

# Weight Saving in Complex Steel Forgings using Extrusion and Forging Combination

Mehmet Okan Görtan<sup>1, a)</sup>, Fisun Yazicioglu<sup>2, b)</sup>, Oguz Ozsoy<sup>2, c)</sup>

<sup>1</sup>*Hacettepe University, Beytepe Kampüsü, Makina Mühendisliği Bölümü, 06800 Beytepe / ANKARA / TURKEY*

<sup>2</sup>*Teknorot Automotive Parts Industries, Beyköy / DÜZCE / TURKEY*

<sup>a)</sup>Corresponding author: okangortan@hacettepe.edu.tr

<sup>b)</sup>Fisun.YAZICIOGLU@teknorot.com

<sup>c)</sup>Oguz.OZSOY@teknorot.com

**Abstract.** Closed-die forging with flash is the most common method of bulk metal forming processes. In this processes, two or more dies are pushed towards each other to form a simple billet into a more complex shape. The billet always includes surplus material which flows during forging out of the die cavity through the flash land. This flash ensures complete filling of the forging die cavities. However, flash should be trimmed and discarded after forging operation which requires an additional process and simultaneously results in material waste. In the current study, the potential of extrusion process to generate pre-shape for a forging operation is investigated. A complex ball joint body part of the car suspension system is used as a demonstration element in the study. Material flow and die filling is analyzed using finite element method using Simufact.forming software. Different strategies are tested in the design of extruded pre-shape for forging. In these tests, besides material flow and die filling, contact normal stresses, process forces as well as billet weight are investigated. A test die set is produced to test the simulation results. With the newly designed system, flash ratio could be reduced from 38% to 17%. Moreover, as a result of lower weight of the billet, contact normal stresses between the forging dies and the billet material could be reduced about 24%. This aspect should reduce wear and consequently increase tool life.