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Thermocontact Interaction of Bodies of Revolution During Induction Heating

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Transient stress and strain fields in bodies of revolution joined with interference by induction heating are analysed numerically. Axisymmetric quasi-coupled electromagnetic, thermal and thermo-elastic problems are solved taking into account contact interaction of the bodies. Solution is performed by the time-stepping method. Parameters of linearised equations describing all three fields and contact zones are determined by iterative processes. The boundary problems are solved using the finite element method. External actions and boundary conditions are generally time-dependent, material properties depend on temperature. Analysis of fixing and liberation of a drill in a chuck of a drilling machine by induction heating is presented. For the real structure the rational selection of radial interference between the drill and chuck, material properties, duration of heating and cooling, power of inductor, operating time, etc. is performed. It is shown that a conic shape of mounting surfaces is more preferable than the cylindrical one. For example, the arrangement does not lose its serviceability even at small plastic strains in the chuck that it is impermissible for cylindrical mounting surfaces.

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