

## ABSTRACT

PINTO, George Leandro dos Santos. *A Non-Intrusive System for Classifying Severity and Estimating the Depth of Damage Caused by Internal Corrosion Using the Potential Drop Technique and Electrical Mapping with Application of Machine Learning Algorithms and Convolutional Neural Networks*. 97 f. Dissertação (Mestrado em Engenharia Eletrônica) - Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, 2020.

This work presents a non-intrusive method to obtain information about damages caused by internal corrosion in AISI-304 stainless steel plates and to classify them according to their severity. By applying the Potential Drop technique, the mapping of the electric potential gradient is extracted, which is examined by image processing strategies such as operations for enhancement of edges and segmentation. With the use of Finite Element Modeling, simulations were carried out to generate examples of damaged plates, using four classes of defects that can be considered as part of pitting corrosion. The image processing stage acts as an extractor of features that, when presented to different regressors and classifiers, make it possible to know the damage depth estimate and the severity classification respectively. With the Random Forest regressor, the mean absolute error of 0.0575mm was obtained in the estimate of the depth of the defects. Additionally, with the application of a Convolutional Neural Network, the accuracy of 94.84% was achieved in the classification of the severity of the damages.

Keywords: Convolutional neural network; Classification; Regression; Electrical mapping; Potential drop technique; Internal corrosion; Pitting corrosion.