



Aalto University  
Media Factory

# Digital\_Fabrication\_Studio.07

## Molding & Casting - materials, finishes, processes

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<http://www.slideshare.net/openp2pdesign>





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# Today:

- \* Mold
- \* Designing a mold
- \* Casting into a mold



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01.

Mold:

what can you get out of it?

# DIY Blow Molding Gun



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Frustrated by the limited access to plastic blow-moulding equipment, George Fereday developed his own, outfitting a standard 'mastic gun'.

Source: <https://vimeo.com/12940879>

[http://www.core77.com/blog/object\\_culture/george\\_feredays\\_personal\\_blow\\_molding\\_gun\\_16846.asp](http://www.core77.com/blog/object_culture/george_feredays_personal_blow_molding_gun_16846.asp)

# BrickArms: hacking and casting LEGO toys

The screenshot shows the homepage of the BrickArms website. At the top, the logo "BRICKARMS" is displayed in large, bold, blue letters, with the tagline "Custom molded weapons and custom minifigures" below it. A horizontal menu bar includes links for Home, Products, Where to Buy, FAQs, Policies, Forums, and About. To the right of the menu is a group of various LEGO minifigures dressed in military-style gear and holding custom weapons. On the left side of the page, there is a sidebar with four categories: Weapons (showing a grid of weapons), Weapons Packs (showing a grid of weapon sets), Minifigures (showing a grid of minifigures), and Headgear (showing a grid of hats). The main content area features text about the products and two promotional images for weapon packs. The first image is for the "Modern Combat Pack v3", showing soldiers in a modern combat setting. The second image is for the "World War II Limited Edition Weapons Pack", showing soldiers in a World War II setting.

BrickArms offers building toy-compatible custom [weapons](#), [weapons packs](#), and custom [minifigs](#).

All BrickArms products are sized to perfectly fit your figs and designed and produced to meet the highest standards of quality. Each BrickArms toy will mesh seamlessly with your other building toys, and thousands of builders worldwide have used BrickArms to explore new ways of building and play.

Join other fans of BrickArms on the [BrickArms Forums](#) to see how others have used BrickArms in their building and even share some of your own BrickArms-equipped creations!

**March 15, 2012 - MAAWS, Black Minigun w/Brass Ammo Chain, MCP v3, & WWII Pack w/Russian Protos!**

Available at all resellers at 12AM March 16th, 2012!

**BRICKARMS**

**Modern Combat Pack v3**

©2012 BrickArms LLC

**BRICKARMS**

Limited Edition Weapons Pack

**World War II**

Contains 30 BrickArms  
Each pack contains a special prototype WWII Russian Rifle!

Odds for each pack:  
SVT40 = 1 in 2  
DP28 = 1 in 10  
Mosin Nagant = 2 in 5

©2012 BrickArms LLC

BrickArms offers building toy-compatible custom weapons, weapons packs, and custom minifigs.

Source: <http://www.brickarms.com/>

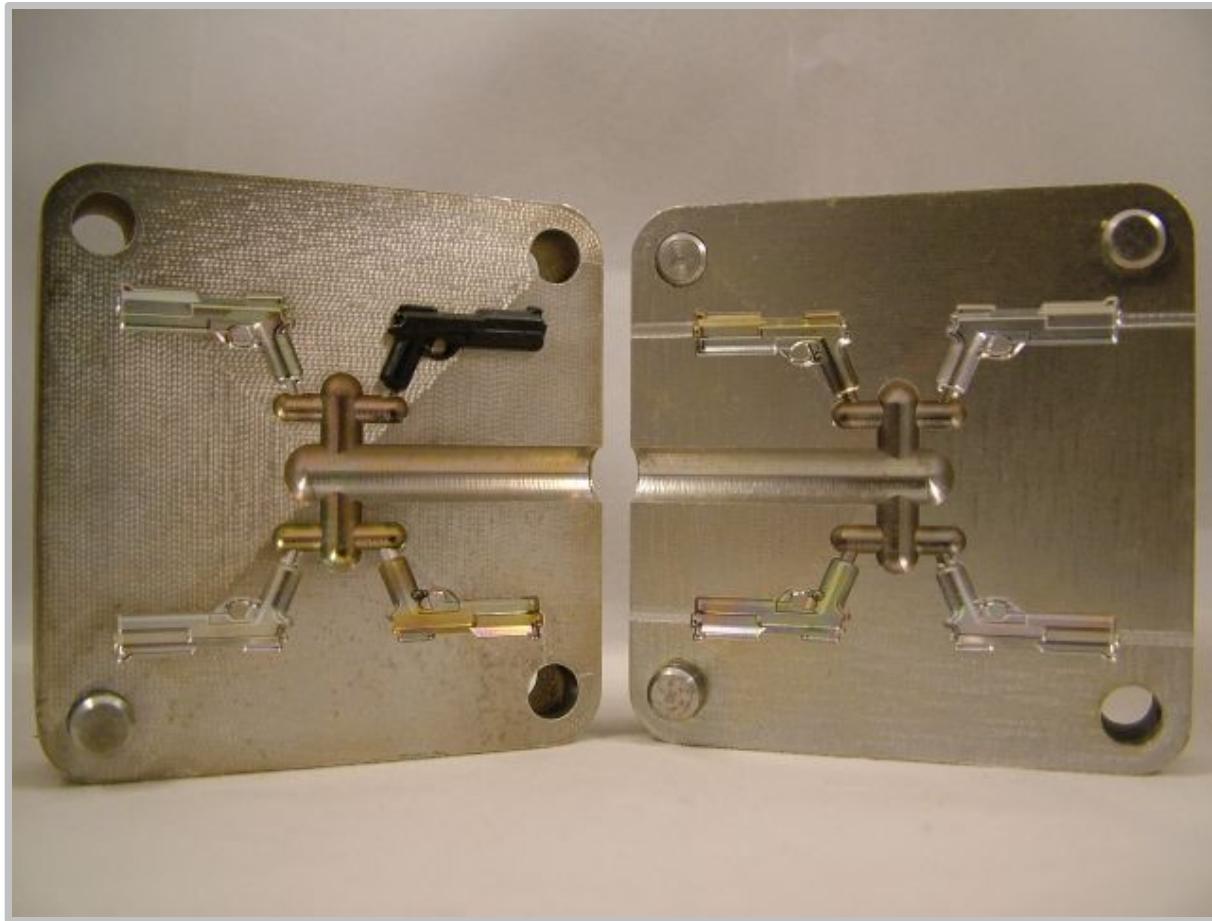
# Brickarms: hacking and casting LEGO toys



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A set of pieces.

