

# 9812 Improved Surface Quality of Exposed Automotive Sheet Steels

## Benefits

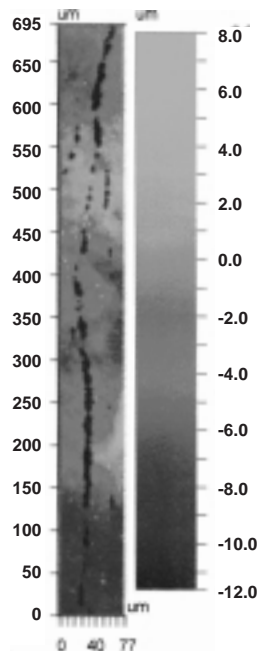
- ❖ Ability to evaluate surface imperfections quantitatively.
- ❖ Improved inspection criteria to make correct decisions on coil disposition leading to fewer internal rejections.
- ❖ Availability of quantitative information to aid in the development of new paint systems, with possible environmental benefits.

## Application

The results of this program when applied for inspection and acceptance criteria, can provide better coil disposition decisions

## Improved Surface Quality Results in Improved Cost, Productivity and Competitiveness

Surface quality in exposed applications (i.e. visible to the final consumer) represents an enormous economic, technical, and operating issue for sheet steel producers. Significant quantities of material are sometimes reapplied by producers to less demanding applications, because of concerns related to surface imperfections. While problems arising during painting at the vehicle assembly plant are increasingly rare due to improved processes and quality assurance procedures in the steel industry, they can be of great inconvenience and concern when they do occur. This project was initiated to develop a methodology to better quantify the geometry of surface imperfections and to understand their evolution during forming and painting. The ability to quantitatively assess the severity of specific surface features is expected to lead to more objective inspection and acceptance criteria. Better coil disposition decisions should thus be possible, resulting in improved quality and delivery as well as cost savings via higher application rates. Furthermore, quantitative understanding of the behavior of different surface features should allow future quality improvement efforts to focus on the highest priority issues.



The image on the left is a color contour plot showing the surface topography of a galvanized-coated sheet steel after straining 10%. The dark feature represents a microcrack from a small region of the coating surface. The vertical scale is indicated in the adjacent color scale.

## Project Description

**Goals:** Surface quality of exposed sheet steels represents an enormous economic, technical, and operating issue for steel producers, and for steel users such as the automobile manufacturers.

The research consists of creating and sampling imperfections on (initially) galvanized surfaces, and carefully characterizing the topography. Changes in the surface are to be measured after forming and painting simulations, and visibility after painting is to be assessed in conjunction with automotive experts. The results will be analyzed to understand the changes which occur during painting and forming, and to determine whether it may be appropriate to consider quantitative inspection criteria.

## Progress and Milestones

- ❖ The project partners have met and agreed upon the objectives and work plans.
- ❖ Additional participants have been contacted from the paint supplier and automotive assembly community, and are now actively supporting the project. Experimental painting procedures have been established.
- ❖ A 3-dimensional optical profiler has been purchased and installed. Two students have begun their studies and are making preliminary surface measurements, and imparting controlled surface features in the laboratory.
- ❖ The next step is to identify industrial sheet surface features and obtain additional samples.
- ❖ By the end of year 2, sample characterization and painting will be completed, and visual evaluations will be done.
- ❖ Lastly, measurements and analysis will be completed and results will be documented and communicated.

## Total Project Cost/Duration

\$340,000/3 years

### Research Organization

Colorado School of Mines (CSM)  
Advanced Steel Processing and  
Products Research Center  
Golden, CO

### Industry Participants

Bethlehem Steel Corporation  
Bethlehem, PA

Dofasco Inc.  
Hamilton, Ontario, Canada

Stelco Inc.  
Hamilton, Ontario, Canada

USX-US Steel Group  
Pittsburgh, PA

### For additional information

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