

# **Experimental Investigation on Friction Stir Welding of HDPE reinforced with SiC and Al and Taguchi Base Optimization**

## **Abstract**

Light weight thermoplastics are the most prominent concerns of manufacturers due to their high performance characteristics in the current trend. Weld strength and weld quality are the performance measures of the thermoplastic materials, and determining the optimum weld parameters is the major research problem. This paper presents the optimization of weld parameters required for friction stir welding (FSW) of silicon carbide and aluminum reinforced in high density polyethylene. The improved mechanical properties of these composites are the resultant effects of the optimum process parameters like welding speed, rotational speed, tilt angle, and percentage of reinforcement; hence it is very essential to determine them and to study their influence on composites weld joint. The experimental analysis was carried out for three levels in each and different combinations of weld parameters in order to measure the tensile strength and hardness. The optimum set of nine experiments was designed based on L9 Taguchi's design. The elicited test results convey that rotation speed of the tool is the most influential weld parameter for tensile strength and weld speed is the most responsible for hardness response of FSW butt joint. The analysis reveals that the added silicon carbide and aluminium particles enhances the ductility and brittle characteristics to base HDPE sheet causing improved weld strength and in turn ensures the weld quality.

**Keywords:** Friction Stir Welding; High Density Polyethylene sheet; Taguchi;