

A novel Fast light Alloys Stamping Technology (FAST) for complex titanium alloy components**Mateusz Kopec^{1,2,a}, Kehuan Wang^{2,3}, Xin Yuan², Liliang Wang², and Zbigniew L. Kowalewski¹**

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Abstract

The traditional hot pressing processes for titanium alloys require simultaneous heating of forming tools and blank within a furnace attached to the press. When the forming tools have a large mass, significant amounts of energy and time are required. A very high temperature, slow strain rate and simultaneous heating of tools and sheet during the process decrease significantly a productivity, and proportionally, increase the production cost of titanium components. FAST (Fast light Alloys Stamping Technology) was proposed to address the technological challenges of hot stamping and to support the multi-material mix for the next-generation vehicles. In this new technology, a titanium alloy blank was heated rapidly to the specified temperature, then formed and quenched immediately in dies at room temperature. The innovation of the FAST technology lies in the precise control of the phase transformation, grain growth and oxidation at elevated temperatures by the combination of tailored initial microstructure, precisely controlled heating, transfer, forming and in-die quenching, which could solve the dilemma discussed above, improve the formability and reduce the springback simultaneously. A novel ‘FAST’ hot stamping process allows to form complex shaped panel components from titanium alloys with an improved forming efficiency by more than 80%.