DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that Thesis entitled "SIMULATION OF INERTIA FRICTION WELDING MILD STEEL AND ALUMINIUM USING FINITE ELEMENT METHOD ON ABAQUS" which is submitted by Pushpandra Nimesh (2K14/CDN/13) in partial fulfillment of the requirement for the award of degree M. Tech. in Department of Mechanical Engineering of Delhi Technological University, is a record of the candidate own work carried out by him under my supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree/ certificate in any other institution/university.

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Supervisor

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Supervisor

DATE: 29/07/2016

PLACE: DELHI

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Signature

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DECLARATION

I hereby declare that the thesis entitled "SIMULATION OF INERTIA FRICTION WELDING MILD STEEL AND ALUMINIUM USING FINITE ELEMENT METHOD ON ABAQUS" submitted in mechanical engineering department of Delhi Technological University is my own work. It is further to declare that the matter embodied in thesis is original and has not been submitted for the award of any other degree/ certificate in any other institution/university.

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ABSTRACT

Friction welding is a welding technique involving green technology concept as it makes use of a non-consumable tool to produce coalescence between work-pieces by utilizing heat generated because of friction and plastic deformation at the interface of work-components affecting the formation of weld joint while the material being in solid state. Advantages of frictional welding process are low distortion of weld joint, absence of flash related defects and high strength of weld joints in those alloys and metals that are considered to be Non-Weldable by conventional fusion welding processes. Friction welding process is omitted of filler-induced defects as the inertia friction welding process requires no use of filler material and thus susceptible to hydrogen damage. The technique can be used to produce joints on equipments utilizing traditional machine technologies and it can be used to produce weld between varieties of similar and dissimilar metals and alloys and it can also be used for producing weld joint between metal reinforced composites. Use of friction welded joints leads to a significant reduction in weight and cost savings serving friction welding process as a reusable tool for industrial and manufacturing sectors. Apart from industrial and manufacturing level applications, inertia friction welding process finds its application in field of Navy, Medicinal applications. Friction welding process seems to be a simple process but this is not, instead it is a very complex process as it includes conversion of mechanical energy into thermal energy in form of heat due to frictional rubbing between work-pieces. So prediction of properties of weld formed at interface is difficult. Numerical simulation offers a way to tackle that problem and also a way to increase repeatability of the friction welding process at manufacturing level and also it opens new ways to understand the process's mechanics more efficiently. This thesis works review an introduction toward the friction welding process, work that had been performed in corresponding field and research work needed to be done in the corresponding field on the basis of research gap in the corresponding field. This project works consists of performing inertia friction welding process between mild steel and aluminum 6061 using lathe machine and then performing numerical simulation of the inertia friction welding process using finite element method on ANSYS and ABAQUS and then performing comparison of the data obtained both experimentally and numerically so as to increase the repeatability of the inertia friction welding process.

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