WOHLERS ASSOCIATES

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Three-Day DfAM Course Outline

Hands-on exercises Presentations/discussions

Day 1		
8:30-8:45	Introduction	Introduction to the course and participants.
8:45-9:15	State of the AM industry	Recent AM growth trends and developments around the world.
9:15-10:15	Introduction to design for AM	Benefits of AM in the context of DfAM, how AM is being applied, and how certain parts can be designed for AM.
10:15-10:45	Break	
10:45-11:15	Thinking DfAM Economics of AM	The thought processes behind DfAM and the economics of AM. When does it make sense to use AM for production quantities? What determines AM costs and how are parts designed to minimize expenses?
11:15-12:00	AM design optimization exercise	Optimize a part to be printed with minimal or no support material. In this exercise, participants will design a hydraulic manifold while considering print orientation and support material.
12:00-12:45	Lunch	
12:45-1:15	AM design exercise	Finish redesign of manifold so it is ready for printing.
1:15-2:15	Designing for polymer AM processes	Specific issues and design guidelines surrounding polymer AM (material extrusion, powder bed fusion, vat photopolymerization, etc.) and post-processing.
2:15-2:45	Break	
2:45-3:00	3D scanning	The ins and outs of laser scanning, CT, and other methods.
3:00-4:00	Design for mass-customization exercise	Hands-on exercise to design a custom product using a combination of CAD, 3D scanning, and STL editing software. This exercise introduces attendees to working with multiple software tools to produce custom parts optimized for AM.
Day 2		
8:30-9:45	Designing for metal AM	Specific issues and guidelines around designing for metal AM, including anisotropy, process constraints, general guidelines on wall thickness, hole sizes, tolerances, and angles. A close look at metal AM post-processing and material properties.
9:45-10:15	Stress reduction exercise	Redesigning a clamp to minimise the amount of residual stress that might otherwise cause a print to fail.
10:15-10:45	Break	
10:45-12:00	Lattice structures exercise	A solid part is transformed into a shell filled with a lattice structure. This exercise will first be done using Magics and

		then repeated using nTopology as an introduction to the thought process behind the software.
12:00-12:45	Lunch	
12:45-1:45	Post-processing	Understanding various methods of post-processing AM parts.
1:45-2:15	Part consolidation exercise	Hands-on exercise on the implications of part consolidation for AM.
2:15-2:45	Break	
2:45-4:00	Computational design	Intro to implicit modeling and exercise on designing a heat exchanger with nTopology.
Day 3		
8:30-10:00	Company visits	Visit local companies to see their AM facilities and remove participant-designed parts from machines and post-process them.
10:00-10:30	Break	
10:30-11:00	Tooling applications of AM	AM beyond direct part production: Tools for injection-molding, sheet-metal forming, cutting and drilling, extrusion, and jigs and fixtures. Adding fixtures to parts to ease mounting on CNC machines for more efficient post-processing.
11:00-12:30	DfAM expert panel session	A group of DfAM experts offer opinions and experiences and answer questions from participants.
12:30-1:00	Lunch	
1:00-1:45	Topology optimization	Designing topology-optimized parts for AM and creating light-weight parts using the Inspire software. The workflow of topology optimization, setting up multiple load-cases, and using the generated ideas to produce a final design.
1:45-2:15	Break	
2:15-3:15	AM in the future	Where AM and design software tools are headed in the future and how they may impact DfAM.
3:15-3:45	Conclusion	Closing comments and distribution of certificates of completion.

DfAM
Design for Additive Manufacturing