# Brickarms: hacking and casting LEGO toys



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The two-side mold (for injection moulding).

# Brickarms: hacking and casting LEGO toys



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The two-side mold (for injection moulding).

# Brickarms: hacking and casting LEGO toys



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Do you know this guy?  
(Here's the answer)

Source: <http://www.flickr.com/photos/enigmabadger/3643236010/in/photostream>

# Brickarms: hacking and casting LEGO toys



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Do you know this guy?  
(Here's the answer)

Source: <http://www.flickr.com/photos/enigmabadger/6174048858/in/photostream>

# BrickForge: hacking and casting LEGO toys

The screenshot shows the homepage of the BrickForge website. At the top is a vibrant illustration of several LEGO minifigures in various costumes, including a wizard, a knight, and a Roman soldier. Below the illustration is a navigation bar with links: Home, About, Contact, Contests, FAQ, Forum, Policies, and Shop. The main content area features a blog post titled "3rd Annual BrickMagic LEGO Festival" with details about the event, ticket prices, and location. To the right is a sidebar with a search bar and a "Featured Items" section displaying various LEGO products.

**3rd Annual BrickMagic LEGO Festival**

April 25th, 2012 | Author: admin

Will you be attending [BrickMagic](#) in Raleigh, NC this year? If so here is what you have to look forward too....

- help build a 6-foot wide LEGO Deathstar
- see a huge hall filled with custom LEGO creations
- be the first to see top secret new sets the LEGO will unveil
- build with thousands of bricks in our Free Build Room
- participate in workshops on building techniques
- watch a robotics competition by teams from area schools
- shop for hard-to-find LEGO parts and sets

Registered attendees will receive an exclusive *BrickForge Doomsday Pack* featuring never-before-seen items in cool colors!

Tickets: \$12 adults, \$8 kids (age 4-16) and Seniors (get a \$1 discount when you order online).

Hilton North Raleigh/Midtown  
3415 Wake Forest Road  
Raleigh, NC 27609

Posted in [products](#) | [No Comments »](#)

**Search Entries**

**Featured Items**

- TACTICAL HELMET
- BLACK CARBON STEEL
- TACTICAL VEST
- SHOCK TROOPER ARMOR
- SHOCK TROOPER HELMET

"We consider ourselves intermediaries between the community and the lumbering Danish company."

Source: <http://www.brickforge.com/>  
<http://blog.makezine.com/2011/10/12/make-interviews-indie-lego-molder-brickforge/>

# BrickForge: hacking and casting LEGO toys

The screenshot shows a website for 'BRICK FORGE'. At the top, there's a search bar with 'Search:' and an 'Advanced search' link. Below the search bar is a navigation menu with 'Categories' and 'Bestsellers' sections. The 'Categories' section includes links for Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, and SALE. The 'Bestsellers' section lists items 1 through 5. The main content area displays a product page for a 'Scooter - Medium Blue (Rainbow print)'. The page title is 'Scooter - Medium Blue (Rainbow print)'. It features a large image of a blue scooter with a rainbow graphic on the side panel. To the right of the image is a logo for 'BRICK FORGE' featuring a stylized flame. Text on the page describes the scooter as a step-through design for minifigs, mentioning it's a younger cousin of the motorcycle. It highlights its popularity for urban transportation and ease of assembly. The page also lists the parts included: Scooter (body) x1, Scooter (handlebars) x1, Scooter (wheels) x2, Front Tire (narrow) x1, and Rear Tire (broad) x1. A note states that body, handlebars, and wheels are black. The 'Details' section provides SKU (PL-VEHI-SCOO-MBR), quantity in stock (775 item(s) available), and weight (0.40 oz). The price is listed as \$6.25.

(Almost) anything that you cannot find in a  
LEGO store...

Source: <http://www.brickforge.com/store/product.php?productid=17777&cat=0&page=1>

# BrickForge: hacking and casting LEGO toys



(Almost) anything that you cannot find in a  
LEGO store...

Source: <http://www.flickr.com/photos/42832748@N05/5680269752/in/photostream>

# Few insights about their process

## **Having designed the element how do you create the mold?**

Once the element is designed a mold is created out of aluminum stock using a CNC milling machine. Most of the time we bundle several accessories together on the same aluminum block. In dealing with such small scale elements we need to insure that every detail is accurate up to 1/10 of a millimeter!

## **I assume you use ABS. When you get it, in what sort of form does it arrive?**

Once the aluminum mold is created it is slotted inside an injection machine and the magic begins. ABS pellets are mixed with a dye and then poured into a hopper. A heating cylinder and reciprocating screw located inside the injection machine feeds the molten ABS into the mold via gates and channels, that then defines the final shape of the object.

# BrickForge: hacking and casting LEGO toys

The screenshot shows a website for 'BRICK FORGE' with a yellow header bar containing a search field and an 'Advanced search' link. A blue sidebar on the left lists categories like Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, and SALE. Below this is a 'Bestsellers' section listing five items, with 'Spill/Splat - Trans Red' at the top. At the bottom of the sidebar is a 'Manufacturers' section. The main content area shows a product page for 'Spill/Splat - Trans Clear'. It features a yellow LEGO minifigure holding a large, translucent yellow umbrella, standing on a black base plate. To the left of the figure is a large, translucent yellow puzzle piece. The base plate has the words 'SPILL / SPLAT' printed on it. The product description text reads: 'Watch your shoes! Someone or something leaked. The contoured design is cleverly designed and anywhere else a mess is needed. Our valentines used as a surrogate for almost any liquid substance? Beverages? Blood & Gore? It's up to you. Fit Guest CAD Modeler: Designed by Thrash'. The price is listed as '\$1.00'. There are buttons for 'Add to cart' and 'Add to wish list'.

You can be even creative and play with the materials and their attached meanings...

