



EWI Forming Center

EWI Forming Center helps our customers get new products to market by leveraging our expertise in materials formability testing, simulation, and process design.

EWI Forming Center supports the manufacturing industry by providing a technology, knowledge, and training base for process development, simulation, and materials evaluation.

We are equipped with state-of-the-art equipment such as a 300-ton AIDA Servo Press, a 160-ton Minster Hydraulic Press with warm forming capabilities, an Erichsen Universal Sheet Metal Testing Machine, and several inspection/analysis systems that can be used before, during, and after testing to help evaluate material formability.

Our forming simulation toolbox includes the following software packages: ABAQUS, Autoform, DEFORM, Dynaform, LS-DYNA, and PAM-STAMP. These tools significantly enhance our process development and validation capabilities.

Testing capabilities include both standard and specialized formability tests such as biaxial bulge, deep drawing, die galling, edge cracking, springback, and forming limit diagram testing. Tests can be conducted at elevated temperatures when requested.



Aida 300-ton Servo Press

EWI Forming Center Equipment

Aida 300-ton Servo Press

EWI's 300-ton AIDA servo press features full control of the press slide motion, speed, and the 25-ton servo die cushion system. These features can increase productivity, quality, and material formability.

- Bolster area - 1.7-m x 1.2-m
- Maximum daylight - 980 mm
- Maximum slide stroke - 400 mm.

Warm Forming Cell with 160-ton Minster Press

EWI's 160-ton Minster hydraulic press features a 100-ton CNC controlled cushion system. The press is integrated with an infrared furnace and automated linear transfer system that enable warm and hot forming tests at up to 1000 °C.

- Bolster area - 1-m x 1-m
- Maximum daylight - 800 mm
- Maximum slide stroke - 500 mm.



Erichsen Universal Sheet Metal Testing Machine

The Model 145-60 Erichsen Universal Sheet Metal Testing Machine can execute various formability tests very efficiently and precisely. The test machine is capable of a drawing force up to 600 kN and can handle blank diameters up to 220 mm. See below for examples of Erichsen forming tests.

The B2 Erichsen Deep Draw Test

The B2 Erichsen Deep Draw Test helps customers to determine if a material is suitable for deep drawing applications. The limited drawing ratio of a material, which is the maximum achievable ratio between the initial blank diameter and the depth of the drawing punch, is measured using this test.

Erichsen Bulge Test

A material's biaxial yield stress can be determined by means of a Bulge Test. Hydraulic pressure is used to deform the material without any friction. Digital image correlation (DIC) can be used to record the deformation and obtain a stress-strain curve.

Forming Limit Diagram (FLD)

A forming limit diagram is used to predict the sheet material behavior and potential necking failure under different combinations of the major and minor strains. EWI incorporates DIC to measure the strain during testing. A reliable FLD is very important



input data for obtaining accurate results from finite element analysis (FEA) of most sheet metal forming processes.

Limiting Dome Height Test/Half Dome

The Limiting Dome Height (LDH) is defined as the largest depth of cup formed with biaxial stresses and the flanges clamped. The test can be conducted at temperatures up to 550°C and integrated with DIC to record deformation and strain measurements. EWI can test both full or half dome samples. Half dome samples are used for edge formability tests. A DIC system is used to measure the strain and thinning at the onset of edge-cracking.

Hole Expansion Test

Edge formability of a punched hole is evaluated using the ISO 16630 standard Hole Expansion Test (HET). A 10 mm diameter hole is punched at the center of 90-mm square blank and expanded with a 60-degree conical punch until a through-thickness crack appears. The deformation of the hole is recorded using DIC and the first image that captures the through-thickness crack is used to determine the hole expansion ratio.

Additional Formability Tests at EWI

Using EWI's 160-ton hydraulic press, additional formability tests can be performed based on our customer's needs.



Cup Drawing Test

The cup draw test is used to evaluate various wet or dry film lubricants. Compared with other commonly used friction tests, cup drawing emulates realistic friction conditions that exist in stamping operations in terms of pressure and forming speed at the tool-sheet interface. This test uses 305-mm diameter samples and draw depths up to 80 mm.

Viscous Pressure Biaxial Bulge Test

In most stamping processes, the material experiences a biaxial stress condition. This test simultaneously measures the dome height and the viscous pressure used to bulge the sample. The data is used to generate a biaxial stress-strain curve that enhances input data for simulating forming processes (versus a uniaxial stress-strain curve with significant data extrapolation).

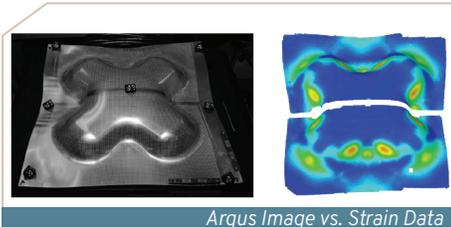




3MA System

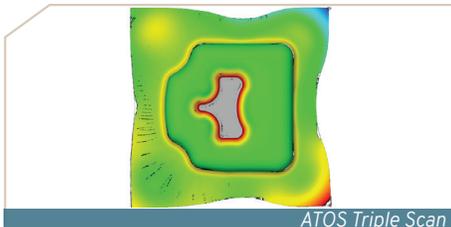
incoming material properties can lead to reduced scrap rates. Using this tool, EWI can provide full calibration, validation, measurements, and recommendations for 3MA applications at our customers' facilities.

ARGUS and ATOS



Argus Image vs. Strain Data

ARGUS is an optical software system that uses photogrammetry to measure an etched pattern on the sheet material. The system delivers major strain, minor strain, and thinning as a 3-D plot of the final part shape. The results provide a 3-D color map of critical areas that could lead to cracking and/or wrinkling issues. A forming limit diagram can be incorporated with the ARGUS data to determine how close the material is to failure.



ATOS Triple Scan

ATOS Triple Scan uses blue light technology to produce a high-resolution 3-D image of a part. The 3-D image is used to compare the geometry, tolerance, and/or springback against a CAD model or simulated part.

Inspection/Analysis Tools

To complement the various formability tests that EWI offers, we have invested in multiple inspection and analysis tools that add value to the testing process and results.

3MA System

3MA is a micromagnetic, non-destructive evaluation (NDE) tool that can measure tensile properties, case depth, coating depth, and residual stress (among other properties) of sheet materials either before or after forming. Detecting variations in

The EWI Advantage

EWI empowers manufacturers to overcome complex manufacturing challenges and integrate new processes to bring products to market more quickly and efficiently. Our specialists offer comprehensive engineering services to help companies identify, develop, and implement the best options for their specific applications. With unmatched expertise, state-of-the-art lab facilities, and technology resources, we offer customized solutions that deliver game-changing results.

Get Started

To find out how EWI can help you develop, qualify, and enhance the quality of your forming capabilities, contact

Hyunok Kim
hkim@ewi.org

(or) 614.688.5239

Laura Zoller
lzoller@ewi.org

(or) 614.688.5283



EWI WORLD HEADQUARTERS

Columbus, Ohio
[614.688.5000](tel:614.688.5000)
info@ewi.org

BUFFALO MANUFACTURING WORKS

Buffalo, New York
[716.710.5500](tel:716.710.5500)
info@buffalomanufacturingworks.com

EWI COLORADO

Loveland, Colorado
[970.635.5100](tel:970.635.5100)
info@ewi.org

For more information regarding our capabilities and services, visit EWI.org

WWW.EWI.ORG→