# *Testing Automotive Materials at Multiple Deformation Rates for Forming and Crash Simulations*

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***Abstract:***

*Deformation of automotive lightweight materials (particularly steels) is largely rate dependent; nevertheless, stamping and crash simulations are often performed using data obtained at quasi-static rates (< ~0.1 s-1), which fall below the deformation rates associated with stamping operations (~0.1 - 10 s-1), and far below the rates experienced during a crash event (~50 - 500 s-1). This is primarily driven by the difficulty in getting reliable experimental data at multi-strain rates, particularly at the high rates (above 50 s-1). Even when data is obtained at multiple rates, data quality issues are often noted at high speeds, bringing into question the value of performing these tests altogether, and leaving the impression that extrapolating quasi-static data is still an acceptable approach!*

*In this presentation we shed some light on the challenges associated with high rate testing, and show some of the advancements that help in alleviating the issues associated with this type of testing, particularly with the proper use of high speed digital image correlation. We also present the results of detailed experiments performed over the full range of strain rates for several automotive materials to show that reliable and repeatable data can be obtained, to support our material databases and numerical simulations. The results highlight the significance of rate sensitivity and its variation among the various materials.*