0012 Formability Characterization Of A New Generation Of High-Strength Steels

Benefits

- Application of a new generation of high-strength steels with a 25 percent greater strength-to-weight ratio
- Estimated energy savings of 6.8 X 10^{12} British thermal units (Btu) per year based on a reduction of 4,000,000 tons per year of steel production
- Reduction of CO_2, NO_X (as NO_2), SO_X (as SO_2), and particulate emissions
- Energy savings in the transportation industry due to reduction of automobile weight when using the new generation of high-strength steels

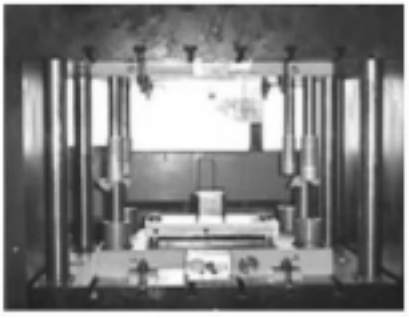
Applications

High strength steels, such as dual phase and TRIP, will find extensive use in the appliance, office furniture, transportation, construction machinery, and modular construction markets.

Research Data Will Ensure Successful Application Of New Generation High-Strength Steels That Have A 25 Percent Greater Strength-To-Weight Ratio

In accordance with the Steel Industry Technology Roadmap, the American Iron and Steel Institute (AISI) in conjunction with the U.S. Department of Energy (DOE), and Ispat Inland Research Laboratories are conducting a two-year project that entails characterizing the formability of new high-strength steels, including dual phase and transformation-induced plasticity (TRIP) steels, that are currently being developed by the North American steel industry.

This project will deliver comprehensive data on the formability of a new generation of high-strength steels, including dual phase and TRIP steels, and will make it possible to evaluate FEA formability methods for both breakage and distortion. The project consists of a series of tests on controlled lots of steel to accurately measure their stretching and drawing characteristics, formability limits, stress-strain, and distortional properties. These data are critical for advanced high-strength steels to compete with current steel and other materials in a variety of flat roll steel markets: appliance, office furniture, transportation, construction machinery, and modular construction. With appropriate property data, technical barriers to the use of these new steel grades is solvable by existing engineering methodologies.



Stretch-draw tooling

Stretch-draw sample

Project Description
Goal: To successfully apply new generation high-strength steels, including dual phase and TRIP steels, based on the generation of quality data on formability.

Project results will characterize the formability of high-strength steels by using a series of simulative tests that provide data on comparative performance, by providing high quality data to evaluate FEA formability methods, for both breakage and distortion (springback, etc.), and by providing more sophisticated stress-strain data as a basis for understanding differences in behavior in the simulative tests and as input for FEA.

It is estimated that 10 lots of steel for skin panel part applications and 30 lots of steel for structural part applications can be evaluated in two years.

The overall energy savings and reductions in related environmental impacts are projected to be approximately 1.2 percent of the current production requirements for the American steel industry. However, the true benefit of these steels is that they will reduce the production requirements of current high-strength steels by 25 percent.

Progress and Milestones
Specifically, the program will include the following tasks:

- Project start date, January 2001.
- Conduct tests on stretching, drawing, and denting.
- Conduct tests on forming limits.
- Conduct tests on stress-strain properties.
- Conduct tests on distortion.
- Project completion date, January 2003.

Total Project Cost/Duration
$651,000/2 years

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