SUCCESS STORY

PSSP
Photonic Sensing for Smarter Processes

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Project

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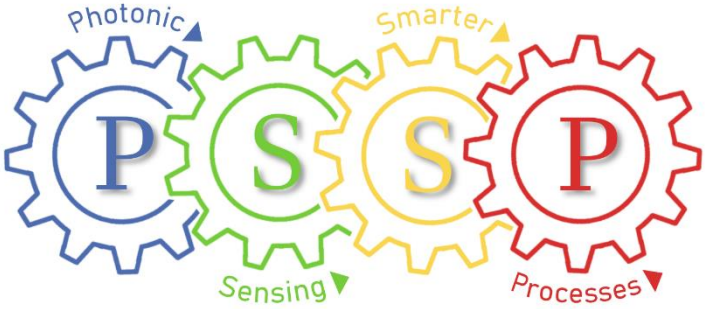

AUTOMATED DEFECT DETECTION – WHAT ARE THE LIMITS?

CHARACTERIZATION OF THE LIMITATIONS OF AN AUTOMATED DEFECT-DETECTION SOFTWARE BASED ON SIMULATED DATA

Computed tomography (CT) has been gaining ground as a non-destructive measurement method in quality assurance since the late 1990s. Since a wide range of wood, plastic, metal and composite materials can be analyzed with CT, it is now used in a wide variety of areas of industrial production. In addition, the advancing automation – including, e.g., the use of loading robots, automatic defect detection software and optimized scan parameters – contributes to the ability to perform more and more scans in less and less time. This enables to check specimens not only on a randomly picked basis, but also in a 100% quality control scheme in serial production. Hand in hand with the advancing automation goes further development of suitable simulation software. Simulation is highly beneficial, especially for parameter optimization in order to shorten scanning times or for the training of an automated defect detection software. Real measurements are often associated with a lot of effort, but the use of simulations can generate a large amount of data – and this with comparatively low effort. This data can then be used to optimize test sequences in quality assurance, e.g., for the training of an automated defect detection software. However, improving a process chain by parameter optimization and training of an automated defect detection software is not the only challenge. When implementing a fully automated process for CT-based inspection and quality assessment, also the following question arises: Where are the limitations of the whole chain when taking into account the physical CT scan as well as the automated defect detection in an intelligent software?

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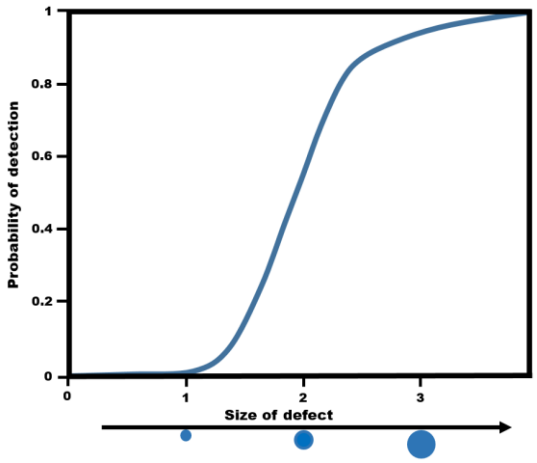
Impacts and Effects

To find an answer to this question, a „Probability of Detection“ (POD) study is very well suited. The result of such a POD study is a graph, which describes the detectability of a defect as a function of its size. In the figure on the right such a graph is schematically displayed – the greater the size of the defect, the greater is the probability of detection. Unfortunately, in order to be able to statistically secure such results, a large number of CT scans is necessary – and this is exactly where simulation can save a lot of effort: starting with the manufacturing of components with precisely characterized defects through to the repeated CT inspection of these various components.

Within the COMET-project PSSP, the FH Wels / University of Applied Sciences in cooperation with the company Nemak Linz GmbH, optimized the simulation software SimCT, which was completely developed by FH Wels. The main new feature is, that the software now can simulate a CT-scan quite exactly as it would have been done in one of Nemak’s computer tomographs. Instead of real components, various digital test specimens with random defects can be generated automatically. The size and position of the defects are chosen randomly in a specified range. Therefore, many different digital test objects with various defects can be generated quickly. Subsequently, the simulated CT scans of these generated digital test samples can be performed in a batch mode – a mode that is also integrated in the simulation software SimCT.



Schematical display of a POD-curve.
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The (1) optimization of the simulation to fit the real CT scan, (2) the generation of different test specimens with random defects and (3) the possibility to perform the simulated CT scans via batch mode will massively reduce the effort to characterize the limits of a whole CT-scan process chain including the CT scan as well as the automated defect detection.

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Project partner

- Nemak Linz GmbH, Austria

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