2017

SEO CONSORTIUM

Users Group Meeting

Presentation by: Matt Motes & Michael Postlethwait

Makerspace People c'mon!

3D PRINTING – *ARE YOU READY?*

- What are they?
- What exactly can I do with them?
- Costs?

VOCABULARY WORDS FOR THE DAY

Filament

Extruder

Nozzle

Build Plate

Build Plate Tape

3D printer

Thingiverse

Starting a print

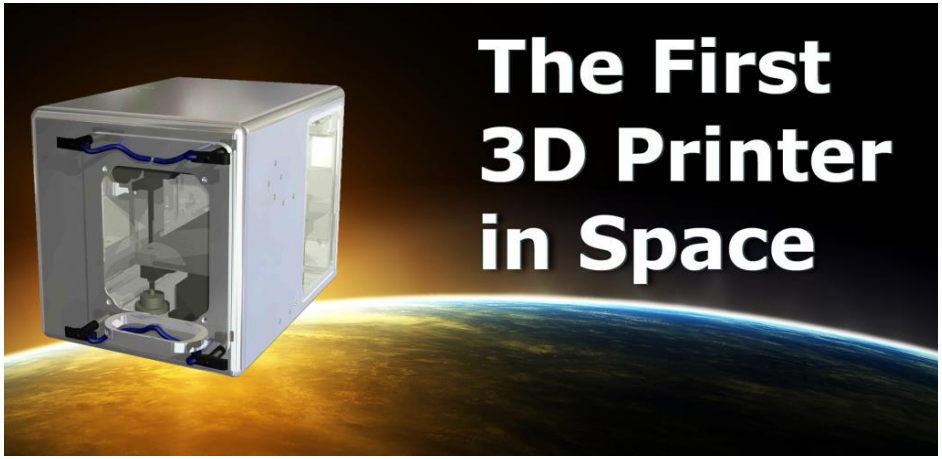
WHAT IS Thingiverse?

- MakerBot's Thingiverse is a thriving design community for discovering, making, and sharing 3D printable things. As the world's largest 3D printing community, we believe that everyone should be encouraged to create and remix 3D things, no matter their technical expertise or previous experience. In the spirit of maintaining an open platform, all designs are encouraged to be licensed under a Creative Commons license, meaning that anyone can use or alter any design.

- Lets take a look at the website

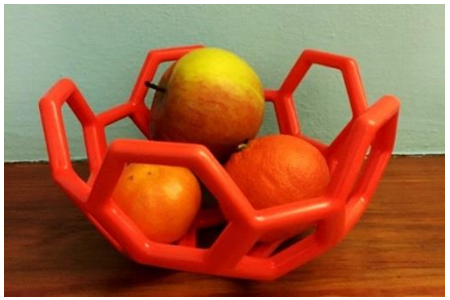
- http://www.thingiverse.com/

3D PRINTERS ARE CHANGING TODAY AND TOMORROW



CONSUMER GOODS

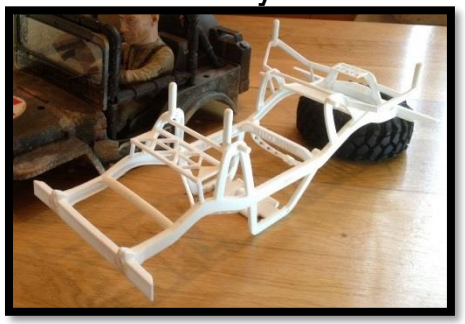
- "*Things*" will no longer be manufactured and shipped to customers. Instead, you'll purchase designs for everything from glasses to housing goods. The costs of having them printed on site will be cheaper than the current supply-chain process we have today, and will minimize transportation pollution.



PARTS FOR MACHINES

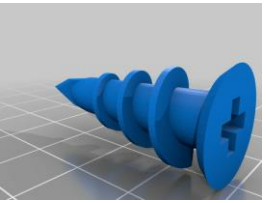
- Often times it's difficult to find old parts for cars, RC Vehicles, Hobbyists, or durable goods. 3D printers allow replacement parts to be built for low cost.
- Jay Leno uses 3D printing technology to build hard to get parts for his massive 200 car and 100 motorcycle collection.
- *"With 3D printing the automotive industry has changed more in the last ten years than it did throughout the entire last century,"* Leno said. *"We are pleased to be positioned at the forefront of this technology with 3D Systems."*

Remote Control and Hobby Parts

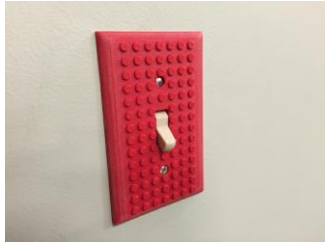


Fighter Jet flying with 3D printer parts

Refrigerator Shelf Fix



Hardware store is never closed



Things like screws and brackets that you need day to day can be made from the comfort of your home. This gives you the ability to have a personal hardware store right in your own computer room. The only limitations currently is the material being plastic-based.

