

SUMMARY OF THE THESIS

The scenario that resulted in the need of the study has been described in Chapter 1. This chapter started from the implication of the process in the manufacturing field and the descriptions of the two available technologies under FSW i.e. CFSW and BFSW. The aim of the research was to better understand the FSW process and develop the in-house facility to weld different materials. When the research was started it was a challenge to conceive an idea and develop the confidence to join the material in actual sense, because in the beginning instead of welding the material cutting was taking place, hence the aim was focused on parameter variability with functional perspective.

The advantages of the technology were discussed and objective of the research work was defined.

An extensive literature review, as presented in Chapter 2, provides the background of the necessary that is available in the body of literature. Also has discussed in detail the FSW process and the significance of its essential parameters. Suggested factors stated by the researchers were identified. However, focused and depth of the studies was found to be lacking in the area of substrate clamping system, tool features in general and BFSW in specific and corrosion studies of the welded samples. Besides that essential information is also provided to understand the remainder of work and to highlight the current availability of the knowledge and facilities.

The detailed experimental procedures employed in this research work were presented in Chapter 3. The approaches used in achieving the objectives are stated. Although the statistical approach could not be conducted as initially intended, the study has been conducted on individual examination of selected parameters. The reason is because it was found that some of the variables were in poor control and certain variables were yet to be identified, and in such situation a DOE approach would result in unreliable conclusions.

Therefor the steps taken in solving this issue are divided into different sections like tooling which includes clamp design, tool design and their fabrication.

Initially the plan was to work only on CFSW; but after in depth literature review the curiosity arose to study the BFSW also. And hence the experiment was extended to BFSW right from the fixture design, tool design to its fabrication, and execute the process for successful welding using fixed gap bobbin tool.

These also include the various methods of analysis conducted on the welded samples, viz: mechanical testing, metallurgical characterization, and corrosion measurements, and exploration of infrared thermography.

Author's observations, and results and discussion on the bases of testing carried out is presented nicely in Chapter 4. It presents results of tensile test, bend test, hardness test, corrosion measurement, metallurgical characterization and some highlights of IR Thermography.

The outcome of the research work is presented in Chapter 5 with concluding remarks. It also includes scope of future work.