Applied Mathematics & Information Sciences
An International Journal

http://dx.doi.org/10.18576/amis/110207

Numerical Model of Heat Transfer Coefficient in Hot Stamping Process

*Mohd Ali Hanafiah Shaharudin** *and Zahari Taha*

Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

Received: 7 Jun. 2016, Revised: 21 Feb. 2017, Accepted: 23 Feb. 2017
Published online: 1 Mar. 2017

Abstract: Due to the demands to reducing the gas emissions, energy saving and producing safer vehicles have driven the development of ultra high strength steel. Since the mechanical properties of ultra high strength steel are remarkably high, it has become a major setback for forming process and this has led lead to the development of special forming technique for ultra high strength steel called Hot Stamping. In hot stamping, the ultra high strength steel blank is heated to its austenization temperature of about 900 - 950 °C inside the furnace. Then, the heated blank is transferred to the tool where forming takes place and simultaneously quench the blank inside the tool. As the tool dwells, the microstructure of the blank becomes fully martensite thus giving the final part strength of up to 1500 MPa. In order to have a better understanding of the Hot Stamping Process, a numerical model of heat transfer need to be developed to simulate the temperature changes of the blank as well as validate the heat transfer coefficient (HTC) of the blank and tool contact surface as a function of distance and time. The numerical model is based on the heat transfer at the contact surface between the ultra high strength steel blank (Boron Manganese Steel) and the tool made of Tool Steel (SKD11).

Keywords: Numerical Model of Heat Transfer, Hot Stamping Process, Ultra High Strength Steel