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EVALUATION AND CHARACTERIZATION OF THE ACOUSTICEYE TECHNOLOGY

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FINAL REPORT – EXECUTIVE SUMMARY
SwRI® Project No. 18.16303

Prepared for

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Approved:

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AcousticEye has developed technology for inspecting tube and pipe geometries using Acoustic Pulse Reflectometry (APR). To facilitate the acceptance of this technology in field applications, AcousticEye approached Southwest Research Institute® (SwRI®) to conduct an independent evaluation of the technology for use in heat exchanger tubing. The evaluation would be carried out in compliance with Article 14 of the ASME BPV section V standard (intermediate rigor) to aid AcousticEye with the development and acceptance of their technology in the field.

SwRI constructed an experimental heat exchanger tube mockup to test the detection capabilities of the AcousticEye technology. The mockup contained 36 tubes with 73 defects of various sizes and types, including thru-holes, pits, grooves, erosions, blockages, and end-of-tube (EOT) erosions. The mockup could also be inspected independently from both ends, effectively increasing the count to 137 defects. A SwRI inspector was trained in the use of the AcousticEye equipment, and she performed a blind inspection on the experimental mockup.

The results from the inspection were promising. Hit rates for blockage, erosion, and thru-hole defects were high (90-100%). Hit rates for other defects, such as pits and grooves, were very dependent on defect size. EOT erosions were incompletely characterized due to poor choices of defect size. False call rates were generally low (0-5%), with only pit, groove, and EOT erosion defects having any false calls. Misidentification of defects was also rare, and improper installation of three small defects may have been the cause of the only defect misidentifications noted from the inspection results.

The AcousticEye system performed well in positional accuracy of the defects it identified. The majority of defects were identified as within 50mm of their actual locations, using a single inspection from one side of the mockup. When two-sided inspection data was averaged, the majority of defects had positional deviations of less than 25mm. The accuracy in sizing defects was somewhat more problematic for the system. Updates to the AcousticEye software should continue to improve the sizing performance.

In addition to the experimental mockup, other tube sizes, materials, and geometries were examined in limited tests. The initial results suggest that the AcousticEye technique will be equally successful on larger tubes of different materials, as well as on u-bend geometries.