SPB8. WISC Inspection Of Fillet Welds

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Introduction

Johnson Controls manufactures seat frame assemblies for automobiles and vans by robotic GMA welding. Currently, weld data collection for quality control purposes is limited to manual measurement of weld length. An automatic weld data collection system based on the Servo Robot WISC portable laser scanner was proposed to allow more efficient collection and examination of data. The objectives were to demonstrate the WISC's ability to evaluate production automotive seat welds and to analyze welds in an SPC format relative to production specification.

Technical Approach & Results

Work was carried out to develop a procedure for scanning weld profiles on a seat frame weld prior to evaluating the usefulness of the WISC for profile and length measurements. The profile scanning and measurement procedures were carried out over a range production conditions (different days, part batches, robot cells, etc.) and the data was used to create X-bar and R-charts and normality tests and a process capability studies was performed.

It was found that the length of the welds could be reliably measured where as leg length and width measurements were feasible due to the geometry of the weld that was being analyzed. The average weld length was 33.50 mm and the standard deviation was 4.68mm, calculated on a sample size of 300 welds. Kolmogorov-Smirnov Normality Test yielded a P-value larger than 0.15. It is noted that P values greater than or equal to 0.05 indicate a normal data distribution. X-Bar and R charts were calculated for the length data. The process capability ratio Cp demonstrates the ability of the process to perform within specification limits. The calculated Cpl of 0.60 shows 3.5% of welds require rework whereas the Cpu of 0.11 shows 37% of welds exceed desired length.

Conclusions

The WISC could quickly record weld bead profiles and weld length whereas undercut measurements would required more development. The Kolmogorov-Smirnov Normality Test determined that the data distribution was normal. The X-bar and R control charts verified that all points lie between the upper and lower control limits, although on the weld that was analyzed, substantial savings would be possible by reducing over-welding.