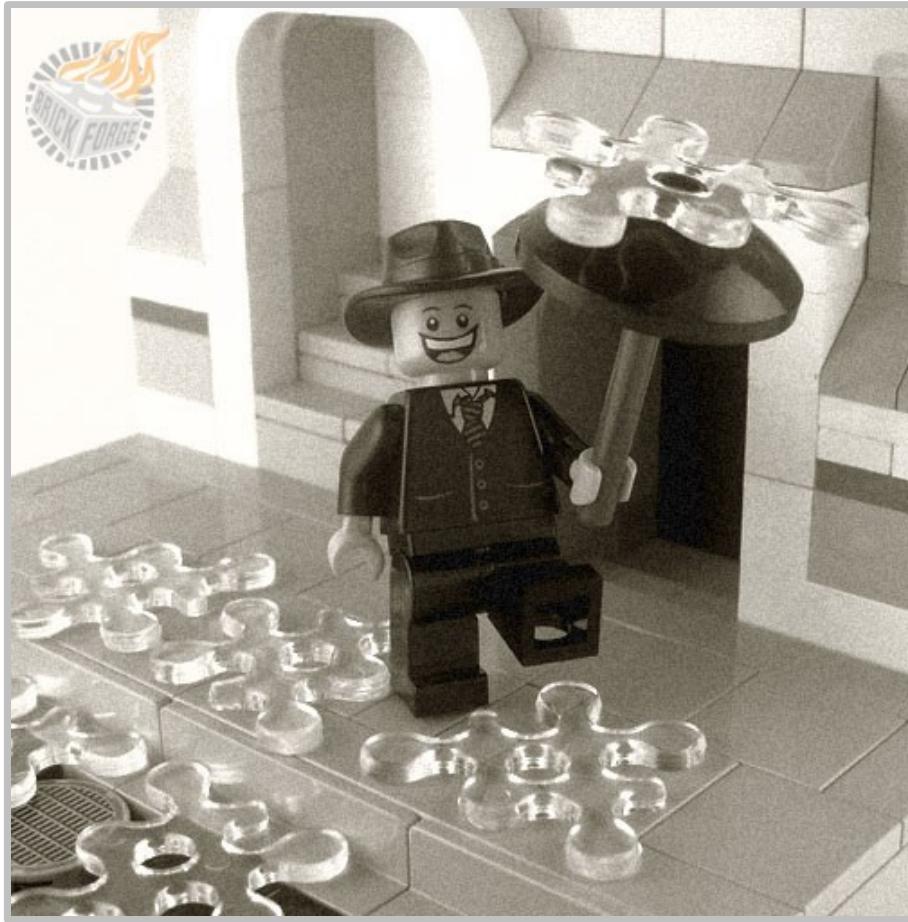
# BrickForge: hacking and casting LEGO toys



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I mean, really creative....

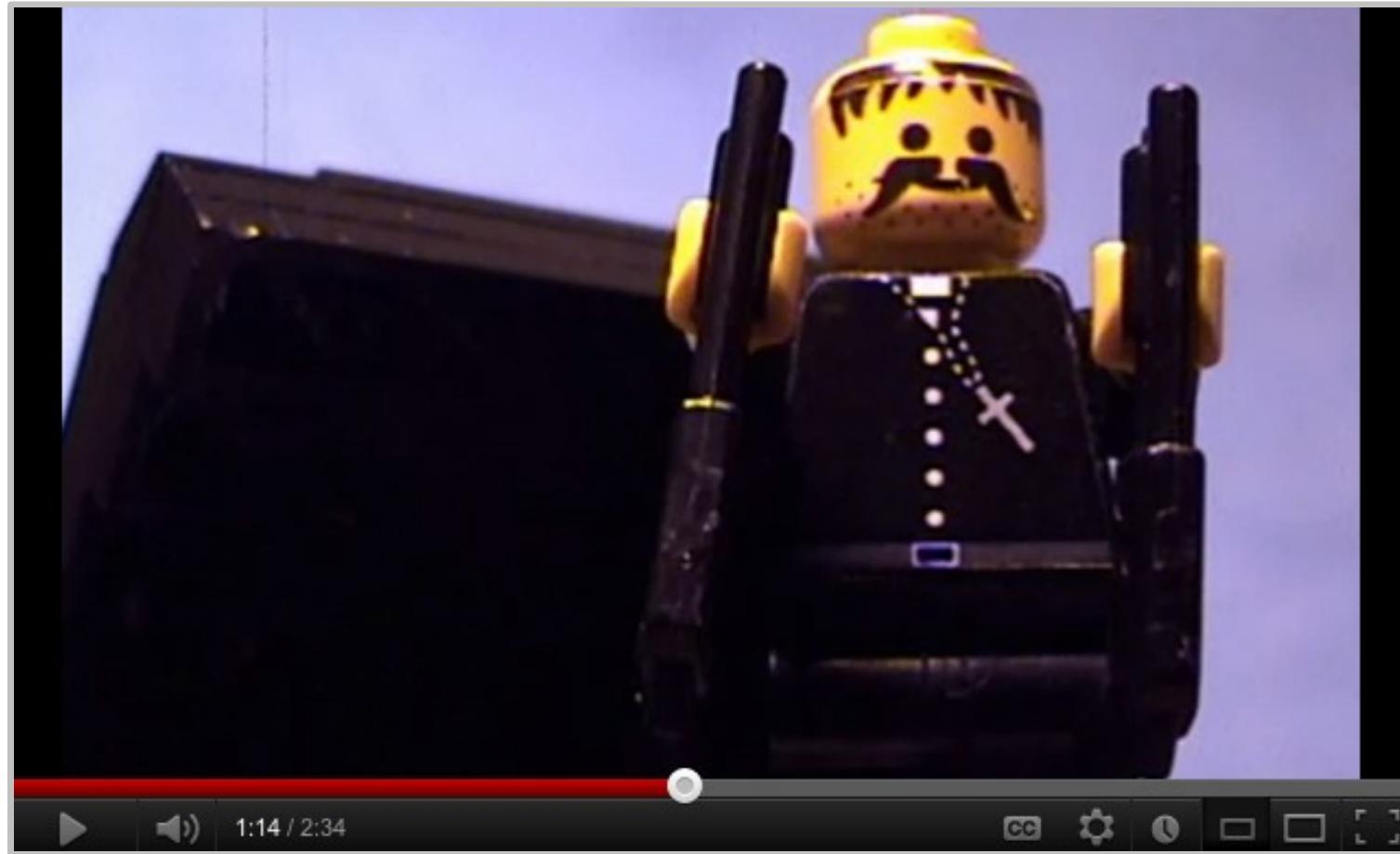
# BrickForge: hacking and casting LEGO toys



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I mean, really creative....

