



We Manufacture Innovation

EWI's New Materials Forming Application Development Capabilities

By [Dr. Hyunok Kim](#), EWI, Applications Engineer, Modeling

New materials forming innovations are enabling manufacturers to achieve greater competitive advantage by improving product performance, quality, and cost. Application of advanced materials and net-shape forming methods can reduce materials usage, weight, manufacturing operations, and cost, while improving structural performance. However, optimization of part designs, forming processes, and tooling designs to achieve these benefits requires an understanding of material formability, forming process parameters, tooling friction and wear, and quality control methods.

EWI has been expanding its capabilities to help customers optimize designs and materials forming methods for specific applications. Our most recent addition is a 160-ton forming press which will be installed this summer to deliver high-impact material forming solutions to our customers. This new capability builds upon EWI's existing extensive capabilities for materials testing and characterization, non-destructive evaluation, as well as forming process modeling and simulation. Together, these capabilities create an incomparable combination of expertise in testing, modeling and simulation-based engineering to provide practical solutions for stamping and forging applications.

Along with the new press, EWI is also acquiring specialized tooling for stamping and forging materials formability and friction evaluation testing, such as:

- Viscous pressure bulge (VPB) testing to evaluate sheet material formability
- Friction and wear testing to evaluate lubricants and coatings for stamping and forging
- Deep draw testing to evaluate the drawability of sheet materials
- Stretch bending testing to evaluate springback and bending fractures

The VPB test, for example, is used to obtain material properties of the sheet, such as a more representative stress-strain curve, under biaxial stretching conditions that are close to stamping conditions. During the test, the dome height and internal pressure are measured simultaneously with a laser sensor and pressure transducer, respectively (Figure 1). These data are used to calculate the stress-strain data. Compared to the tensile test, the VPB test provides a larger range of true stress-strain data with no extrapolation of data up to between 30% and 60% plastic strain for various kinds of sheet materials (Figure 2). The material properties measured at high strains with these tests can significantly improve the accuracy of forming simulations.

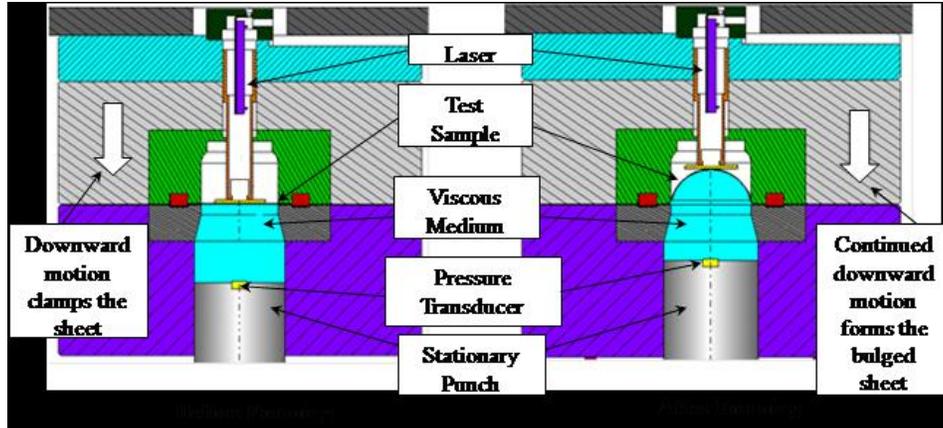
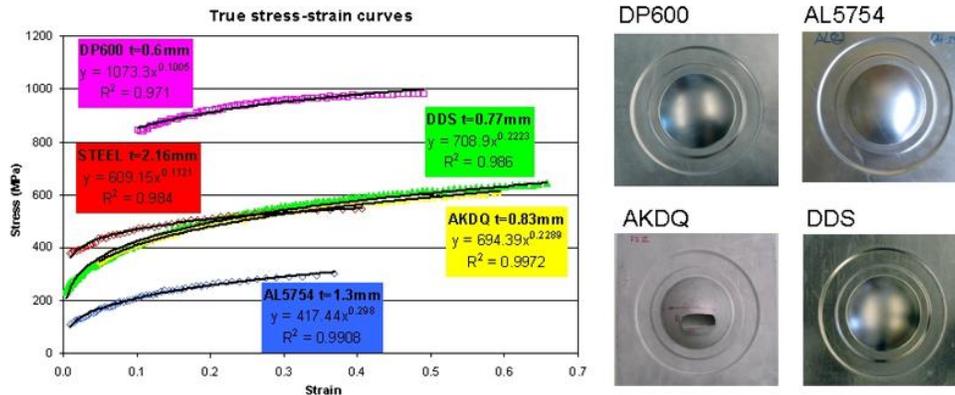


Figure 1. Schematic of VPB Test



Type Figure 2. Comparison of VPB Test Results for Different Materials

Many practical industry problems have been solved by using these testing capabilities. For example, various friction and wear tests, such as the cup drawing and ironing tests, and a strip galling test, have been successfully used to evaluate the performance of lubricants and tool materials/coatings with different steels for a major Japanese automotive OEM and its suppliers. EWI has been actively involved with this project to evaluate the performance of lubricants in welding and corrosion aspects. The customer plans to deploy its selected lubrication system to its stamping plants in North America. With this material forming test capability, EWI expects to duplicate this type of success with other customers.

This new capability will allow EWI to provide a range of services, including:

- Material formability/friction/fracture assessments
- Material properties database development
- Forming simulation and test-based engineering for the design of dies and processes

- Component prototype manufacturing
- Component pilot runs

According to EWI's CTO, Chris Conrardy, "Acquisition of these new forming capabilities is another step towards EWI's plan to build a world-class materials forming application center that complements our joining, inspection, testing, and automation capabilities. This new capability will allow us to provide innovative solutions in an increasingly important allied technology area in fulfillment of our mission to advance our customers' manufacturing competitiveness through innovation in joining and allied technologies."

Learn More

Contact the author, Dr. Hyunok Kim, at hkim@ewi.org or 614.688.5239.

For more information about EWI, visit www.ewi.org, email info@ewi.org, or call 614.688.5000.