Plastic Tools

Plastic Bolts

Drywall Anchors

Refrigerator Shelf Fix

PROSTHETIC ARMS FOR HUMANS

- Prosthetics arms are being made at lower prices then ever before because of the ability for the parts to be made with 3D printers. This opens up immense possibilities and grants access to people in under-developed countries.
- Video of prosthetic arm developed in Sudan

The Enable Community allows people to use their 3D printers to build hands for people in need. The average cost is $50 in material and supplies, and then you have the option of personally delivering the hand or mailing it to a recipient.

Raptor Reloaded

Arm v2

NEED A HAND

Find out how you can get a 3D printed hand for you or someone you know!

Read More >

BUILD A HAND

(more…)

Read More >

LEND A HAND

Find out how you can help!

(more…)

Read More >

Hermit Crab gets a new shell

PROSTHETIC FOR ANIMALS

Toucan receives a new beak

This year alone, we have seen a huge increase in prosthetic legs being created for dogs and even shells printed for turtles. The list goes on…

MEDICAL INDUSTRY

3D printing has had a huge impact in the medical field, but Scientists all over the globe are racing to create the first fully-functional human organ using 3D bio-printing. Bio printing combines traditional 3D printing methods with stem cell "*ink*" creating delicate structures such as capillaries. Human organ prototypes have been designed that could feasibly solve the growing organ-donor problem within the next decade.

Washable breathable cast that does not cause the itchiness of a plaster cast.

HOMES FOR PEOPLE IN TIME OF DISASTER

- This small home may look plain, but it represents a significant achievement in rapid construction. A Chinese company has demonstrated the capabilities of its giant 3D printer by rapidly constructing 10 houses in less than 24 hours. Built from predominantly recycled materials, these homes cost less than US$5,000 and could be rolled out in masse to ease housing crises in developing countries.

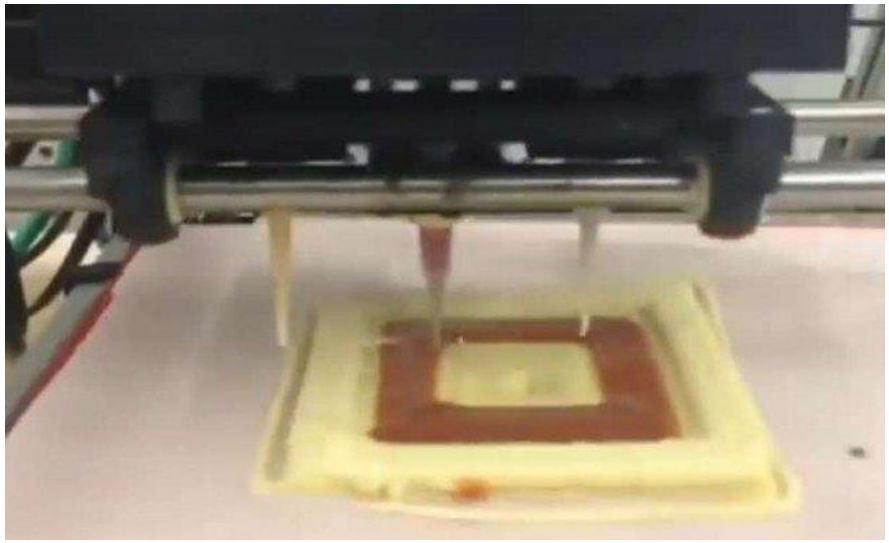
3D SCANNERS

- 3D scanners are giving future inventors the ability to take a standard product and build upon it. 3D Scanners allow the ability for inexpensive prototypes to be designed.

3D PRINTED FOOD

- 3D printer Video making pizza (NASA funded project for a Mars journey. Scheduled for 2030).

- 3D food Printed restaurant



ELECTRONICS STORE ACCESSORIES

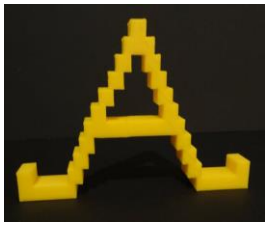
- Do you enjoy changing your phone cases, but do not enjoy the high price tag that goes along with them? Electronic accessories are a popular print item for 3D printer owners.

Phone Case

Watch and phone cradle

Controller Backs

Quadcopter frame (motor and speed control not printable)



Letters

TOY STORE IS NEVER CLOSED

Fidget Cube

- 3D printers give children the opportunity to have the toy store in there bedroom and anything can be made. The only limitation is your imagination.

Cars

Games

Doll House

Toy Train Set

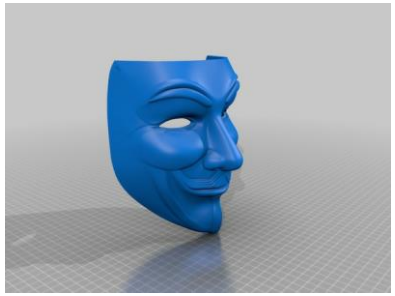
PARTY TIME STORE

- Ever need that one or two things to be ready for your party?

