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**Theoretical and experimental ultrasonic investigation of a thin
plate with regions of different periodic double-corrugations**

Sarah Herbison and Nico Declercq
Georgia Tech Lorraine - G.W. Woodruff School of ME, UMI Georgia Tech - CNRS 2958, 2 rue Marconi,
57070 Metz, France

In order to provide a qualitative measurement of the depth of periodic double-corrugations existing on both sides of a thin plate, theoretical and experimental ultrasonic techniques have been applied. The aesthetic galvanized steel sheets under investigation contain many regions of periodic double-corrugations, each region with a different corrugation depth. An ultrasonic technique is investigated as a means to improve existing optical testing techniques in quality and speed. Theoretical simulations using the theory of diffraction from periodically corrugated surfaces have been employed to obtain reflection spectra to facilitate qualitative observations regarding the depth of the corrugation in the different regions. Experiments to obtain reflection spectra correlate well with the theoretical simulations, and show the application of ultrasound to the qualitative measurement of the corrugation depth. Because the wavelengths necessary to make the investigations produce Lamb waves, some difficulty lies in the generation of diffracted bulk waves and Lamb waves. The research shows that correlations between theory and experiments exist, but they can only be obtained after thorough simulations that do not produce easy to apply rules of thumb.