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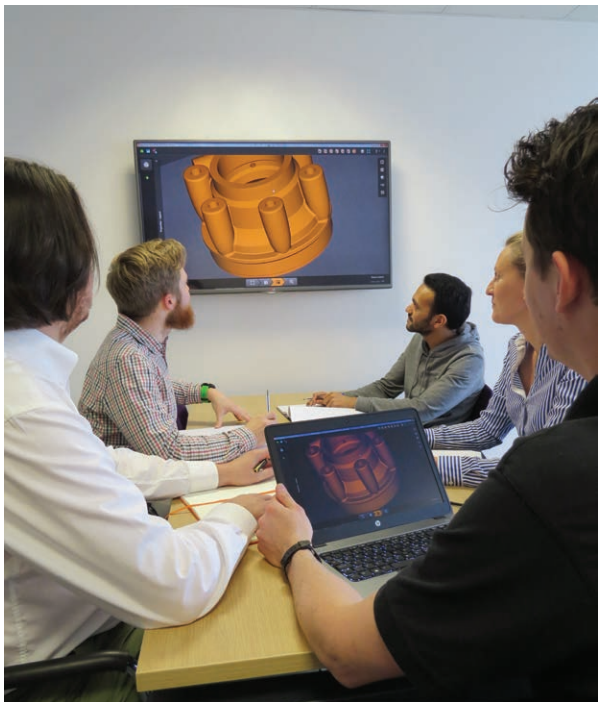
Training course: Additive manufacturing design essentials

Overview

Additive manufacturing (AM) gives the designer tremendous freedom to create components with free-form and intricate features; designs which would be impractical, if not impossible, to produce conventionally. AM components are often lighter, more efficient and better adapted to their application than those produced conventionally.



Introduction

To create successful AM components there are a number of design considerations which need to be understood and embodied in the design for it to gain the maximum advantage from AM.

An example of this is a component designed with overhanging features which will require sacrificial supports to enable it to be built successfully. These supports increase the build time, consume extra materials, require extra energy and necessitate additional post-processing for their removal. By optimising the design, orientation and layout of the build the number of supports can be reduced and savings of time, energy and materials can be achieved.

The AM design essentials training course is ideal if you want to optimise your designs for AM and maximise the benefits of AM for your application.

Course specification

Course detail	Value
Duration	One day
Attendance	Up to ten students
Location	Renishaw facility or customer site (by arrangement)
Service code	CS-TRA-SOFT-14-DT1

The course is aimed at designers intending to manufacture items using Renishaw metal additive manufacturing (AM) systems.

This essentials course covers the general rules for additive manufacturing design with metal powders. Each design should be considered on its own merits. Some understanding of applications is required in order to make educated design choices.

To assist you further in your journey towards AM, Renishaw also offers a range of training courses including subjects such as AM systems, QuantAM build preparation software and material process parameter development.

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Course objectives

At the end of this course you will be able to:

- Identify good orientation attributes for build success and the best orientation for details
- Understand the purpose of support material and the different ways that supports can be applied to designs
- Apply appropriate machining stock to your design
- Allow adequate clearance between features and parts on the build plate
- Understand how hollow designs should be approached

At the end of this course you will have an appreciation of:

- The guidelines for thin walls in metal AM design
- The basics for part optimisation for topology, orientation and weight
- An introduction to the fundamentals of lattice and mesh structures
- Build options such as hybrid supports and additional protective structures
- The limitations of data
- Factors such as residual stress, build height, process parameters and laser on-time that may affect the success of your build
- Post-process activities that may impact on your design choices

Course topics

Design data quality
- Formats for design model transfer and their limitations

Residual stress and design
- Causes and impacts of residual stress in AM builds.

Machining stock
- Machining of critical surfaces
- Work-holding and fixturing features

Detail features
- Minimum gaps and features sizes
- Surface finish
- Holes, tubes and channels

Optimisation
- Topological and build orientation optimisation
- Optimisation for post-processing

Clearance
- Clearance between parts and design of moving parts

Orientation
- Impact of orientation on build time and residual stress
- Orientation selection to minimise supports
- Orientation of features for optimal precision
- Orientation relative to the recoater

Supports
- Support purposes – tie downs and heat sinks
- Primary and secondary support design
- Additive manufacturing design to avoid supports
- Support design guidelines

Wall thickness
- Spot size and wall thickness
- Tall, angled and overhanging walls
- Supports for walls and overhangs

Hollow parts
- Hollow part design to minimise supports and facilitate powder removal

Case studies
- Presentation of case studies where optimising a design for AM has brought significant benefits

For worldwide contact details, visit www.renishaw.com/contact

Issued: 07.2017

H-5800-3915-01-A