New Year Glasses

Cookie Cutters

Masks



Floral Centerpiece

T-Rex Skull

TEACHERS USE 3D PRINTERS

Frog Dissection Kit

Hieroglyphics

- Can print real life examples of examples of skulls, dissections, or hieroglyphics. Bringing real world feel to classroom lectures can help students learn with real life examples.

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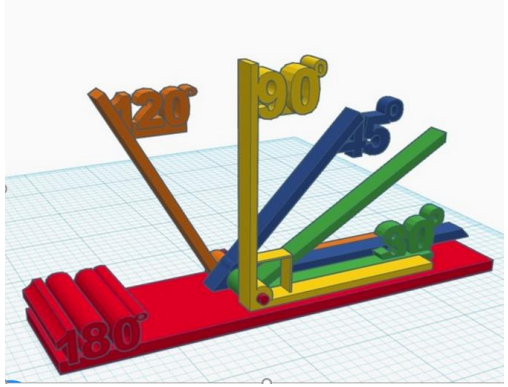

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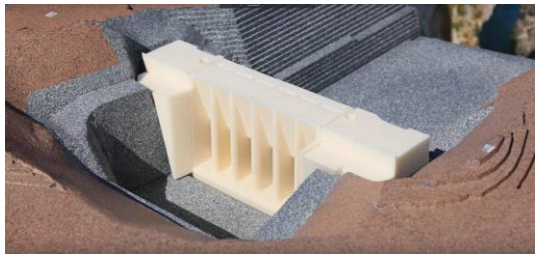
9-12

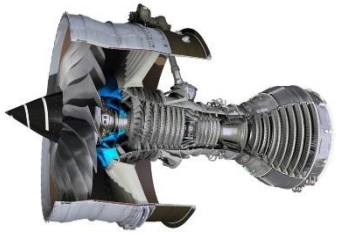
ENGINEERS USE 3D PRINTERS

- 3D printers are causing an invention resolution. Engineers use to design, then would send that design to production which could take up to 15 weeks now can be done in 1 week with 3D printing.

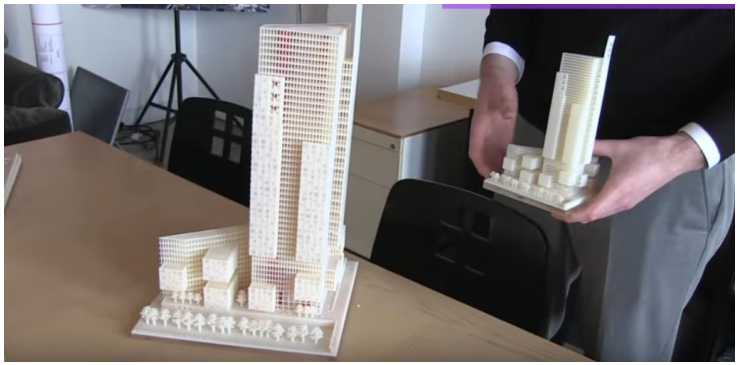
Army Corps use 3D print for Folsom Dam spillway design



Rolls Royce plans on adding a 3D printed part in its engine that will cut manufacturing time by 30%



3D printers are helping architectural companies improve model production and communication with customers.



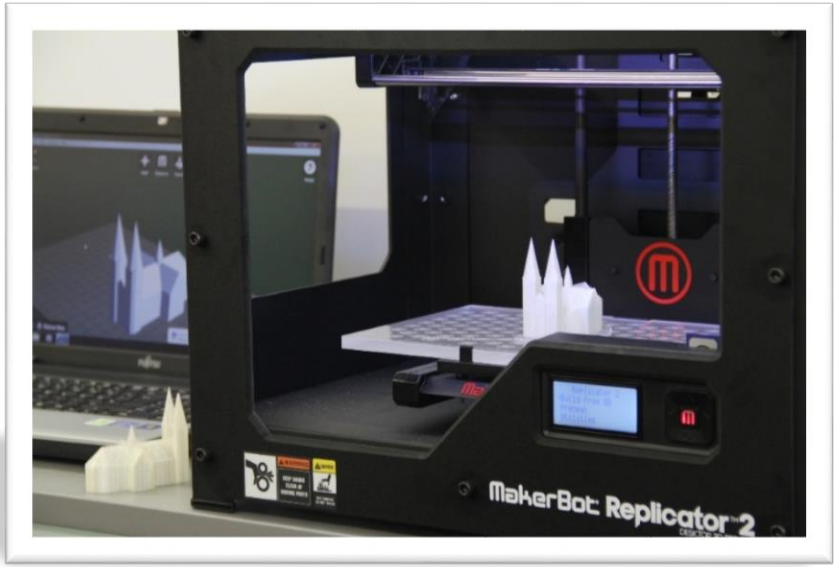
How do we get this technology into Young People's hands to develop even greater things?

The Answer is for schools and libraries to recognize that this investment into 3D printers is giving our generation the technology early to begin creating objects that improve the quality of life for the masses..

WHY THE LIBRARY?