# ... and what can I do with these toys?

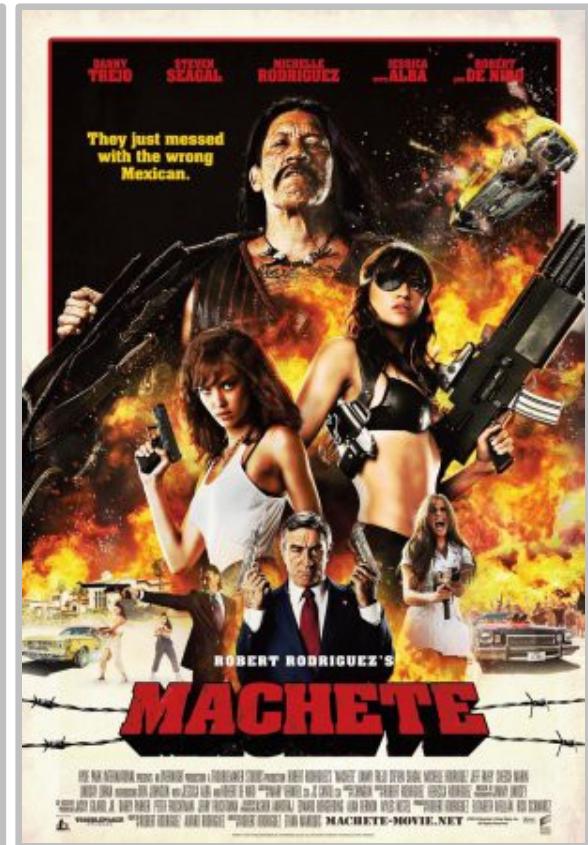
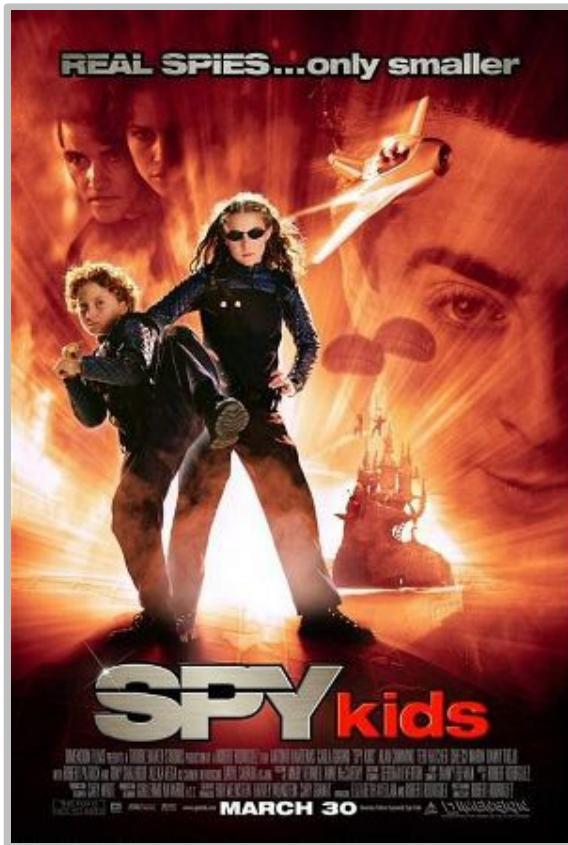


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And then the fake trailer is so popular, that fans make even a Lego version..

Source: <http://youtu.be/XtkHygTC8A>

# With more than one possible media strategy



A side character from a movie, then a trailer of a fake movie inside another movie, the the trailer becomes popular and becomes a real movie.

Source: [http://en.wikipedia.org/wiki/Spy\\_Kids](http://en.wikipedia.org/wiki/Spy_Kids) [http://en.wikipedia.org/wiki/Grindhouse\\_\(film\)](http://en.wikipedia.org/wiki/Grindhouse_(film))  
[http://en.wikipedia.org/wiki/Machete\\_\(film\)](http://en.wikipedia.org/wiki/Machete_(film))

# ... and that's not the only case!



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Many different adaptions, photos and videos can be found online.  
(Solution for the above picture [here](#))

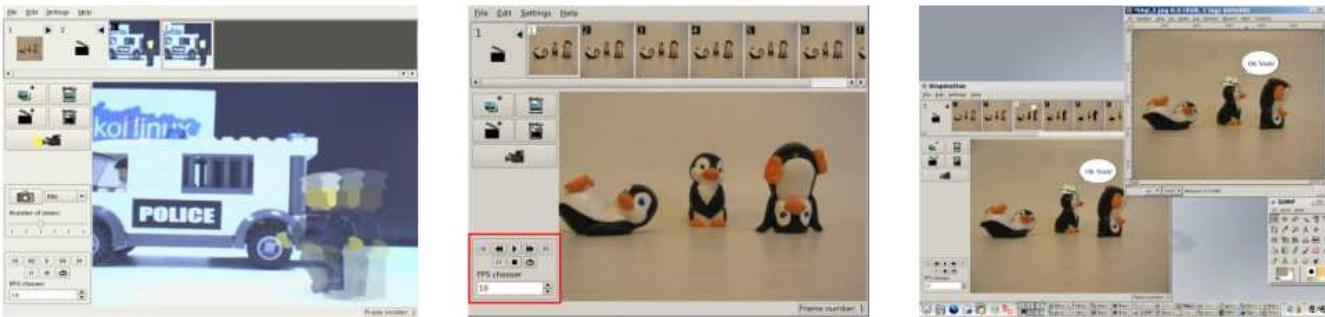
Source: <http://www.flickr.com/photos/catsy/5948099285/in/pool-1206921@N23>

<http://www.flickr.com/groups/1206921@N23/> <http://speckyboy.com/2009/06/12/24-lego-stop-motion-films-mimicking-cool-movies-scenes/>

# ... and there's an open software for this!



Home Download Support Development About



## Linux Stopmotion

Linux Stopmotion is a Free Open Source application to create stop-motion animations. It helps you capture and edit the frames of your animation and export them as a single file.

Linux Stopmotion is a Free Open Source application to create stop-motion animations. It helps you capture and edit the frames of your animation.

Source: <http://linuxstopmotion.org/>



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02.

# Molding: how to design and mill a mold

# Mold: choose your type

A mold can be 1-side or 2-side (or you may not need a mold). So start from these questions:

- \* **positive or negative** shape? A mold or an object?
  - \* **which material?** Silicon (soft object) or another plastic (hard)?
  - \* so.. if you want **a soft silicon object: no mold**
  - \* is your object **flat on one side or 360°?**
-

# Mold: choose your material

The Smooth-On website features a prominent banner at the top with the text "Materials to **SCARE** the **LIFE** out of you™" and a cartoon image of a scary clown. Below the banner is a navigation bar with links for About Us, Seminars, Tech Support, Contact Us, My Account, and a shopping cart icon labeled "BUY NOW". A secondary navigation bar includes Home, Technical Info, How-To, FAQ's, Videos & More, New Products, Distributors, and Mold Makers Exchange.

