

Industrial inspection

This application note illustrates the most popular applications for the industrial inspection of metal castings, injection-molded parts, concrete, or any manufactured part requiring quality control.

- Measurements of part porosity.
- Linear or volumetric measurements of key features of interest.
- Wall thickness evaluation.
- Identification of cracks or other unwanted defects.

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Introduction

The industrial inspection of manufactured parts is one of the main applications of X-ray computed tomography (CT). Non-destructive 3D imaging using CT allows quality assurance of parts by the full 3D evaluation of parts, with a unique view into the inside of parts. The method allows the measurement of part porosity, linear or volumetric measurement of key features of interest, wall thickness evaluation and easy identification of cracks or other unwanted defects. The method is often used for quality control for pass/fail decisions on critical parts, and can be used to regularly monitor manufacturing quality, ensuring consistency and reliability of parts. The generated digital record of the part and its evaluation can be useful for traceability and evidence of supplier quality.

Requirements

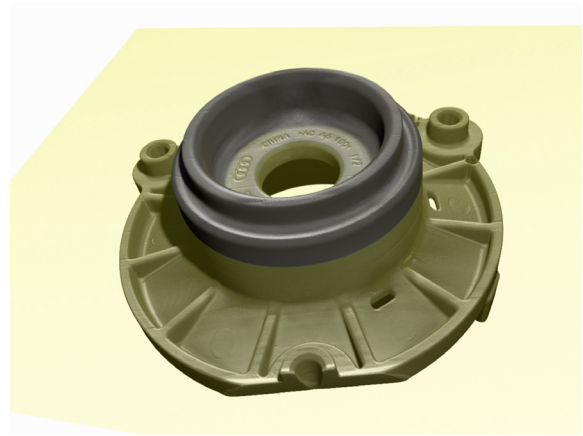
A high-quality CT scan of the part, typically using a laboratory X-ray micro-CT instrument. Image analysis is fully digital, and the actual part is not needed. A computer with Dragonfly 3D World is needed, the data can be any format provided that the voxel size is known (typical is a stack of 16-bit tiff images representing the full volume).

Typical outputs

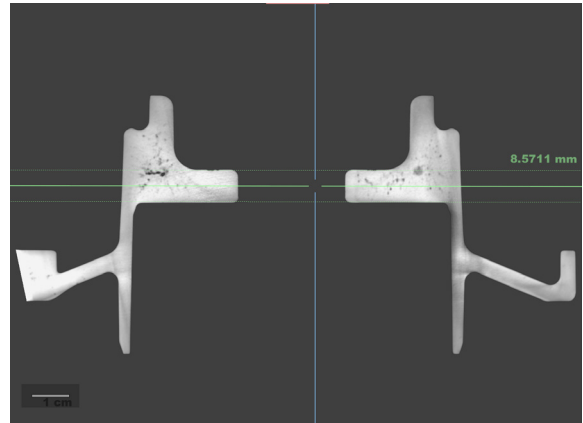
- Porosity analysis: volume fraction in percent; pore size distribution, largest pore size, further pore statistics including aspect ratio, sphericity, and so on as needed.
- Cross sectional images of defects/cracks & highlighting flaws/indications.
- Wall thickness analysis.
- Key dimensional measurements.
- Mesh of real part geometry (STL file).



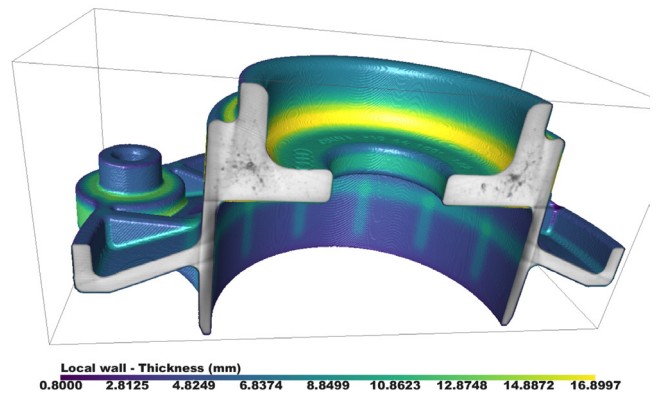
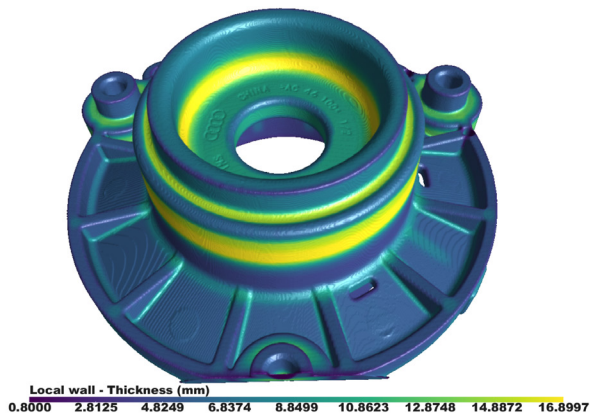
A typical cast metal part evaluated for porosity using Dragonfly 3D World – pores are color coded by size. This porosity is typical for castings - ensuring the size and volume fraction in key areas are below some threshold values assists in quality control.



