

## SHORT ABSTRACT

In this thesis aluminium alloys AA 6061 and AA 5052 were chosen for studies because of their wide applicability in automotive sector. First a number of experimental studies were carried out with Friction stir welding (*FSW*) process to study weld-ability of these alloys as a different material combination and different thickness Tailor welded blanks (*TWBs*) respectively. Successful welding with optimum welding parameters was found out supported by good mechanical and microstructure results. Like, defect free *TWBs* with different grade combination were obtained by friction stir welding AA5052-*H32* to AA 6061-*T6* in thicknesses of 1 mm and 1.5 mm respectively. The optimum process parameters were found to be tool rotational speed of 1500 rpm and welding speed of 63 mm/min and 98 mm/min. During tensile test welded blanks failed at weld zone near AA 5052 alloy. During welding intermetallic compounds were formed in weld zone which contribute negatively in the fracture strength of the joint.

In second phase formability study of these *TWBs* with Electromagnetic forming (*EMF*) were carried out. Comparative study was done to access formability of base material and *TWBs* by high velocity (*EMF*) process and by conventional quasi-static forming process. Formability was analysed in terms of Limit dome height (*LDH*) test and Forming limit diagram (*FLD*).

In addition, with the help of commercially available *FEM* software *LS Dyna* simulation work was done to predict the failure region in sheet metal during *EM* forming. The simulation result helped in die design and was successfully validated with experiment result.