Only a Shadow

Industrial Computed Tomography Investigation, and Method development, Concerning Complex Material Systems

av

Anton Jansson

Akademisk avhandling

Avhandling för licentiatexamen i maskinteknik, som kommer att diskuteras offentligt
Torsdag den 19 Januari 2017 kl. 13.15,
Hörsal M (HSM), Örebro universitet, Örebro

Diskussionsledare: Dr. Peter Hammersberg
Chalmers tekniska högskola
Göteborg, Sverige
Abstract


The complexity of components fabricated in today's industry is ever increasing. This increase is partly due to market pressure but it is also a result from progress in fabrication technologies that opens up new possibilities. The increased use of additive manufacturing and multi-material systems, especially, has driven the complexity of parts to new heights. The new complex material systems brings benefits in many areas such as; mechanical properties, weight optimisation, and sustainability. However, the increased complexity also makes material integrity investigations and dimensional control more difficult. In additive manufacturing, for example, internal features can be fabricated which cannot be seen or measured with conventional tools. There is thus a need for non-destructive inspection methods that can measure these geometries. Such a method is X-ray computed tomography. Computed tomography utilizes the X-rays ability to penetrate material to create 3D digital volumes of components. Measurements and material investigations can be performed in these volumes without any damage to the investigated component. However, computed tomography in material science is still not a fully mature method and there are many uncertainties associated with the investigation technique. In the work presented in this thesis geometries fabricated by various additive manufacturing processes have been investigated using computed tomography. Also in this work, a dual-energy computed tomography tool has been developed with the aim to increase the measurement consistency of computed tomography when investigating complex geometries and material combinations.

Keywords: Computed tomography, additive manufacturing, dual-energy, material inspection, complex material systems, measurement consistency.