- Libraries have adopted the role of providing universal access to technology over the last couple of decades. The library provides an environment that traditionally supports creative thinking and collaboration.

- Public libraries were originally created to give the community free access to information and text.



Replicator+
Desktop 3D Printer
$2,499

Maximum Print Size
11.6” Length
7.6” Width
6.3” Height

Replicator Mini+
Compact 3D Printer
$999

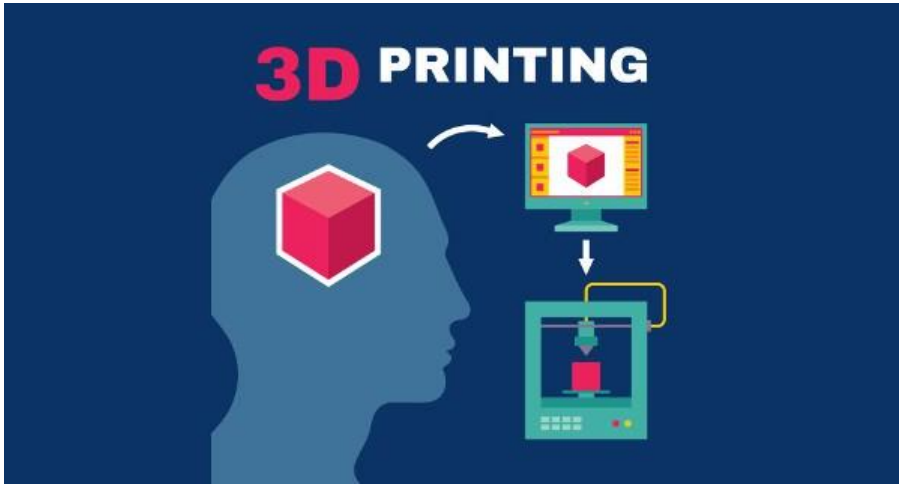
Maximum Print Size
4” Length
5” Width
5” Height

Replicator Z18
Large 3D Printer
$6,499

Maximum Print Size
11.8” Length
12” Width
18” Height

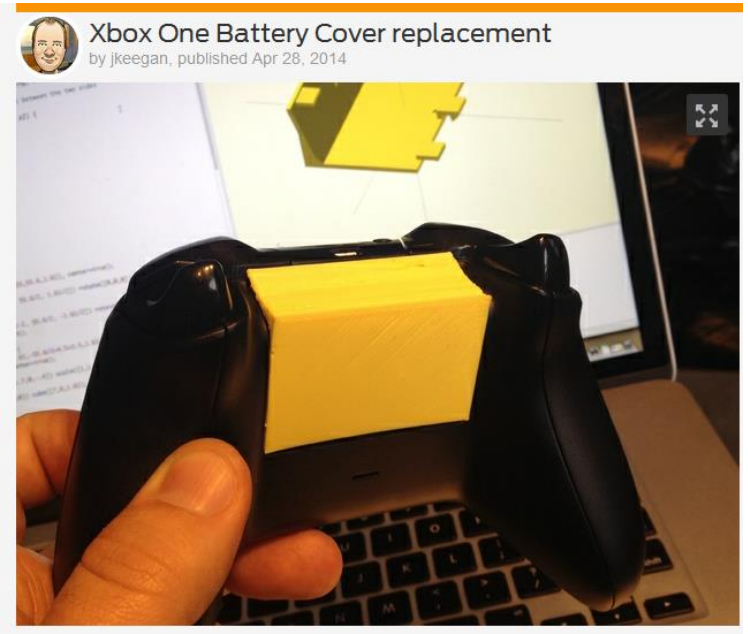
FILAMENT BREAK-EVEN POINT?

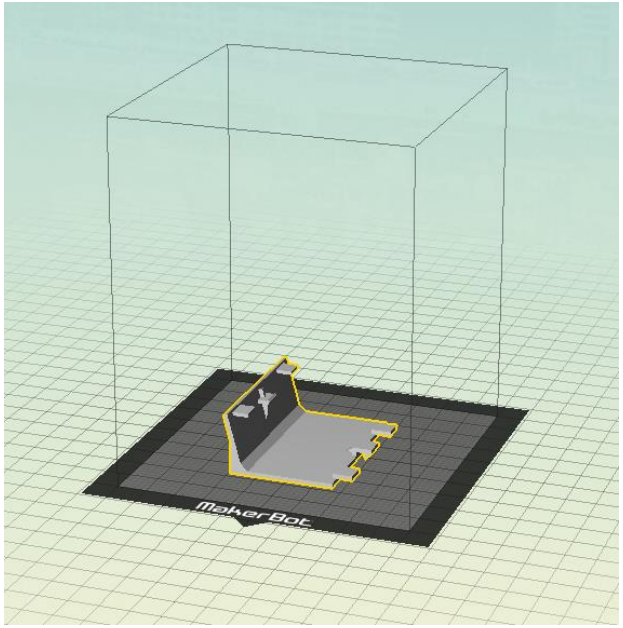
- It depends on what goal we have in mine do we attempt to break even on filament (ink) and expected extruder replacement (similar to printer heads).