A search bar and language selection dropdown are also present. The main content area shows the "Applications" sidebar with various categories like Architectural Restoration, Aquarium Decoration, Candlemaking, Concrete Casting, Encapsulation & Display, Food Related Applications, Home Projects & Hobbies, Industrial, Lifecasting, Model Making, Orthotics & Prosthetics, Prototyping & Inventing, Sculpture & Art Casting, Special Effects & Props, Sprayable Materials, Vacuum Bagging, and Taxidermy.

The central article is titled "SORTA-Clear® Translucent Silicone Rubber". It describes the material as premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. It highlights exceptional tear and tensile strength, clarity for extracting models via cutting, and its use for prototypes, jewelry, or molds where visibility is important. It also mentions casting into urethane, epoxy, or polyester resins without a release agent, and casting into wax or metal alloys. The text notes that the material can be pigmented with SILC Pig® silicone pigments.

A callout box highlights that SORTA Clear® 40 and SORTA® Clear 18 are suitable for baking, casting ice, butter, or chocolate. A "CLICK HERE" button is provided to learn more.

On the right side, there are links for "Click To Enlarge Image", "Technical Bulletin" (with a TB icon), "MSDS" (with a diamond icon), and "Videos And Photos" (with a video camera icon).

Smooth-On is one of the best manufacturers, but it's not the only one...

# Mold: always read the instructions!

The screenshot shows the Smooth-On website homepage with a banner featuring a scarecrow and the text "Materials to SCARE the LIFE out of you™". Below the banner is a navigation bar with links for About Us, Seminars, Tech Support, Contact Us, My Account, and a shopping cart icon labeled "BUY NOW". A secondary navigation bar below includes Home, Technical Info, How-To, FAQ's, Videos & More, New Products, Distributors, and Mold Makers Exchange.

A search bar and language selection dropdown are also present. The main content area displays the "SORTA-Clear® Translucent Silicone Rubber" product page. On the left is a sidebar titled "Applications" with a list of categories: Architectural Restoration, Aquarium Decoration, Candlemaking, Concrete Casting, Encapsulation & Display, Food Related Applications, Home Projects & Hobbies, Industrial, Lifecasting, Model Making, Orthotics & Prosthetics, Prototyping & Inventing, Sculpture & Art Casting, Special Effects & Props, Sprayable Materials, Vacuum Bagging, and Taxidermy.

The main text on the page describes SORTA-Clear® as premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. It features exceptional tear and tensile strength, making it ideal for prototypes, jewelry, or molds where visibility is important. It can be cast into urethane, epoxy, or polyester resins without a release agent and can be pigmented with SILC Pig® silicone pigments.

A callout box highlights that SORTA Clear® 40 and SORTA® Clear 18 are suitable for baking, casting ice, butter or chocolate, and other food applications. It includes a "CLICK HERE" button.

On the right side, there is a thumbnail image of a hand working with the material, which is circled in red. Below the image are links for "Click To Enlarge Image", "Technical Bulletin" (with a "TB" icon), "MSDS" (with a diamond icon), "Videos & Photos" (with a camera icon), and "FAQs" (with a question mark icon).

At the bottom of the page, a list of products is provided:

- SORTA-Clear® 18 - Shore 18A hardness
- SORTA-Clear® 40 - Shore 40A hardness

It is very important that you always read the technical bulletin, it will tell you how to work the material, its features and safety information.

# Mold: always read the instructions!

The Smooth-On website features a prominent banner at the top with the text "Materials to **SCARE** the **LIFE** out of you™" and a cartoon image of a scary clown. Below the banner is a navigation bar with links to About Us, Seminars, Tech Support, Contact Us, My Account, and a "BUY NOW" button. A search bar and language selection dropdown are also present. On the left, a sidebar lists various applications: Architectural Restoration, Aquarium Decoration, Candlemaking, Concrete Casting, Encapsulation & Display, Food Related Applications, Home Projects & Hobbies, Industrial, Lifecasting, Model Making, Orthotics & Prosthetics, Prototyping & Inventing, Sculpture & Art Casting, Special Effects & Props, Sprayable Materials, Vacuum Bagging, and Taxidermy. A red box highlights a yellow callout box containing text about food-safe mold materials.

**SORTA-Clear® Translucent Silicone Rubber**

SORTA-Clear® rubbers are premium water white translucent silicone rubber (platinum catalyst) that cures at room temperature with no shrinkage. SORTA-Clear® features exceptional tear and tensile strength. Rubber clarity is especially useful when extracting models via cutting. SORTA-Clear® rubber is ideal for making prototype, jewelry or other molds of any configuration where model visibility is important.

Materials such as urethane, epoxy or polyester resins can then be cast into SORTA-Clear® silicone without application of a release agent. Other materials such as wax and low melt metal alloys can also be cast into SORTA-Clear®. SORTA-Clear® can be pigmented with SILC Pig® silicone pigments.

**SORTA Clear® 40 and SORTA® Clear 18 are both suitable for making molds for baking, casting ice, butter or chocolate and other applications used to produce food.**

**CLICK HERE**

- SORTA-Clear® 18 - Shore 18A hardness
- SORTA-Clear® 40 - Shore 40A hardness

Also check if your material is food safe!

# Mold: choose your material

The screenshot shows the Silcom website homepage. At the top left is the Silcom logo with the tagline "Muotista se kaikki alkoi". Below the logo are five images: a hand holding a mold with a purple pattern, a red brick building, a close-up of red circular objects, and two men standing next to a statue.

The main navigation bar includes links for Restaurointi, kynttilät, betonityöt, koristeet, harrasteet, prototypit, kuvanveisto, taide, erikoisefektit, and various business applications like sekä lukuisia sovelluksia yrityskäyttöön.

A sidebar on the left lists product categories: Tarjoustuotteet, Uudet tuotteet, Silikonikumit, Lifecasting, Polyuretaanhartsit, Vaahtomuovit, Polyuretaanikumit, Oheistuotteet, Muotoilusavet, Kynttilä- ja saippuamateriaalit, Valmispaketit, Epoksit, and Etusivu. The "Ostoskoris on tyhjä." message is visible near the shopping cart icon.

The central content area features a search bar with fields for "Haku:" and "Kaikesta tuoteryhmästä", and a "Hae" button. A Facebook integration section highlights a competition to win 600 euros for ideas posted on their page. Below this are links to Smooth-On's catalog and information about their Smooth-On Betonista product.

