Optimization of Throughput and Image Quality at CT Scans of Large Parts

Eberhard Neuser[1], Oliver Brunke[2], Alexander Suppes[3]

[1]Engineering, Waygate Technologies, Germany, [1]Product Management, GE Sensing & Inspection Technologies GmbH, Germany, [1]Engineering, GE Sensing & Inspection Technologies GmbH, Germany

For production process control of complex and expensive components, Computed Tomography (CT) becomes the technology of choice for many inspection and metrology tasks, e.g. for automotive castings, aerospace turbine blades or 3D printed parts which by nature have hidden features. A major challenge is the increased cycle time requirement even for large parts combined with high inspection depth which requires improved methods to deal with imaging artefacts. In our paper we will present innovations to overcome the challenges to bring CT to the production floor, including advanced scatter correction technique, x-offset CT and next generation high dynamic X-ray detectors. Scattering of X-rays is main factor for such artefacts in CT. While state of the art scatter reduction simulates scatter based on CAD data or sample's material properties, the new method is really measuring the scatter portion of that specific sample in the CT scanner and minimizes it from the CT result for every individual voxel. In our presentation we will show comparison study results between up to 100 times slower fan beam CT as well as conventional, scatter radiation impacted cone beam CT and advanced scatter reduced cone beam CT. The new method will not only substitute slower fan beam minifocus CT in many inspection and 3D metrology application cases: we will show other case studies where 300 kV microCT scans can now be applied for inspection tasks were normally the investment in more expensive 450 kV high energy CT equipment would be required. A key factor for excellent CT results is the detector performance. We will show the next industrial 16" X-ray detector generation with up to 10x improved efficiency and sensitivity compared to state of the art 200 µm pixel DXR detectors. This allows 2-3x cycle time increase without an image quality impact, allowing fully automated high throughput CT inspection on the production floor. A further challenge for CT manufactures is the increased demand of user to scan bigger and complex shaped parts which require alternative scanning and reconstruction methods beyond standard circular scanning. We will present application examples which demonstrate how these alternative rotation axis offset based scanning methods can improve scanning volume without significant cycle time impact