TOUR-torial: Fundamentals of Additive Manufacturing for Ocean Applications

(Approved for 3 Professional Development Hours)

Instructors: Solid Concepts Staff, Host: Dan Searle

IMPORTANT NOTE: This TOUR-torial will be held offsite of the Oceans2013 conference, at the San Diego plant of Solid Concepts. A bus will be leaving from the front of the Town & Country Convention Center at 0830, 30 minutes before the morning Tutorials begin. The bus will return by 12:30, allowing attendees time to have lunch and attend the afternoon tutorials. Local attendees may drive their own cars and meet at the plant.

Overview

The offshore industry general doesn't often have the large manufacturing volumes that justify the expense of the steel tooling needed for mass production. Are we out of luck then for custom or prototype plastic or metal parts? Are we missing out on first article inspection or refinement of design? Actually, no, we're not.

Designers of low volume systems have access to rapid prototyping, direct digital manufacturing, and short-run production services in plastic, metals, and urethanes supported by a network of facilities around the U.S.

This seminar will be a hands-on, in-depth technical presentation including custom parts, tooling, injection molding, and other processes for prototyping and low volume production of plastic and metal components directly from design data. More traditional 5-axis CNC and vacuum bag composite processes will also be shown. A plant tour of active machines and in-process work will follow the lecture.

One process to be shown, Direct Metal Laser Sintering (DMLS) makes 3D parts with nearly perfect density using SS 17-4 PH, Inconel 625, or Titanium 6-4, all of particular importance to ocean engineers.

Attendees will handle examples from PolyJet, high-precision 3D printing, Stereolithography (SLA) models and patterns, Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DLS), and more.

The half-day course will cover:

1. Additive Manufacturing – An application matrix compares the complementary strengths of the different 3D printing technologies, including:

    a. Stereolithography (SLA)
        1. Process
        2. Resolution

3. Minimum feature size
4. Limitations of Process
    i. Materials
    ii. Use in prototypes and Production
5. Master Patterns
6. Quick cast patterns
7. ID Light parts

b. PolyJet
1. Process
2. Resolution
3. Minimum feature size
4. Limitations of Process
    i. Materials
    ii. Use in prototypes
    iii. Master Patterns

c. Selective Laser Sintering (SLS)
1. Process
2. Resolution
3. Minimum feature size
4. Limitations of Process
    i. Materials
    ii. Use in prototypes and production
    iii. Unique characteristics
5.Conformable gas tanks etc

d. Fused Deposition Modeling (FDM)
1. Process
2. Resolution
3. Minimum feature size
4. Limitations of Process
    i. Material Available
    ii. Use in prototypes and production
    iii. Unique characteristics
5. Mimic sheet metal etc

e. Z- Corp Color 3D Prints
1. Process
2. Resolution
3. Minimum feature size
4. Limitations of Process
    i. Materials
    ii. Use in prototypes

f. Direct Metal Laser Sintering (DMLS)
    1. Process– Printing Metal
    2. Metal options
    3. Resolution
    4. Minimum feature size
    5. Limitations of Process
        i. Pros/Cons – When to use it vs. CNC

2. Cast Urethane
    a. Process
    b. Resolution
    c. Minimum feature size
    d. Utilizing combined technologies for achieving higher tolerances
        1. Over molding
    e. Metal inserts
        1. Tubular metal to create unique strong shapes
        2. Support structures - sheet metal or SS mesh, etc
    f. Soft /Hard Durometer
        1. Rotational molding
        2. Production with Urethane
    g. Unique niches
        1. UL 94 VO Materials
        2. MRI – Transparent Materials
        3. Suspending metal in Urethane for shielding – blocking x-ray
        4. Inserts molded in place
        5. Anatomical – Medical niche
        6. How urethane can save thousands when going to Injection Molding

3. Subtractive Manufacturing
    a.CNC
    b. Master Patterns
    c. 5-AxisCNC

4. Composites
    a. Hand Layup – FRP (fiberglass reinforced Plastics)
    b. RTM – Resin Transfer Molding – production parts – parts that this technology works for

5. Tooling and Injection Molding
    a. Basics
    b. Process

Your instructors will be senior project engineers of Solid Concepts with decades of experience in additive and rapid manufacturing.

Solid Concepts, founded in 1991, has 22 years of experience in additive manufacturing. It has expended to 7 manufacturing facilities in the U.S. with 190,000 square feet of manufacturing space.The privately held company has $54M+ in annual sales, and 300+ employees. It has made 218,000 prototype parts, including 52,000 in short run production parts (1-100 units). It has created 5.3 million injection molded parts.

Solid Concepts operates 77+ additive manufacturing machines, with over 50 material options for prototype fabrication.

NOTE:

0830: Bus departs Town & Country Convention Center for local factory
TOUR-torial: 0900-1200
Return to Town & Country Convention Center by 12:30.

To be held at:

Solid Concepts
12250 Kirkham Road, Unit E
Poway, CA 92064
http://www.solidconcepts.com/

INCLUDED: Course notes, refreshments, transportation.

Proceeds benefit the Society of Manufacturing Engineers, San Diego Chapter 44.