

CT Scanner Facility

MicroCT analysis applications series

Tech note **1** Metal casting porosity/inclusion analysis

By Dr Anton du Plessis



Introduction

Metal castings often contain porosity to varying degrees. The amount of porosity present can vary depending on the mould geometry, inlet size and injection velocity, metal type and cooling rate, amongst others. Nondestructive testing of castings is routine to check for major flaws, however this becomes difficult for complex parts and lacks contrast on some types of defects. A much more clear view of such defects is found by microCT and is demonstrated in this tech note. With the increasing availability of lab facilities for microCT testing, this is now becoming a viable option with much better results than traditional testing. Here we demonstrate some typical results for light metals and discuss limitations and practical considerations to best make use of this method.



Example 1: casting porosity analysis

This part shown in Figure 1, approx. 100 mm in length, was subjected to a microCT scan, the data reconstructed and porosity analysis performed.

The results can be viewed as slice images (virtual cutting the object in any orientation) or the identified pores can be colour-coded by size and viewed in 3D, to see the extent and 3D orientation of the pores.

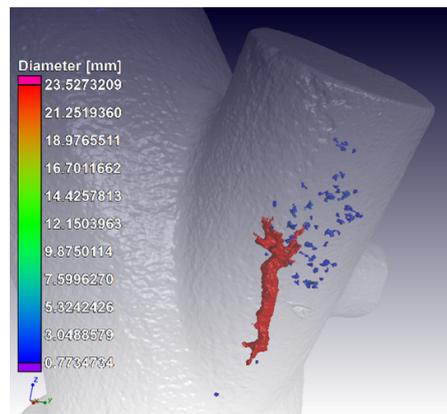
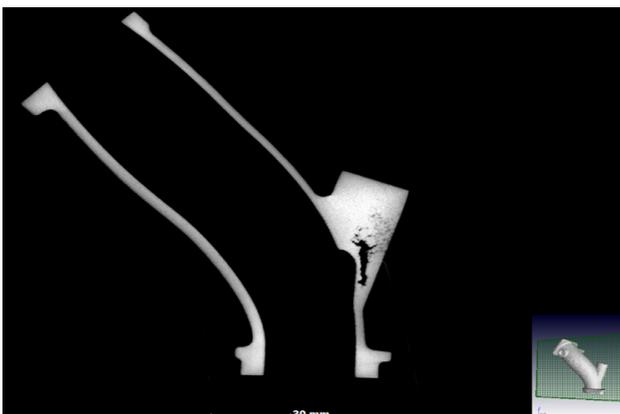
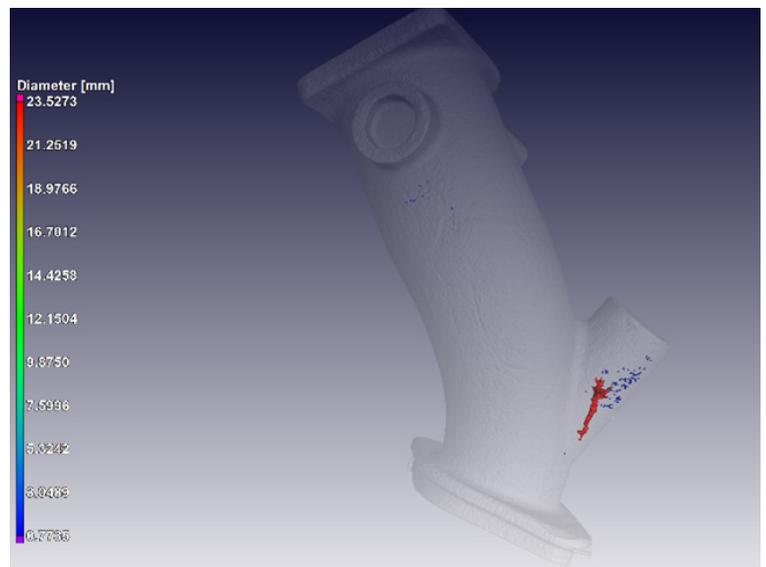


Figure 1: Light metal casting microCT scan slice image shows porosity as black area (top) and 3D view with colour coding – diameter refers to longest axis of pore

Example 2: casting inclusion analysis

Unlike pore spaces which appear black in CT scans, dense particles or inclusions can easily be visualized as they appear very bright in slice images. This is demonstrated in Figure 2.