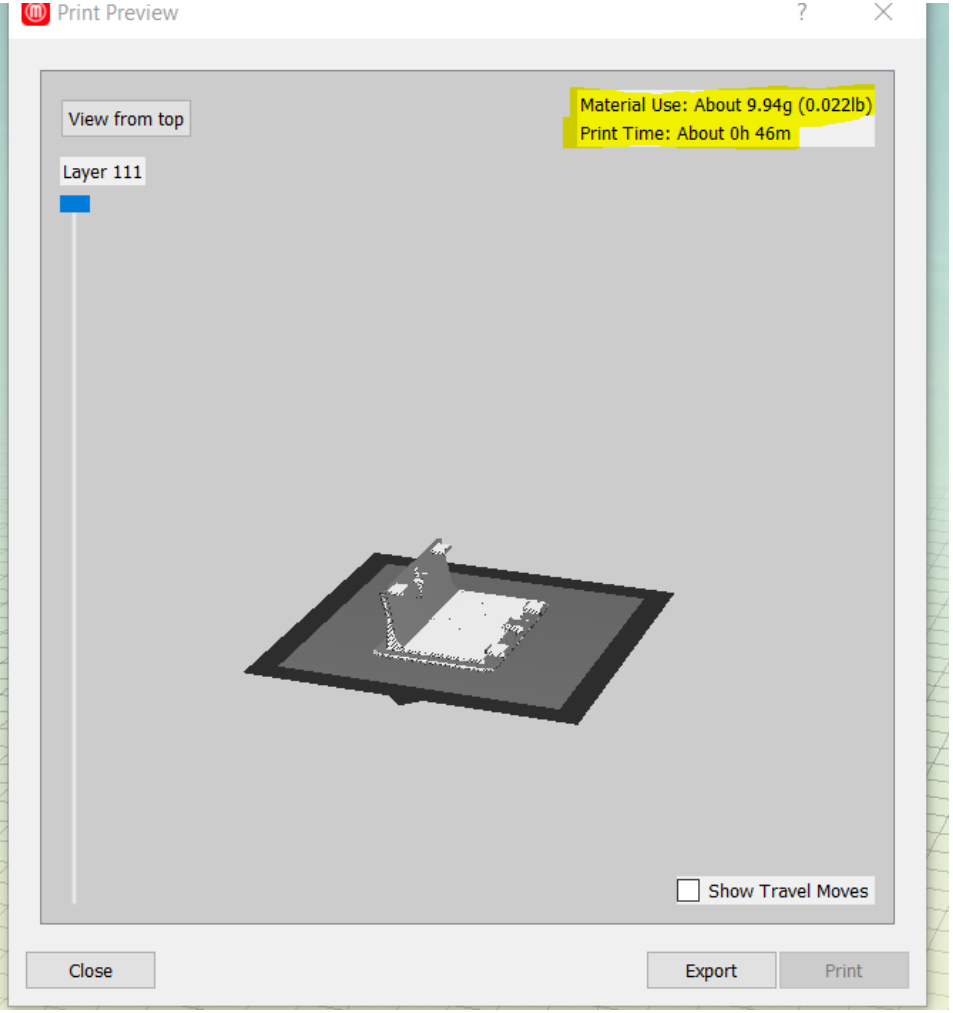


Lets say we have someone that comes in and has lost the back to their Xbox One controller.

We search on Thingiverse and find the battery cover and add it to our printer software.





