheng; Chou, Chang-Pin

Abstract

The hole drilling strain gauge method described in ASTM standard E837 is a popular method for measuring residual stresses near the surface of a material. However, some measuring errors have been found that may affect the accuracy of the measurement. The present paper aims to improve the accuracy by analysing the errors caused by local yielding around the hole. The materials used were 304 stainless steel, 5052 H32 aluminium alloy, and 1018 low carbon steel. The experimental results showed that the error induced by local yielding around the hole is negligible when the residual stresses measured are less than 65% of the yield stress. The maximum errors are in the range 32–47% and occur when the calibrated tensile stress is 95% of the yield stress of the test material. The maximum plastic error occurs in the perfect elastic–plastic material. The plastic error increases as the value of the Young's modulus of the material used increases.