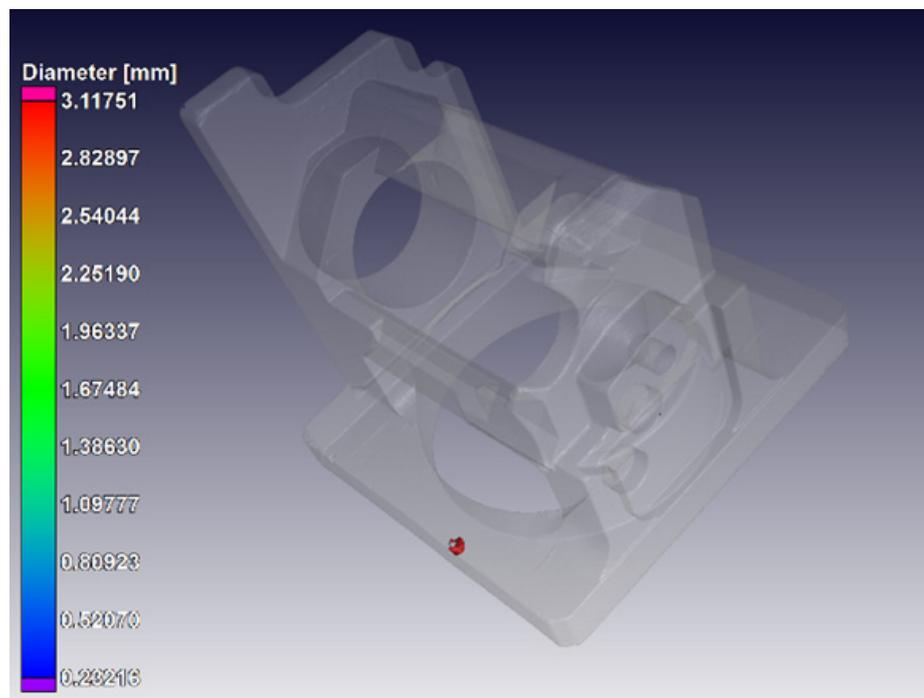
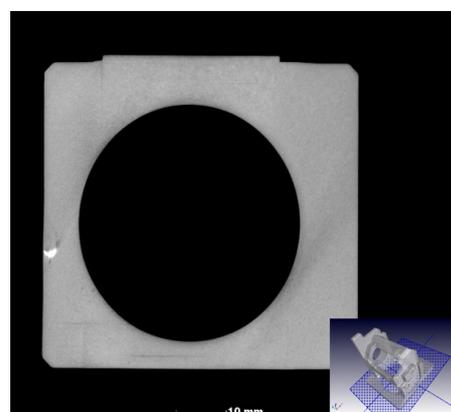
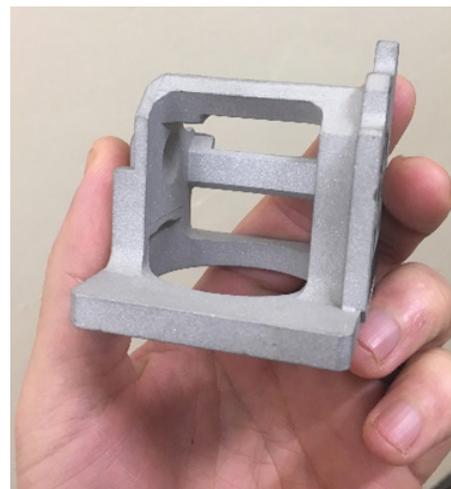


Figure 2: Inclusion analysis in casting – bright white area in slice image – viewing location and size in 3D with colour coding on size



Limitations?

Limitations on maximum X-ray penetration – typically samples should be smaller than 150 mm for light metals and 50 mm for steels and similar. This is a grey area depending on part complexity and total material to be penetrated. Total material penetration limits for plastics, wood: 200 mm, titanium alloys and lighter metals: 40 mm; steel: 10 mm. Basically a poor scan will also show problems but not as beautiful as above.

How to go about it

Send your samples or bring it in. For a routine scan and basic analysis as above, we now (2017) charge R3050 per sample incl VAT. For >10 samples, 7% discount. This includes images and a video of every sample, plus porosity/inclusion analysis automated report. Reduced rates for student research projects at South African universities. International rates US\$ 200 per sample.

Full data can also be provided at additional cost with free viewer software. We use Volume Graphics VGStudioMax 3.0, and myVGL viewer.

SAMPLE SHIPPING AND FORMAL QUOTES

Dr Anton du Plessis
CT Facility
PO Sauer building
Bosman Rd
Stellenbosch
7602

SOUTH AFRICA

Anton2@sun.ac.za

+27 (0)21 808 9389

www.sun.ac.za/ctscanner

For more info on image analysis check our youtube channel (click here)

YouTube