MEASUREMENT APPLICATIONS BASED ON LASER SCANNING HIGH RESOLUTION POLYGONAL MODELS

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Abstract: In this study we have shown the capabilities of 3D laser scanning and the possible computer analysis of the scan data. We have scanned welds and surfaces with corrosion and measured them. The measurement technique consists of comparing scan data and computer generated models. The major advantages over traditional single point measurement are full map of the object and precise representation.

Keyword: 3D laser scanner, measurement, welds, corrosion, large scale point clouds,

1. Introduction

The main idea of the topic is to present the capabilities of laser scanning and the possible measuring applications it can deliver. Laser scanners are capable of making precise digital copy of an object, making possible further computer analysis. In this study we have conducted our tests on welds and surfaces with corrosion.

2. Measurement technique

Laser scanning is a modern and easy way of measurement. It can be way more effective than manual single point measurement. Laser scanner works by shooting a laser (in form of lines) at the target and dedicated sensors capture its reflection. At the same time cameras detect specialized targets (preplaced on the object) and determine the current position of the scanner. The resulted scan data is actually a point cloud, which is converted to a polygon model used for the analysis.

3. Measuring welds

Measuring welds is a complicated matter, as every aspect and part of the weld must comply with the welding standards [2]. Laser scanning is an adequate method of testing the visible shell of the weld. We have scanned few different welds and measured them. The measurement technique consist of comparing the scan data to a computer generated model which is “best fitted” to the scanned data. The used “best fit” function minimizes the sums of squares of distances between the scanned data and the computer generated surface. The computer generated models are planes or cylinders depending on the scanned object (metal plates or pipes). The results of the comparison are shown in color scale.

4. Measuring corrosion

Controlling corrosion level is critical in many fields. By laser scanning we can make a full map of the corrosion and measure its maximum depth. Using the similar technique, like in the case of welding we can get detailed information about the area of the missing material.

5. Conclusion

We can conclude that laser scanning is fast and efficient technic for digital measurement. It can deliver precise representation with large scale point clouds. Another advantage is that scanned data is suitable for various further analyses. The major drawback is the need of expensive equipment.

6. References

2. 5817:2014, Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections