

A spotlight effect is shown in the top right corner, casting a beam of light downwards towards the title text.

# *SPOTLIGHT ON:* INTRO TO 3D PRINTING

Intermountain 3D Inc

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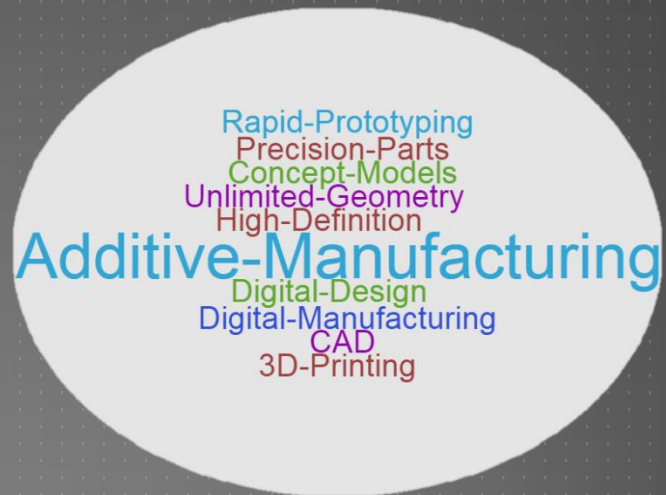
Intro to 3D Printing

# PART 1: OVERVIEW



# UNDERSTANDING 3D PRINTING

Many words are used to describe 3D printing, but what is it really? How does it actually work? How does it differ from traditional manufacturing? Who uses it, and why? We will explore some of these ideas in this overview of 3D printing.



# 3D PRINTING: A DEFINITION

A **manufacturing process**  
that builds **layer by layer**  
to create a 3-dimensional **solid object**  
from a **digital model**

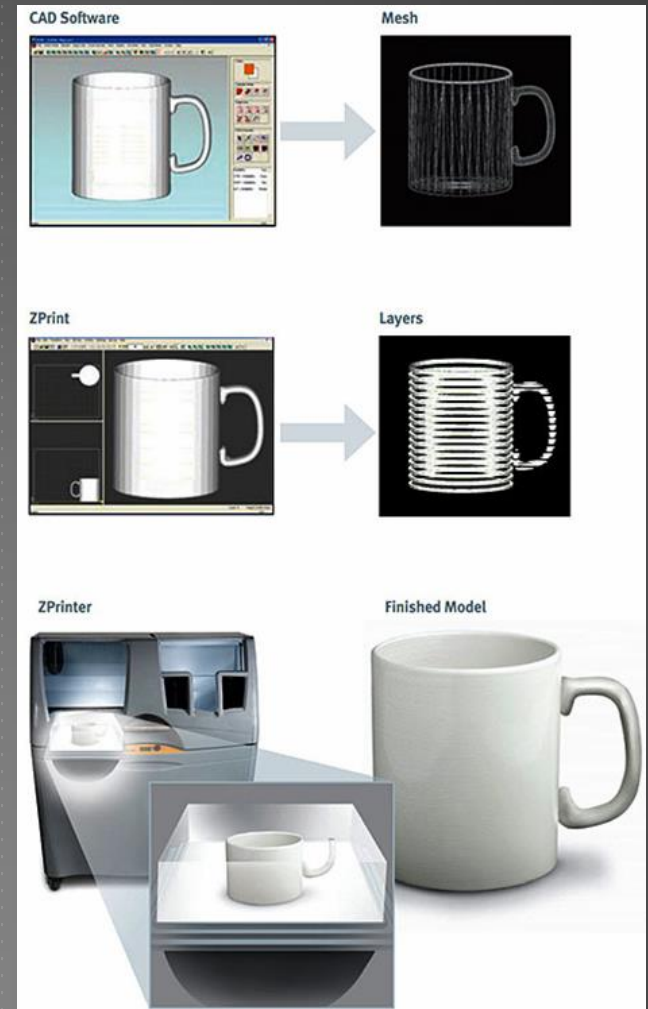


Photo credit: 3D Systems Inc

# ADDITIVE AND SUBTRACTIVE MANUFACTURING

## Traditional vs 3D printing

- ▶ There are many techniques used in traditional manufacturing, many of which employ a subtractive process, eliminating material in a sequential fashion
- ▶ 3D printing is an additive process, adding material in a sequential fashion

## An art world comparison

- ▶ Sculpture is created using both additive and subtractive techniques
- ▶ Carving subtracts material from a block
- ▶ Modeling adds material to a form

# CARVING: A SUBTRACTIVE PROCESS



[www.finearttips.com](http://www.finearttips.com) with Lori McNee

# MODELING: AN ADDITIVE PROCESS



# OR PUT ANOTHER WAY:



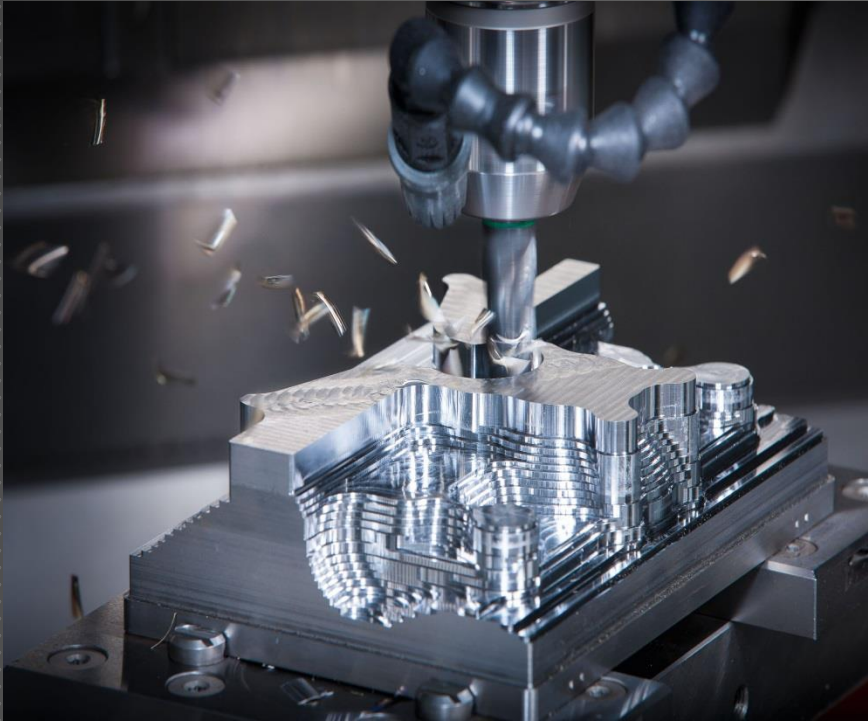
Subtractive



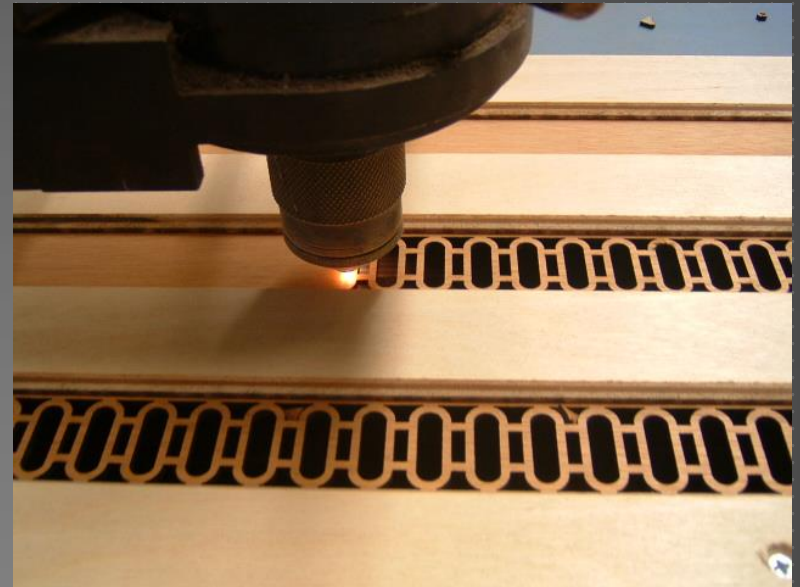
Additive



# TRADITIONAL MANUFACTURING

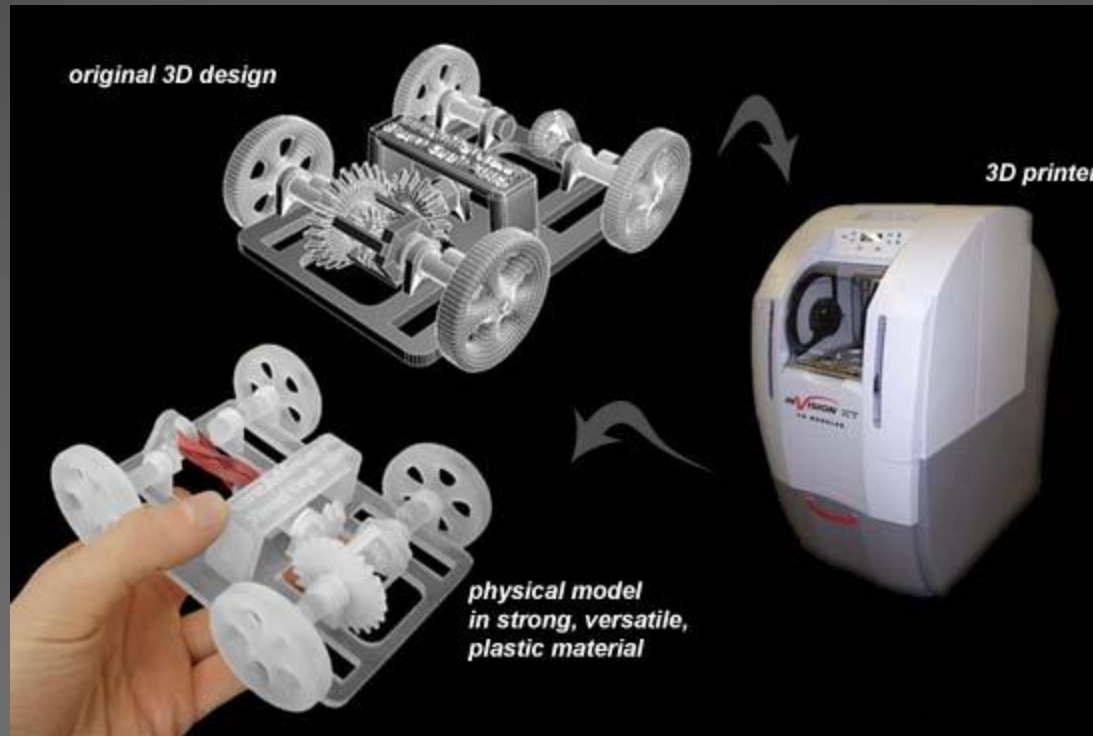


**CNC Machining: Subtractive**



**Laser Cutting: Subtractive**

# 3D PRINTING MANUFACTURING



**3D Printing: Additive**

## Summary

### ▶ Subtractive manufacturing

Concept → digital design → block of material →  
CNC machine → finished piece(s)



### ▶ Additive manufacturing

Concept → digital design → material-loaded 3D  
printer → finished piece(s)

*The same digital design file can be sent to a subtractive  
CNC machine or to an additive 3D printer. Which to use  
encompasses many factors, explored in part 2 of this  
Spotlight series.*



How does 3D printing work?

# THE PROCESS OF 3D PRINTING

# STEP 1: CREATE A DIGITAL DESIGN

Creating a high quality digital design of the product is a crucial step in the manufacturing process. Just as you need a document file to print something on an office printer, so do you need a design file that instructs the printer what to do. So, what happens if you don't have a file?

1. Learn CAD yourself
2. Hire an engineer
3. Reverse engineer the part



## STEP 1

# CAD PROGRAMS

There are many different professional CAD programs, including the following:

- ▶ AutoDesk Inventor
- ▶ Rhino
- ▶ Solidworks
- ▶ TurboCAD
- ▶ Solid Edge



## STEP 1

# ENGINEERING SERVICES

You may choose instead to hire professional help:

- ▶ Professional engineering firms
- ▶ Freelance/independent design engineers
- ▶ Student engineers (e.g., Boise State University's TechHelp)
- ▶ Your 16-year old



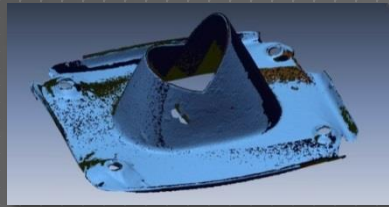
## STEP 1

# REVERSE ENGINEERING

Some parts lend themselves to scan-based design or full reverse engineering to create the digital file. This is an effective way to capture information from an existing part, but is not simple or inexpensive and so is most often used when multiple parts will be manufactured.



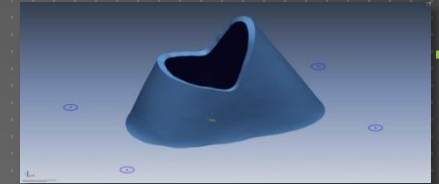
Original part



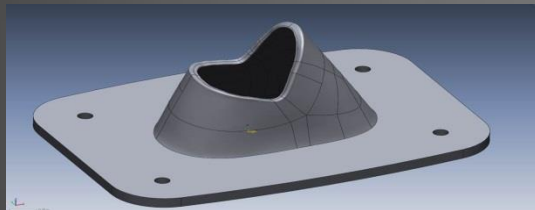
Scan the part



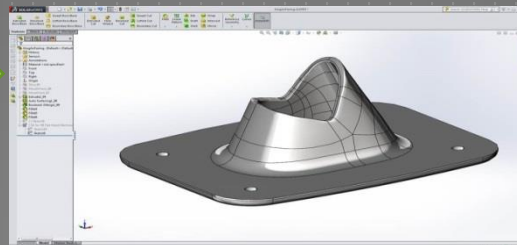
Clean-up scan data



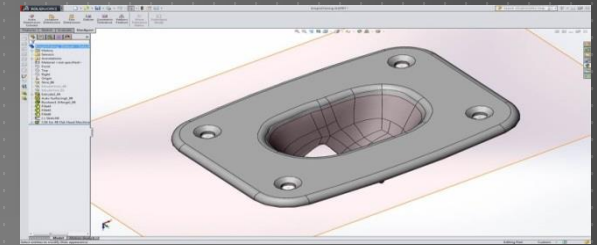
Preserve important geometry



Add design improvements



Convert to 3D CAD and refine model





# RUNNING THE PRINTER

## Step 3

- ▶ CAD file imported into printer prep software
- ▶ Determine 3D printer technology and material
- ▶ Build supports
- ▶ Create platform

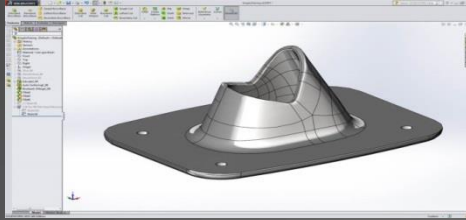
## Step 4

- ▶ Load material into printer
- ▶ Send file to printer
- ▶ Hit 'start'
- ▶ Walk away

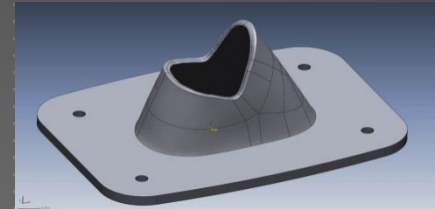
## Step 5

- ▶ Post-process part to clean and remove supports
- ▶ Parts can also be painted, plated, or finished to final specifications

# SUMMARY



Step ① 3D model created

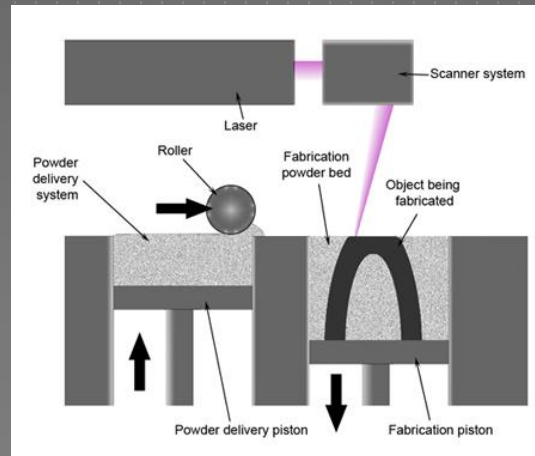


Step ② Convert to printer-ready file

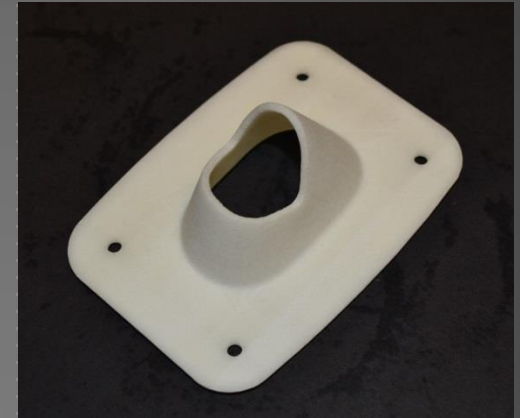


Step ③ Transfer file to printer

③ Prep printer with material for job



Step ④ Printer builds layer by layer



Step ⑤  
Part is post-processed and finished

# ABOUT INTERMOUNTAIN 3D INC

Intermountain 3D was started in 2014 to bring commercial 3D printing capabilities to manufacturers, product designers and entrepreneurs in the pacific northwest.

## **Engineer to Engineer**

When you work with Intermountain 3D, you tap into decades of professional engineering experience, brought to bear on the specific problems and opportunities your project presents. More than just consulting, our engineers work with you to ensure what you envision is actually produced: in CAD drawings, prototypes, production parts, or design-for-manufacturing files.

You know your products; we know 3D design, prototyping and production. Whether you're a one-person shop or 200-people strong, Intermountain 3D is an extension of your team and focused on your success.

*Contact us to see how we can help*