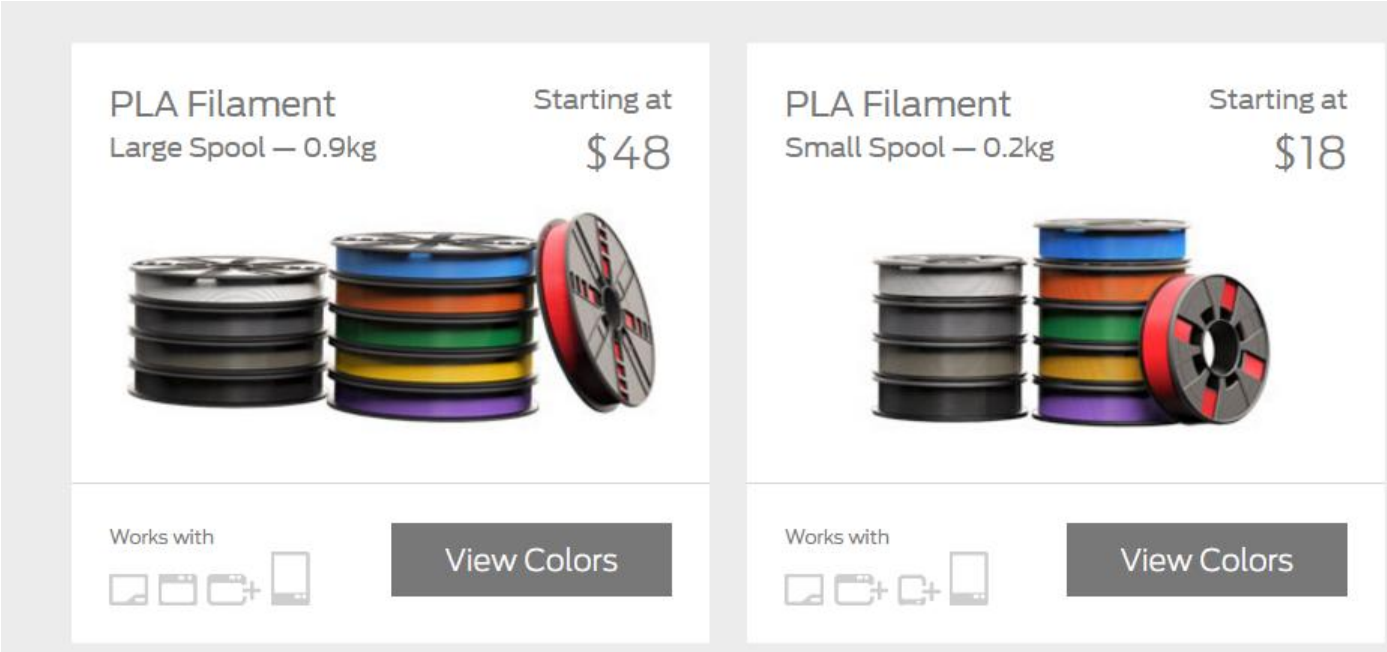


The Print Preview menu shows the estimated amount in grams.

We search on Thingiverse and find the battery cover and add it to our printer software.

FILAMENT COST BY WEIGHT

- Lets Assume we have a printer that handles the Large Spools, and we will base our pricing off of $48 a kg



Material Use: About 9.94g (0.022lb)
Print Time: About 0h 46m

PLA Filament
Large Spool — 0.9kg

Starting at
$48

Per Gram

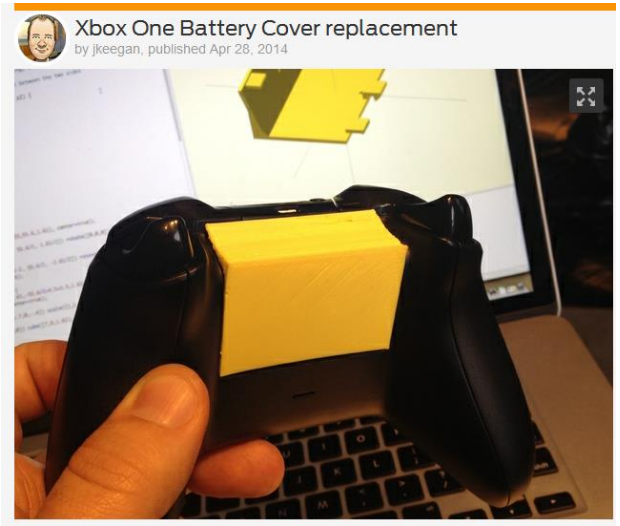
1 Kilogram (kg) = 1000 Grams

Thus one roll of filament = 900 Grams

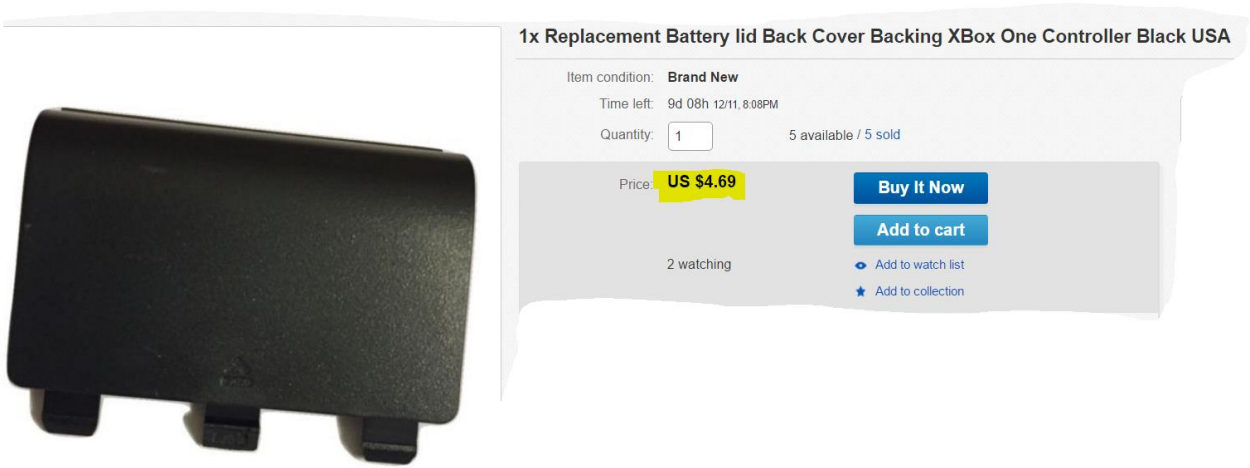
Lets round our Xbox One controller back up to 10 grams to produce.

