

AUTOMATIC CORROSION DETECTION BY FOCUS VARIATION

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1. ABSTRACT

A crucial task in quality assurance is to identify whether a part that has been exposed to corrosive materials or atmospheres is free of relevant three dimensional surface defects such as pits or scratches. In the following we demonstrate a 3D metrology device which contains special modules for automatic analysis and classification of small scale surface defects. The device uses the focus variation technology to obtain both dense depth data with vertical resolutions down to 10nm and perfectly registered true color information. Although the device can be used for a large variety of different surfaces we focus on special applications that deal with the automatic measurement and classification of corrosive defects. First the surface is scanned laterally and vertically to obtain the depth data and the true color information. Then special filtering stages are performed to restrict the analysis to relevant errors. Afterwards the depth information is analyzed to detect the defects which are then listed in a table together with parameters such as their depth, area or volume. Among additional information, a true color image of the whole surface with all marked defects is created. The measurement system is especially designed to allow fast corrosion analysis over large scan areas up to 100x100mm at high resolution. Examples are provided for different applications including the automatic measurement and classification of corrosions on aluminium plates and on steel cylinders (Fig.1). In the field of corrosion and erosion the system has already been applied to the several applications including crevice corrosion [1] or pitting corrosion [2].

[1] J. H. Payer, U. Landau, X Shan and A. S. Agarwal, "Effect of Crevice Former on Corrosion Damage Propagation", *Corrosion 2006, paper no 06110, Houston, TX: NACE*, (2006)

[2] S. Gnefid, R. Akid, "The Effects of Flow Rate on Pitting Corrosion of DSS2205", *Eurocorr 2008*.

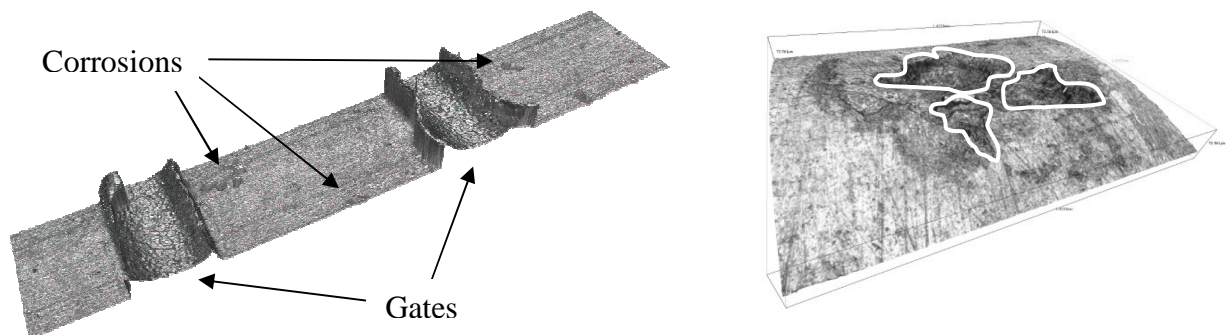


Figure. 1: Left: Detected corrosions on an aluminium plate. Although there are large form deviations (gates) on the surface the system automatically detects the relevant small scale corrosive defects. Right: The system is also able to detect corrosive defects on non-planar objects such as a steel cylinder (detected corrosive defects are marked with white boundaries).