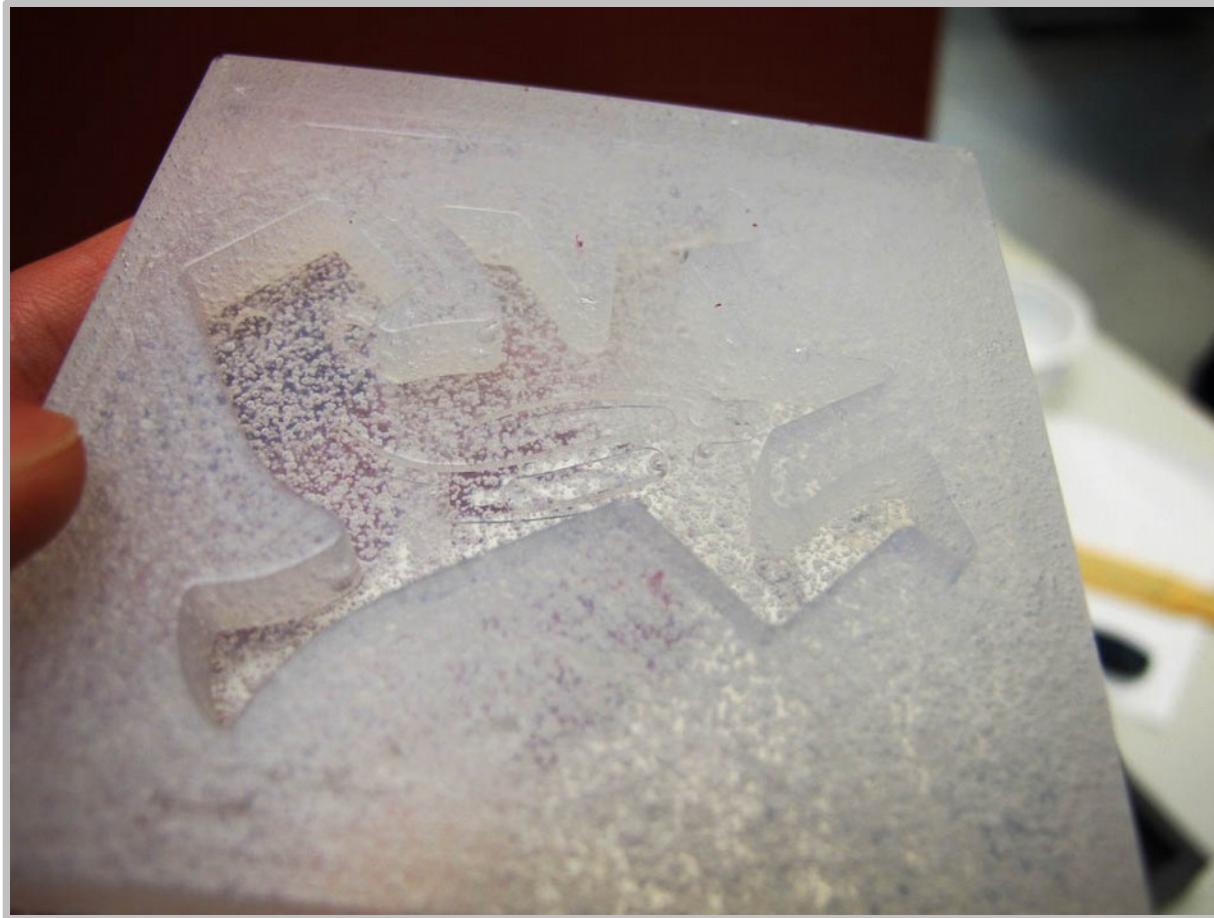
A large text block on the right side reads: "Kaikkea mitä tarvitset muotin valmistukseen ja valutöihin".

Call-to-action boxes include "Tutustu valmispaketteihimme", "Media-galleria", "Asiakaspalvelu 0400 416 371 info@silcom.fi", "Muottitietoa Lue minih kaikkien muottiteknikka soveltuu", and "Materiaallaskuri Osta oikea määrä. Laske tällä".

A blue banner at the bottom right asks "Oletko vasta aloittelemassa? Täältä löydät helnot".

Silcom is the Finnish distributor of Smooth-On and other brands...

# 1-side mold: relief objects (one flat side)



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A 1-side mold for an object with one flat side  
(and a food safe silicon).

Source: <http://www.flickr.com/photos/aaltofablab/7073792943/in/photostream>

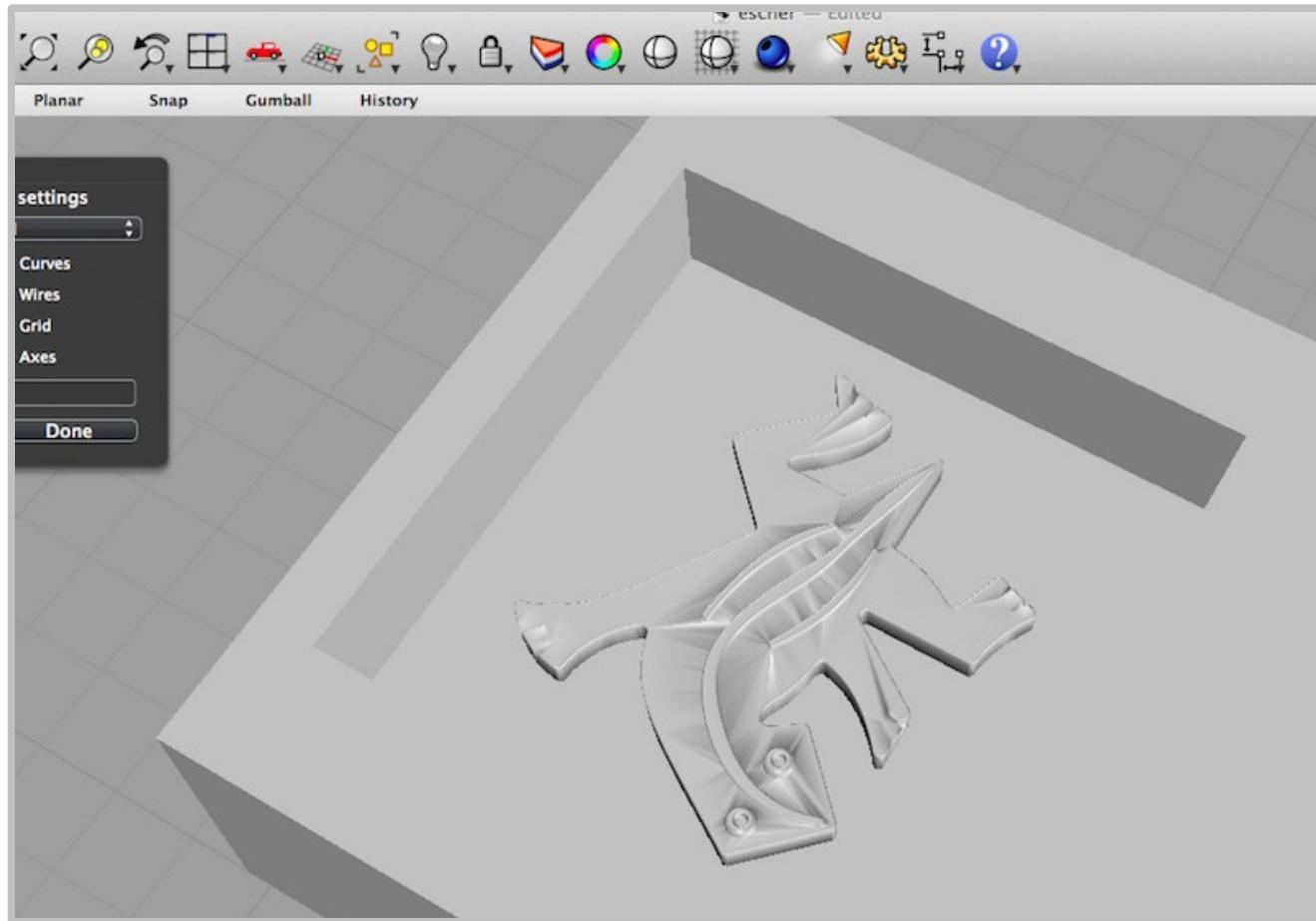
# 1-side mold: relief objects (one flat side)