We will then take the price of $48 and divide it by 900 Gram Filament roll $48 /900 = .053$.
We then take the weight of the object and multiply it by the price per gram.

10 (Grams) * .053 ¢ (Price per gram)= 53¢ to print an Xbox Controller Back at the break even price.



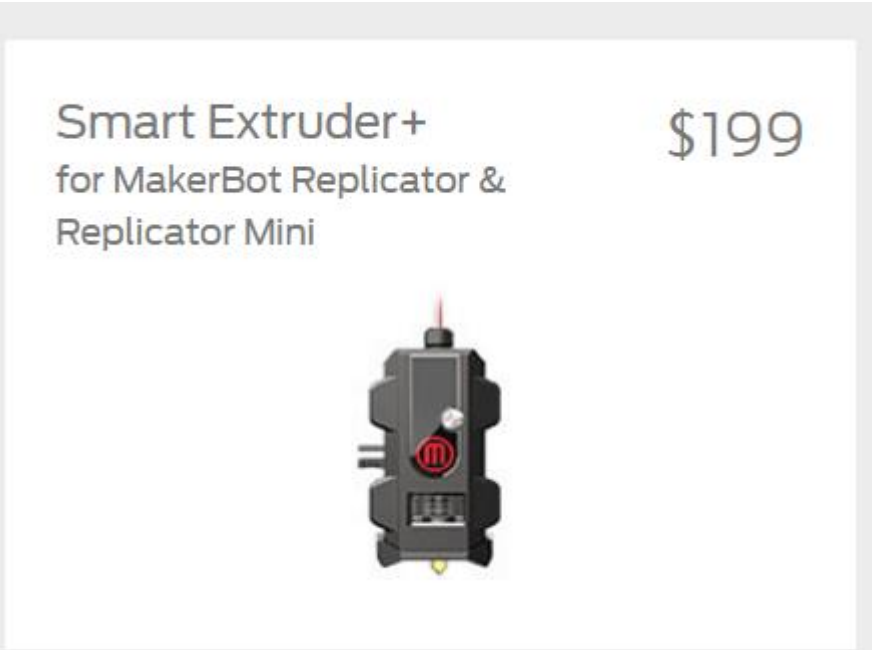
53¢ I have in filament cost, and I get to choose the color.

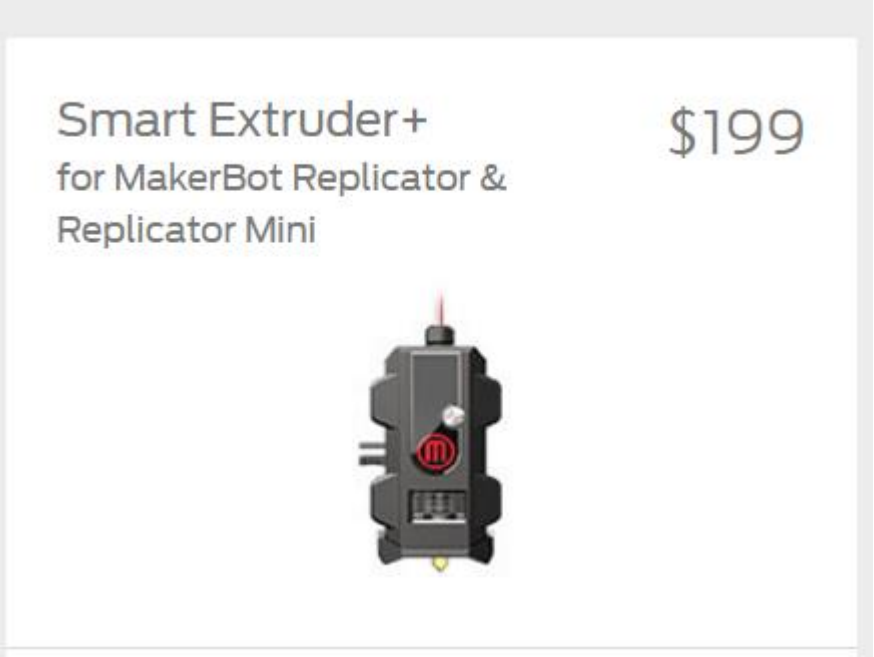


Price to purchase online
$4.69 + Tax + Shipping

OTHER MAINTENANCE

- 3D printers have smart Extruders that is responsible for heating the element as well as laying down the layers. An extruder generally lasts over 700 printing hours before they need replaced. It is best practice to always have a back up extruder on hand to eliminate the need for downtime.





Extruder is designed to work for 750 hours which carries an average cost of $199. Let's use the same controller example of 46 minutes to print.

The estimated life expectancy of an Extruder is 45,000 minutes.

