Course Syllabus

Design & Optimization for 3D Sand Printing

Course Code	CEUs
8-315	1.2 CEUs

Course Introduction

There are many advantages to the use of 3D sand printing of molds and cores, especially when it comes to casting design, and the technology is being rapidly adopted in all sectors. This course focuses on designing castings for the 3D sand printing process, as well as optimizing existing designs to take advantage of the unique capabilities afforded. Topics covered include the advantages and limitations to the process; when to use the process; and important considerations such as communication, storage and handling of cores and molds, gating design and the use of simulation, file formats, and key features allowable. Case studies will be used throughout the course.

Benefits to Taking the Course: Attendees will walk away with concreate ideas for cost reduction of core assemblies via core integration, reduction of lead-times and prototyping costs, potentially eliminating costs for pattern and tooling storage and maintenance, and assessing the breakeven point between the technology and part volume. Participants will be able to talk intelligently, cut through the hype about the subject and be the answer person in their organization on 3DPS technology applications to get castings made faster, more accurately, and with less scrap.

Learning Outcomes

1. Describe the various additive manufacturing techniques used in metalcasting.
2. Describe the 3D sand printing process.
3. List the process considerations for casting quality.
4. Describe cost implications of the process and their advantages/disadvantages.
5. Identify the optimal type of parts for the process.
6. List the design considerations for casting quality.
7. Identify methods in which to improve designs.
8. Describe the role of casting process simulation.

Lesson Outline

- Module 1: Welcome & Introductions
- Module 2: 3DP Overview
  - Lesson 1: What is Additive Manufacturing (AM)?
  - Lesson 2: 7 Types of AM (7 types)
  - Lesson 3: Benefits of AM
- Module 3: 3D Sand Printing
  - Lesson 1: Comparing 3DSP to traditional sand casting
  - Lesson 2: Cost & Time Implications
  - Lesson 3: Considerations and limitations
- Module 4: 3D Sand Printing Process
  - Lesson 1: How 3DSPworks (process steps)
  - Lesson 2: Equipment and materials
  - Lesson 3: Part handling
- Module 5: Producing Castings with 3DSP Molds & Cores
  - Lesson 1: Mold and core types
  - Lesson 2: Mold assembly
  - Lesson 3: Casting with 3DSP molds and cores

Module 6: Designing for 3DSP
- Lesson 1: Design process
- Lesson 2: Design as a tool
- Lesson 3: Casting process modeling

Module 7: Optimization
- Lesson 1: Improving part designs
- Lesson 2: Communication between service bureaus, customers, pattern shops, etc.
- Lesson 3: Quality and defects

Module 8: Putting it to work
- Case studies- part optimization

Instructional Methods:

- Class discussion
- Group activities
- Individual problem solving
- Case studies
- Videos
- Physical examples
- Simulations

Assessment Methods:

No formal assessment will take place in this course; however, attendees will participate in informal activities such as knowledge check and Q&A sessions with the facilitator to verify that learning outcomes are being met. Assessment of successful achievement of learning outcomes must be included throughout the course in order to meet the ANSI/IACET 1-2013 standard for continuing education programs and for CEUs to be awarded.

Recommended Course Prerequisites:

- *Introduction to Metalcasting* (Institute course)
- *Casting Design* (Institute course)

Attendee Requirements to Earn CEUs:

1. Present at least 11 hours of the total 12 hours of instructional time (90%), which does not include meals or breaks.
2. Active participation (can include asking questions, communicating with other attendees during and taking part in group activities, providing responses during whole class or group discussions).
3. Successful achievement of learning outcomes.

Who Should Attend?

The target audience for this course consists of individuals responsible for:

- Design engineers
- Tooling engineers
- Foundry engineers