

The EWI Forming Center

Hyunok Kim, Technical Director, EWI Forming Center
EWI

Introduction

The EWI Forming Center was established in November of 2012 in collaboration with The Ohio State University's Center for Precision Forming (OSU-CPF). The mission of this unique center is to develop innovative forming processes, tooling, and equipment to increase manufacturing competitiveness. In addition, the Center is focused on providing a technology, knowledge, and training base for industry. The Center's long-term goal is to become the most innovative industry-based forming technology hub in North America.

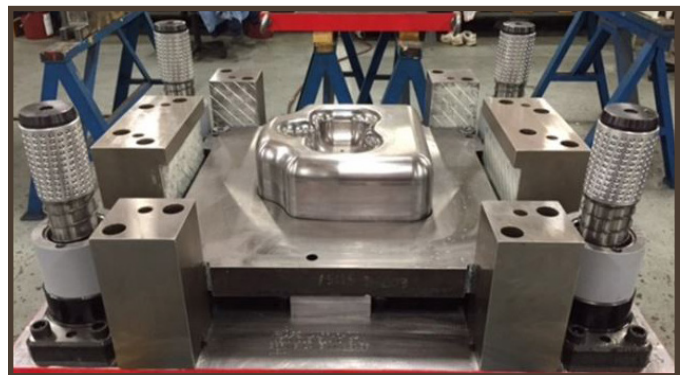
Capabilities

The Center has been expanding its services to help customers optimize designs and materials-forming methods for their specific applications. Forming process simulations are performed with finite element modeling (FEM) codes such as PAM-STAMP, LS-DYNA, DEFORM and ABAQUS, and a 160 ton forming press is used to deliver high-impact material-forming solutions. The Center recently added universal formability test tooling, an in-line monitoring system for hole expansion ratio testing, and an ARGUS 3-D optical strain measurement system. A new manufacturing cell for warm and hot forming tests is also being established. Combining these technologies with EWI's extensive capabilities and expertise in testing, modeling, and simulation-based engineering allows the Center to provide a wide array of practical solutions for stamping and forging applications. Since its creation, the Center has provided services to automotive original equipment manufacturers (OEMs), consumer product OEMs, Tier 1 automotive suppliers, steel and aluminum companies, and lubricant suppliers.

Lightweighting

Driven by the need to improve fuel economy and reduce carbon emissions, automotive OEMs are reducing vehicle weight by using advanced

high-strength steels (AHSS), high-strength aluminum alloys, and magnesium alloys. Advanced technologies have been developed to address the challenges associated with forming these materials, including hot stamping of press-hardened steels, warm and hot forming of 6XXX and 7XXX-series aluminum alloys, and servo-press forming. The Center is using the previously mentioned universal test tooling to evaluate the formability of advanced high-strength steels (AHSS) and aluminum alloys. The in-line monitoring system for hole expansion ratio testing is being used to evaluate edge cracking with AHSS, ultra high-strength steels (UHSS), and aluminum alloys.



Universal formability test tooling available at the EWI Forming Center

Technology Workshops

The Center periodically holds advanced sheet-metal forming technology workshops in coordination with OSU-CPF at EWI's headquarters in Columbus, OH. The most recent of these workshops took place on October 15th, 2015, and focused on advanced sheet-metal forming technologies for lightweighting applications. The event was well-attended, with 80 representatives from 28 companies including automotive OEMs, Tier 1 automotive suppliers, stampers, steel and aluminum companies, forming equipment builders, lubricant suppliers, and members of academia.



Advanced sheet metal forming technology workshop hosted at EWI Forming Center on Oct. 15, 2015

Presenters discussed technical challenges associated with advanced forming technologies and proposed solutions. Presentation topics included:

- *Lightweighting Trends in the US Automotive Industry* by Mark Stevens from The Center for Automotive Research (CAR)
- *Technical Issues and Solutions in Forming Lightweight High-Strength Materials* by Hyunok Kim from The EWI Forming Center
- *Lightweighting - How New Stamping Technologies Can Help* by Professor Taylan Altan from OSU-CPF
- *Evolving Materials and Formability Test Methods for the Modern Lightweight Body Structure* by Jim Dykeman from Honda R&D
- *Next Generation Zn-Coated PHS [press-hardened*

steel] Material & Process by Paul Belanger from Gestamp

- *Automotive Solutions to Lightweighting* by Daniel J Sakkinen from the US Steel Corporation
- *Forming Simulation of Lightweight Metals and Composites* by Professor Farhang Pourboghraat from The Ohio State University
- *Advanced Tooling Technology for Hot Stamping* by Mike Austin from the Diversified Tooling Group
- *The Advantages of Servo Control in Metal Forming* by Darrel Quander, Jr. from Hyson Metal Forming Solutions

In addition to technical presentations, EWI staff moderated an open forum to discuss industry challenges. The diverse group of participants shared their unique perspectives on a variety of topics, including die-less/incremental forming, tooling for low-volume production, the impact of future environmental standards for lubricants, and the need for standards and design expertise for advanced forming processes such as servo-presses.

This workshop was a successful event, allowing subject-matter experts and industry representatives to collaborate as the forming industry faces the significant technical challenges posed by lightweighting initiatives.

For more information on the EWI Forming Center, visit <https://ewi.org/ewi-forming-center/> or contact Dr. Hyunok Kim at hkim@ewi.org or 614.688.5239.

Hyunok Kim brings a diverse background of academic, industry, engineering, research, and teaching experience to his role as Technical Director of the EWI Forming Center. He possesses a comprehensive knowledge of forming technology. His areas of expertise include cold/warm/hot sheet and bulk forming technologies, forming equipment, tribology, simulations, and formability testing/analysis. He has led numerous government- and industry-sponsored research programs of hot and warm forming of automotive and aerospace structures, manufacturing fuel cell components, and shear fracture/edge cracking in stamping advanced high strength steel(AHSS), springback control, and crash modeling of AHSS automotive structure parts.