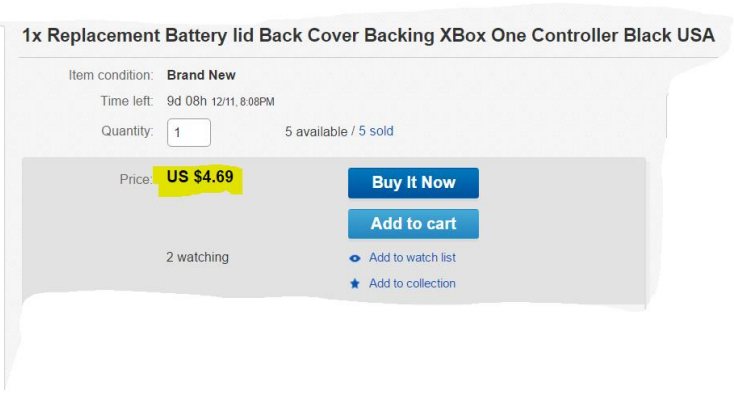
$199/45,000 which comes to .0044 cost per minute. We will then take the Controller back and use that cost times the length of the print

Which the break even cost on the Extruder is 20¢ for this print.

Lets take that number and divide it by the 10 grams which will leave us an additional 2¢ / gram in extruder cost.

Total Breakeven for Extruder and Filament Cost comes to 7¢ /gram.

Making the entire break even cost
70¢ for the controller back.



FREE 3D DESIGN SOFTWARE

Autodesk 123D

Autodesk 123D is a free collection of 3D modeling software integrated with content and fabrication services including Catch, Design, Make, Sculpt, and the new Creature.

Blender

Blender is the most popular, free open source 3D content creation suite, available for all major operating systems. It's very powerful and takes some time to learn. Intimidating at first, but hang in there and you'll master it.

SketchUp

Google SketchUp is a free, innovative and intuitive 3D modeling program that is used by both beginners and advanced users alike. It's easy to learn, but doesn't have the newer features of some other programs.

TOTAL COST FOR 3D PRINTING SPACE

MakerBot 3D Printer Replicator	$2,499
Smart Extruder	$199
Grip Surface Pack	$39.99
Filament x10 rolls	$430
Creation Software	FREE
Total	$3,197.99

LASER ENGRAVING

- What is a laser engraver?
- What can they do?
- Costs?

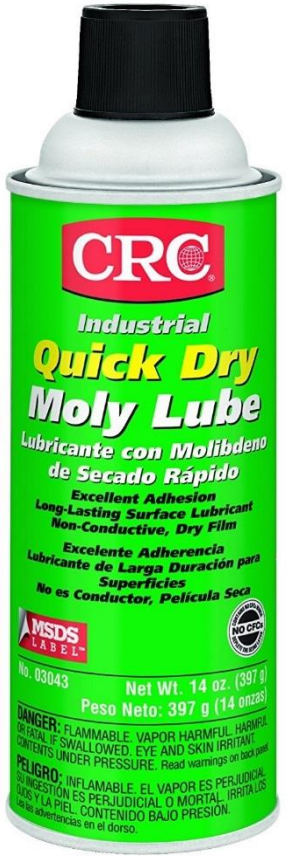
EPILOG LASER MINI 18 ENGRAVER

- High-Powered CO2 40 Watt Laser
- 12’ x 18” Workspace
- 1200 dpi accuracy
- Laser Pointer – high output 1 - 1000mW

APPROVED MATERIALS

	Engrave	Cut
Wood	•	•
Acrylic	•	•
Glass	•	
Coated metals	•	
Ceramics	•	
Delrin	•	•
Cloth	•	•
Leather	•	•
Marble	•	
Matboard	•	•
Melamine	•	•
Paper	•	•
Mylar	•	•
Pressboard	•	•
Rubber	•	•
Wood veneer	•	•
Fiberglass	•	•
Painted metals	•	
Tile	•	
Plastic	•	•
Cork	•	•
Corian	•	•
Anodized aluminum	•	
Twill	•	•
Stainless steel	*	
Brass	*	
Titanium	*	
Bare metal	*	

* CO2 lasers will mark bare metals when coated with a metal marking solution. For more information, call +1 303-277-1188.



WHAT CAN IT DO ALREADY!


DINNER IS COMING

CALERA
2006
JENSEN
VINEYARD
Pinot Noir
MT HARLAN


R&J
9/13/14


Cooper D. Cat
1180 Magnolia St.
555-555-5555(h)
555-555-5551 (c)
Denali
300 W. 5th Avenue
(555) 555-5555
Santa's Little Helper
515 Willow Ln.
(555) 555-5555 (h)
(555) 555-4444 (m)
Denali
300 W. 5th Avenue
(555) 555-5555

LET'S TALK COST

- Epilog Mini 1812 40-Watt Laser Engraver $11,500
- Rotary Attachment (*cups, glasses, candles*) $1,150
- EngraveLab PhotoLaser Software $400
- Air Compressor (*wood and leather engraving*) $300
- Filtration Unit (*can vent directly outside*) $2750
- Corel Draw $200
  - *any vector based software will work (e.g. Illustrator)*

- **Total Investment** **$16,300**

No re-occurring costs. Patrons bring in their own material

Minor maintenance is required (*grease moving parts & lens cleaning*)

THANKS

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