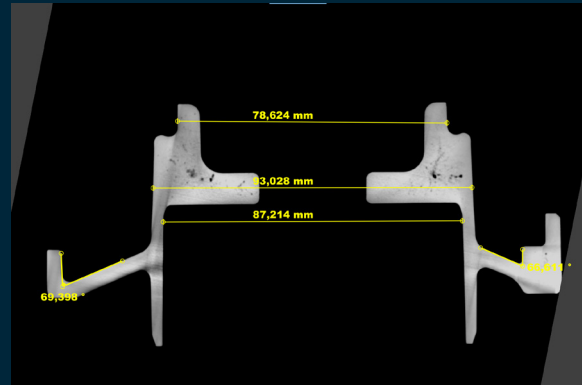
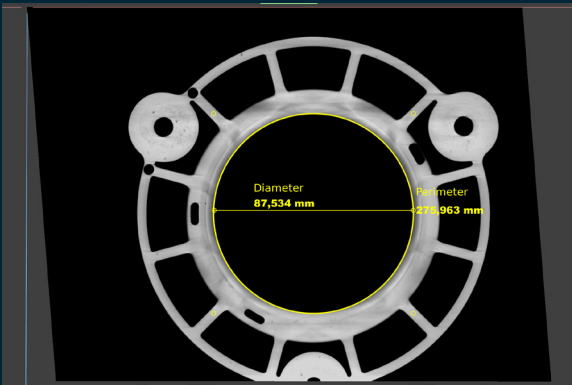
A typical cross-sectional image, contrasted to highlight pores and possible cracks.



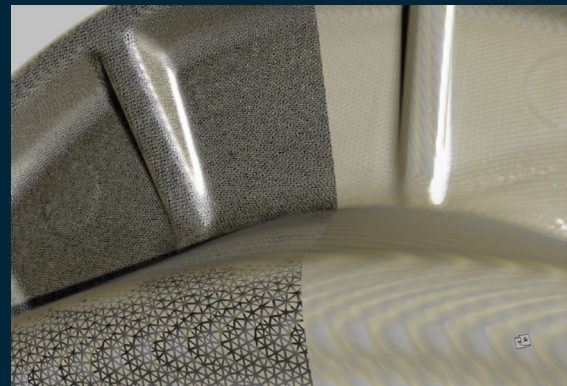
An example of a "thick-slab mode" image highlighting flaws across multiple slices, easing and fast-tracking flaw detection – the image to the right shows the "slab thickness" in a side view.



Wall thickness analysis allows checking for critical walls and feature sizes in an easy workflow.



Linear measurements of specific features of interest allow for quality control.



Mesh generation of the actual part geometry for simplified output.

The benefits

This application note shows some of the most popular applications for the industrial inspection of metal castings. However, the full power of Dragonfly 3D World lies in its advanced functionality, which allows much more than could be demonstrated here. For example, porosity identification in this case was based on a simple thresholding approach, but various custom workflows are also possible depending on the need and application.

The benefits of this for your process is knowledge of the quality of your parts, using a reliable software for data analysis. The workflows in Dragonfly 3D World are fully customizable and open, there are no hidden algorithms or question marks surrounding data analysis. Customization and reporting tools allow faster and better decisions for improving manufacturing processes and in quality control and qualification.

For a video workflow demonstration of the above case:
https://www.youtube.com/watch?v=7-IOCGgo_vk



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