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The final flat object (chocolate).

# 1-side mold: relief objects (one flat side)



---

The mold designed for milling: it is the negative of what you want to get as a real object!

Source: <http://academy.cba.mit.edu/2012/students/menichinelli.massimo/index.html>

## 2-sides mold: full 360° objects

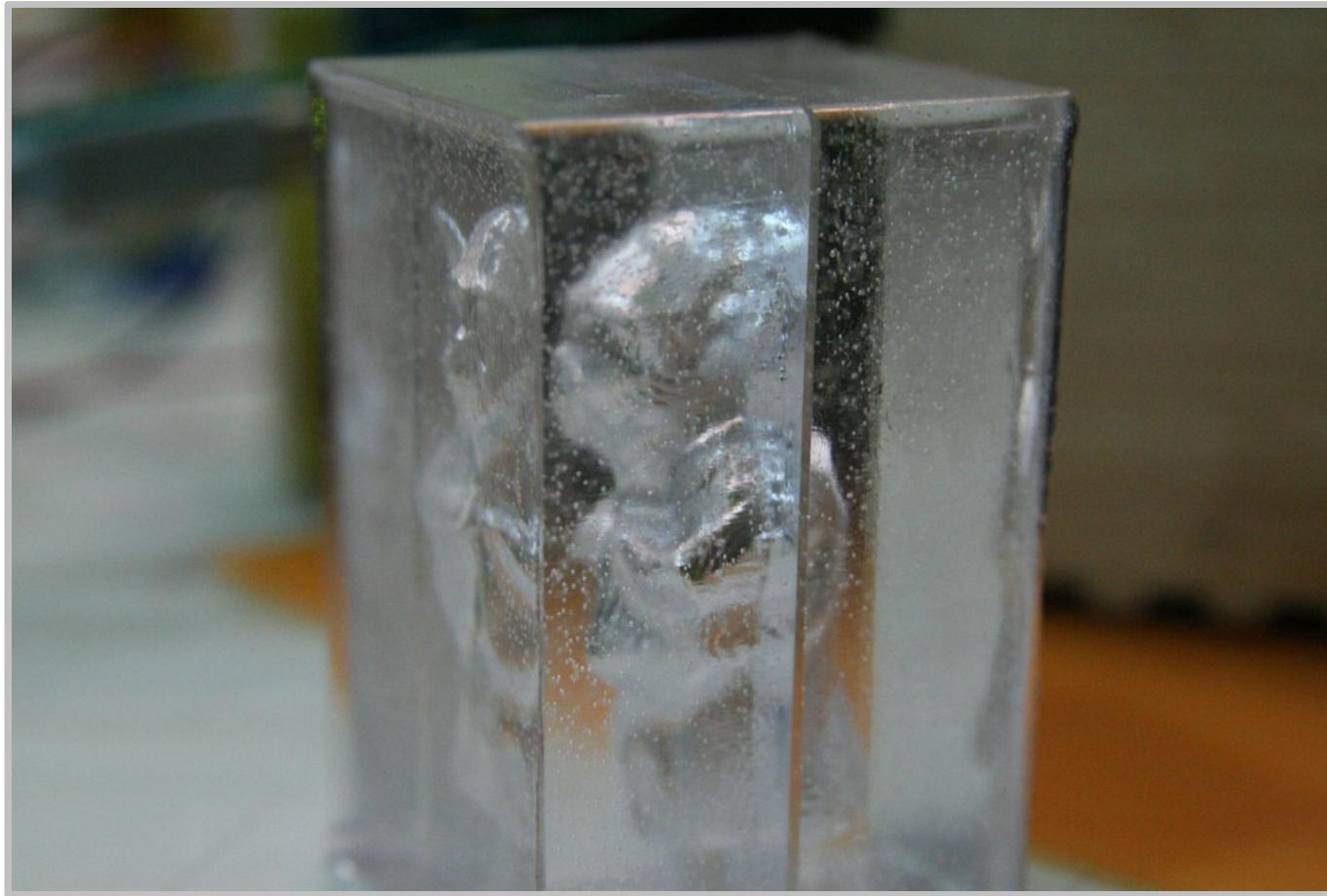


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For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

Source: [http://www.flickr.com/photos/massimo\\_menichinelli/6766269767/in/photostream](http://www.flickr.com/photos/massimo_menichinelli/6766269767/in/photostream)

