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Development of Fixture for Pipe to Pipe Friction Stir Welding of Dissimilar Materials

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Abstract : Friction Stir Welding is a process in which an FSW tool produces friction heat and thus penetrates through the junction and upon rotation carries out the weld by exchange of material within the 2 metals being welded. It involves holding the workpieces stiff enough to bear the force of the tool moving across the junction to carry out a successful weld. The weld that has flat plates as workpieces, has a quite simpler geometry in terms of fixture holding them. In the case of FSW of pipes, the pipes need to be held firm with the chucks and jaws according to the diameter of the pipes being welded; the FSW tool is then revolved around the pipes to carry out the weld. Machine requires a larger area and it becomes more costly because of such a setup. To carry out the weld on the Milling machine, the newly designed fixture must be set-up on the table of milling machine and must facilitate rotation of pipes by the motor being shafted to one end of the fixture, and the other end automatically rotated because of the rotating jaws held tight enough with the pipes. The set-up has tapered cones as the jaws that would go in the pipes thus holding it with the help of its knurled surface providing the required grip. The process has rotation of pipes with the stationary rotating tool penetrating into the junction. The FSW on pipes in this process requires a very low RPM of pipes to carry out a fine weld and the speed shall change with every combination of material and diameter of pipes, so a variable speed setting motor shall serve the purpose. To withstand the force of the tool, an attachment to the shaft is provided which will be diameter specific that will resist flow of material towards the center during the weld. The welded joint thus carried out will be proper to required standards and specifications. Current industrial requirements state the need of space efficient, cost-friendly and more generalized form of fixtures and set-ups of machines to be put up. The proposed design considers every mentioned factor and thus proves to be positive in the same.

Keywords : force of tool, friction stir welding, milling machine, rotation of pipes, tapered cones
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