Abstract Submitted
for the SES13 Meeting of
The American Physical Society

Analysis of residual stress in welds using electronic speckle-pattern interferometry (ESPI) SEAN CRAFT, SAUGAT GHIMIRE, SHUN HASAGAWA, SANICHIRO YOSHIDA, TOMOHIRO SASAKI, MASARU BASKE, BISHWAS GHIMIRE, None — Residual stress is stress locked inside of a material due to the method of manufacturing such as welding, and is independent of external load. It is of consequence because it leads to the acceleration of fatigue, the initiation of cracks, and the separation of dissimilar materials. When two pieces of metal are joined, the welding torch sweeps on the work from the initial point to the final point along the weld line, creating a temperature and volume gradient along the weld line. As the sample cools, it is clamped down to maintain its shape, but this results in residual stress as the welded part is stretched near the initial point of the weld and compressed near the final point. When two dissimilar materials are welded together, the effect is enhanced because of the difference in the thermal expansion coefficient. The technique we use to analyze this residual stress is electronic speckle-pattern interferometry (ESPI): a non-destructive, full mapping, optical interferometric strain measurement. In unrelated experiments, ESPI has been successfully utilized to show areas of concentrated stress when external forces are applied to a sample metal. Our conjecture is that it can also be used to analyze the areas where residual stress is located within a sample such as that described above. The goal of this research is to show that this is a viable method.

Sean Craft
None

Date submitted: 20 Sep 2013 Electronic form version 1.4