Abstract

The essence of this research work is to develop a finite element based simulation model of orthogonal cutting process and determine residual stress induced in component. Thermo-mechanical forces generated at tool-chip interface are responsible for metal cutting operation. These forces are induced on surface or sub-surface layer of work piece and tool in the form of residual stress. Experimentally it is quite difficult to get the values of forces and residual stress. Residual stress has considerable effect on life of a component when subjected to fatigue or variable loading. In real time almost all components are machined to get required surface finish and dimensional accuracy. Hence, knowledge about machining induced residual
stress magnitude and its direction will be of great use while designing the component. This can improve life of component and chances of sudden or accidental failure of critical machine parts can be minimized. The current research work is focused on, finite element simulation of orthogonal machining process on different materials and to get magnitude and direction of residual stress induced in work-piece as result of simulation model. To describe work material behavior Johnson-cook material model is used. A fully coupled Thermo-mechanical analysis is developed to realistically simulate the machining process. As a conclusion graphical analysis of residual stress vs machining parameters will be done, from which decision about selection of optimum machining process, to improve component life can be made.

References

- Athulan Vijayaraghavan, Joel D. Gardner, "Comparative Study Of Finite Element Simulation Software", Sponsored by NSF Grant DMI-0300549 – GOALI: Development of
Finite Element based Simulation of Orthogonal Cutting Process to Determine Residual Stress Induced


Index Terms

Computer Science
Applied Sciences
Keywords
Fe-modeling  Ale Formulation  Abaqus  Machining  Simulation  Residual Stress