



INDUSTRIAL TECHNOLOGIES PROGRAM

Properties of Galvanized and Galvannealed Advanced, High-Strength Hot Rolled Steels

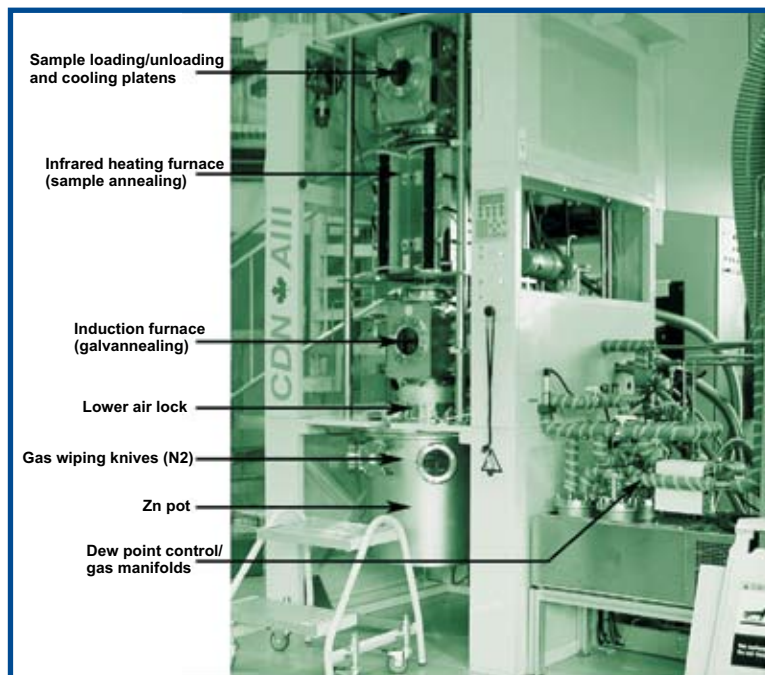
Improvements in Hot Rolled Steel Processing Reduces Need for Cold Rolling

Recent advances in hot rolling technology have enabled the production of hot rolled products with more consistent gauge, shape, profile, and surface quality. These improved hot rolled products are suitable for galvanizing after pickling. This results in large energy and cost savings because finished galvanized strip can be produced without a cold reduction step.

New high-strength hot rolled grades have been developed based on precipitation (HSLA), Dual Phase (DP) and Transformation Induced Plasticity (TRIP) strengthening mechanisms. These grades can be produced with existing thermomechanical processing routes as 1-3 mm hot rolled strip that can achieve target yield strengths of 350 - 600 MPa (50-85

ksi). The improved strength-formability combinations of these grades over those obtained for conventional steels can yield significant performance advantages, such as improved crashworthiness and weight reduction. Consequently, these grades are of great interest to the automotive industry for fabricating front structure components, e.g., rocker panel, engine cradle, and hydroformed engine compartment frames.

Corrosion resistance of these parts can be provided at low cost by hot dip galvanizing. Some grades may also be suitable for closure applications, in which case, a galvannealed zinc coating is required to meet customer's expectations of a high quality painted finish.



Benefits for Our Industry and Our Nation

- Reduces cold rolling process for hot strip mill products
- Improves coating quality
- Eliminates scrap associated with cold rolling
- Saves an estimated 230 billion Btu per year by converting almost 3.5 million tons of cold rolled GI sheet to hot rolled product
- Reduces CO₂ emissions by an estimated 47,000 tons per year

Applications in Our Nation's Industry

The coating process information, formability, and user property data obtained during this project will facilitate the application of advanced high-strength hot rolled sheet steels to industries, such as the automotive industry.

Project Description

Goal: To develop the required coating process information, formability, and user property data for implementation of galvanized and galvanized high strength hot rolled steel in industrial applications such as automotive.

The technical hurdles to overcome in such applications are: (1) achievement of good quality coatings while retaining target mechanical properties, (2) lack of precise knowledge of the behavior of these steels in the various forming operations, and (3) development of accurate user property data in the galvanized conditions.

Progress and Milestones

- Galvanizing simulator trials (complete)
- Formability evaluation
- Fatigue and dynamic tensile strength evaluation

Project Partners

Canada Centre for Mineral and Energy Technology Materials Technology Laboratory (CANMET)
(Lead Research Organization)

McMaster University

McGill University

Noranda, Inc.

Severstal

Stelco, Inc.

US Steel

International Lead Zinc Research Organization (ILZRO)

American Iron and Steel Institute
(Project Manager)

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