

EWI Provides Modeling and Testing for Forming AHSS and Steels

The advanced vehicle concepts for both military and commercial applications require new steels with increased strengths that can enable lighter-weight designs.

The primary thrust for using this type of steel has been driven by the demands for improved passenger safety, vehicle performance, and fuel economy. It has led to an increase in the use of the advanced high-strength steels (AHSS) in the automotive industry.

The AHSS are proving to be much more difficult to form than traditional mild steels. Driven by customer interest, Edison Welding Institute (EWI), Columbus, Ohio, is developing approaches to aid customers with the welding and forming of these AHSS.

One of the key challenges with sheet metal forming is controlling the material's springback. Springback refers to the part shape change due to its elastic recovery after forming. The magnitude of springback depends on the stress-strain distribution across the sheet thickness. Due to their inherent properties, AHSS are much more prone to springback than mild steels.

Prior to cutting forming dies, engineers utilize computer-aided engineering (CAE) models to determine how the metal will perform during the forming process — Fig. 1. Based on these computer models, prototype dies are developed. Due to material variability and an inability to accurately incorporate material properties into the CAE models, several iterations of prototype tools may be necessary as engineers attempt to predict the springback. These challenges can cost manufacturers months of delays and hundreds of thousands of dollars.

As AHSS become more complex, an in-depth knowledge about their properties and the effects of the forming process are becoming more important. Edison Welding Institute has made significant advances in addressing some of the industry's AHSS-forming challenges. Its research has shown that variations in the through-thickness property can lead to errors of 20% in the predicted models. The Institute has developed a numerical prediction methodology to consider these variations in incoming steels. Through physical verification tests, results have shown EWI's predictive models accuracy

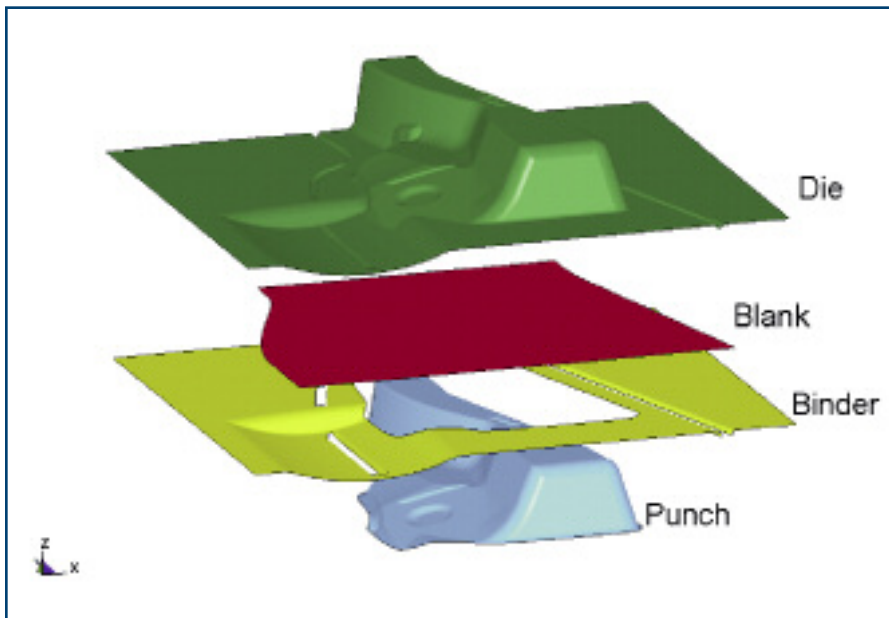




Fig. 1 — Computer-generated stamping model for forming advanced high-strength steels.

in predicting springback, and that there is a way to minimize variations by focusing on the uniformity of through-thickness properties. Along similar lines, EWI has developed innovative nondestructive evaluation methodologies to evaluate the subtle property variations in these AHSS.

The Institute can provide an integrated engineering consultancy to deal with material formability and its effects on weld ability through a modeling and testing simulation capability. This EWI capability was developed through interfaces with commercial software *LS-DYNA* and *Abacus*. Through these tools, EWI customers can accelerate the deployment of AHSS and reduce the expensive experimentation involved in both forming and welding.

For more information on EWI's modeling and testing of AHSS and steels, contact **Jon Jennings** at (614) 688-6144, jon_jennings@ewi.org; or **Suresh Babu** at (614) 688-5206, suresh_babu@ewi.org.

	Operated by 
	The Navy Joining Center 1250 Arthur E. Adams Dr. Columbus, OH 43221 Phone: (614) 688-5010 FAX: (614) 688-5001 e-mail: NJC@ewi.org www: http://www.ewi.org Contact: Larry Brown

Register to Attend

The Friction Stir Welding Technology for Defense Applications Workshop

The third in a series of Friction Stir Welding Workshops will be held Feb. 21, 22, 2007, at Edison Welding Institute in Columbus, Ohio.

This workshop is sponsored by the Navy ManTech Program and Office of Naval Research. It is organized by the Navy Joining Center and Navy Metalworking Center.

This event will provide industry and Department of Defense representatives with the latest advancements in the development and implementation of friction stir welding technology for defense applications.

Due to ITAR restrictions, workshop attendees must be U.S. citizens with an approved DD2345.

For complete information and online registration, visit the News and Events link at www.nmc.ctc.com, or contact **Connie Kotula** at (614) 688-5156, connie_kotula@ewi.org.