Frictional contact in Friction Stir Welding

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ABSTRACT

Friction is one of the major causes of heat generation during Friction Stir Welding (FSW). This phenomenon occurs between tool and the workpiece as the FSW tool rotates and moves forward on the weld line [1-3].

In this work a modified viscoplastic Norton friction model is proposed. This model does not only relate the frictional shear stress to the sliding velocity but also takes into account the axial loading, as this latter has an important role in the process of heat generation. The effect of the rotating tool geometry on the process outcomes is analysed. Additionally, longitudinal and transversal forces and torque are numerically calculated. The effect of the normal pressure is reflected in the obtained forces. In particular, it leads to a more realistic estimation of the transversal and advancing forces.

The proposed model aims at providing the most realistic temperature field with respect to the other available laws. A non-symmetrical temperature distribution appears below the tool affecting the temperature distribution once achieved the steady-state in the entire workpiece being consistent with advancing and retreating zones.

The study shows that the proposed model can provide a better prediction of the forces and temperature during the FSW process.

REFERENCES

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