INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: NUMERICAL AND EXPERIMENTAL INVESTIGATIONS FOR ELECTROMAGNETIC CRIMPING AND WELDING OF MULTI-MATERIAL TUBULAR COMPONENTS

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SHORT ABSTRACT

Multi-material components have become necessities of the present time because of their ability to offer benefits of properties of multiple materials such as corrosion-resistant, lightweight, higher strength, and electrical conductivity in one single component. Joining multi-material combinations such as Cu-SS, Cu-Al, Al-Steel, and D9-SS 316LN by conventional fusion welding techniques is difficult due to the difference in their mechanical and physical properties, causing hot cracking; therefore, electromagnetic joining (EMJ), which is based on cold forming can be a viable alternative to conventional fusion welding processes. EMJ offers many advantages in the efficient manufacturing of multi-material components, yet it has not been widely adopted in industries. Therefore, this thesis aims to expand upon various forms of the EMJ process for tubular components to expedite its adaptation.

This current work has traversed through different horizons of EMJ for creating tubular joints. Depending upon resource availability and different application requirements (joint strength and leak tightness), the process can be chosen among electromagnetic crimping (EMC), electromagnetic welding (EMW) and electromagnetically assisted adhesive joining (EAAJ). The current work further explains the effect of various process parameters on these three techniques; various numerical models are developed, which have been validated with experimental results; In a nutshell, a better understanding of the relative standings of these techniques is obtained.