## 2-sides mold: full 360° objects

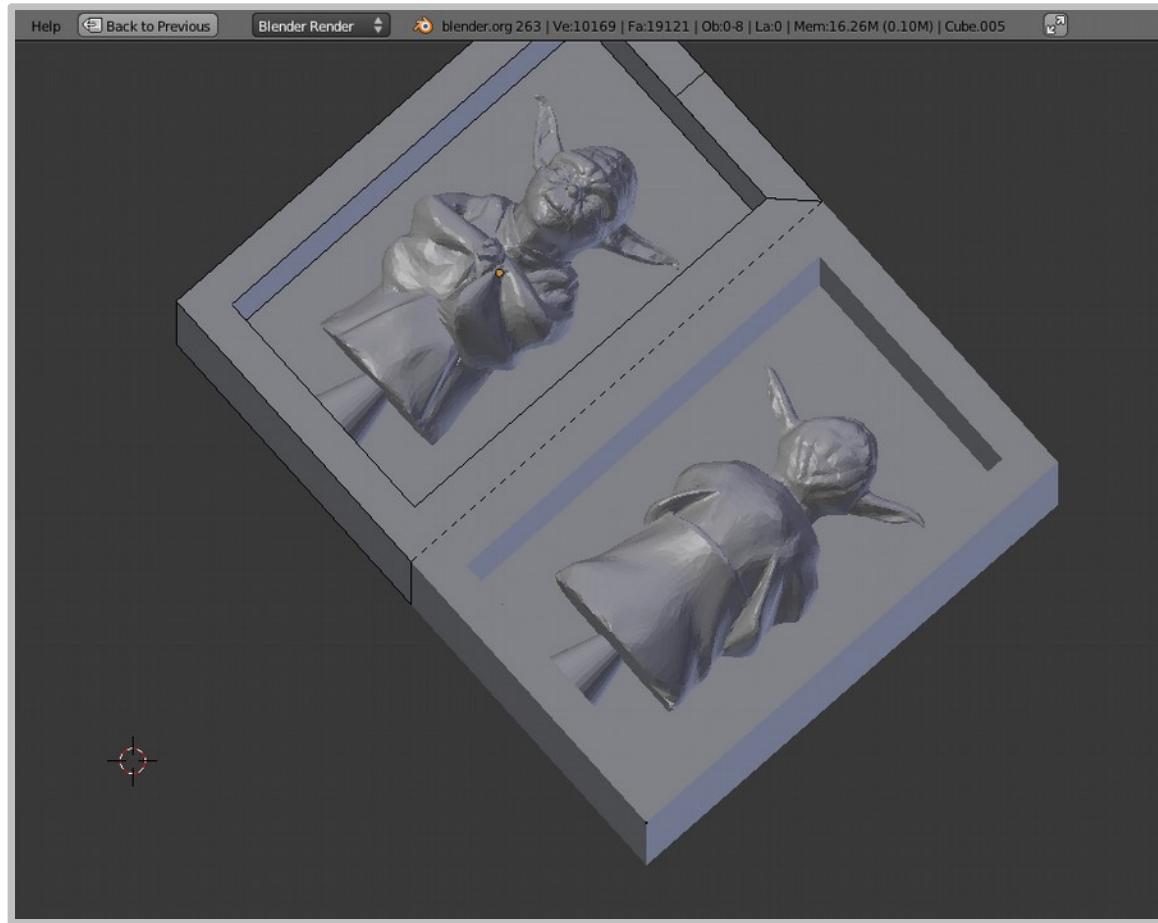


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For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

Source: [http://www.flickr.com/photos/massimo\\_menichinelli/6766270509/in/photostream](http://www.flickr.com/photos/massimo_menichinelli/6766270509/in/photostream)

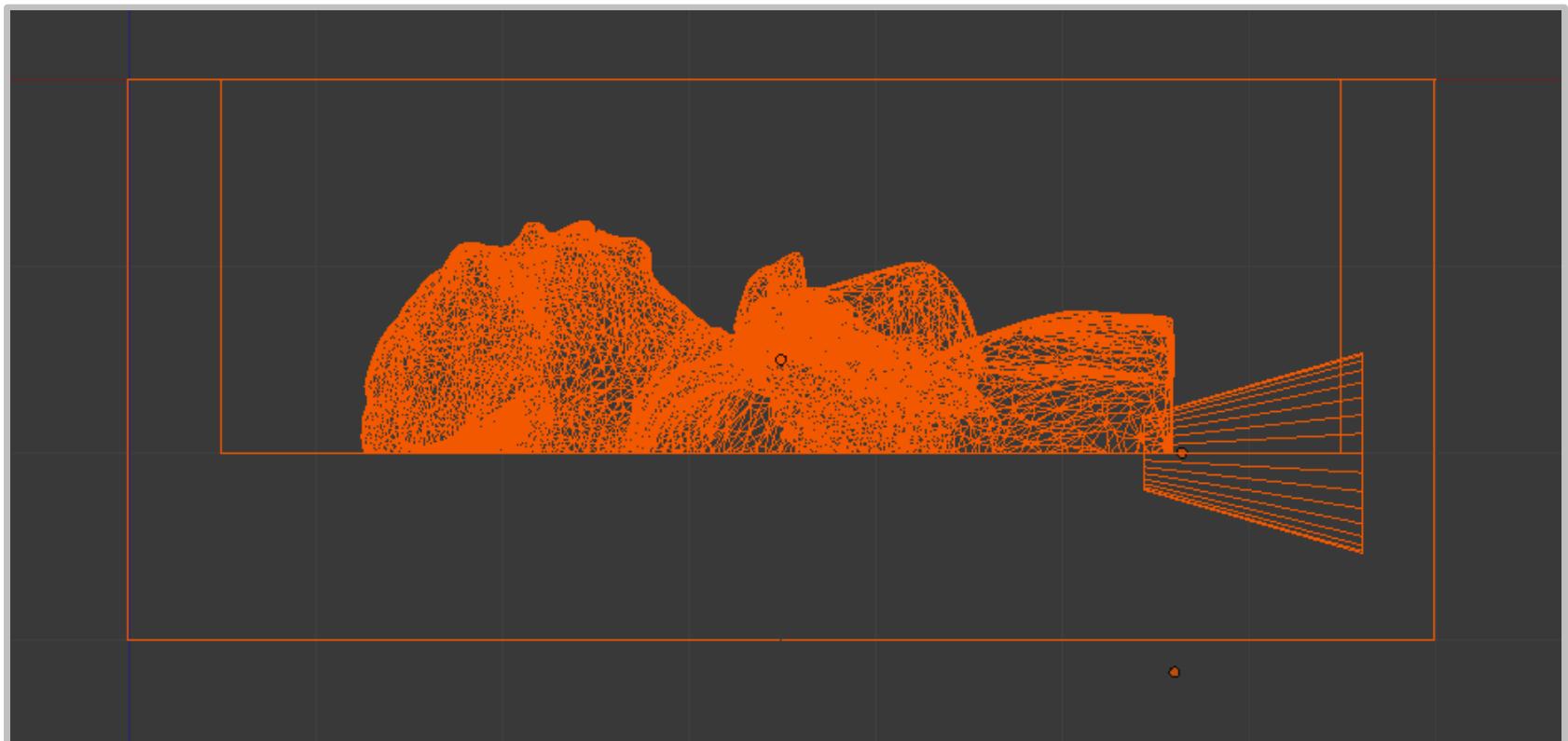
# 2-sides mold: full 360° objects



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For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

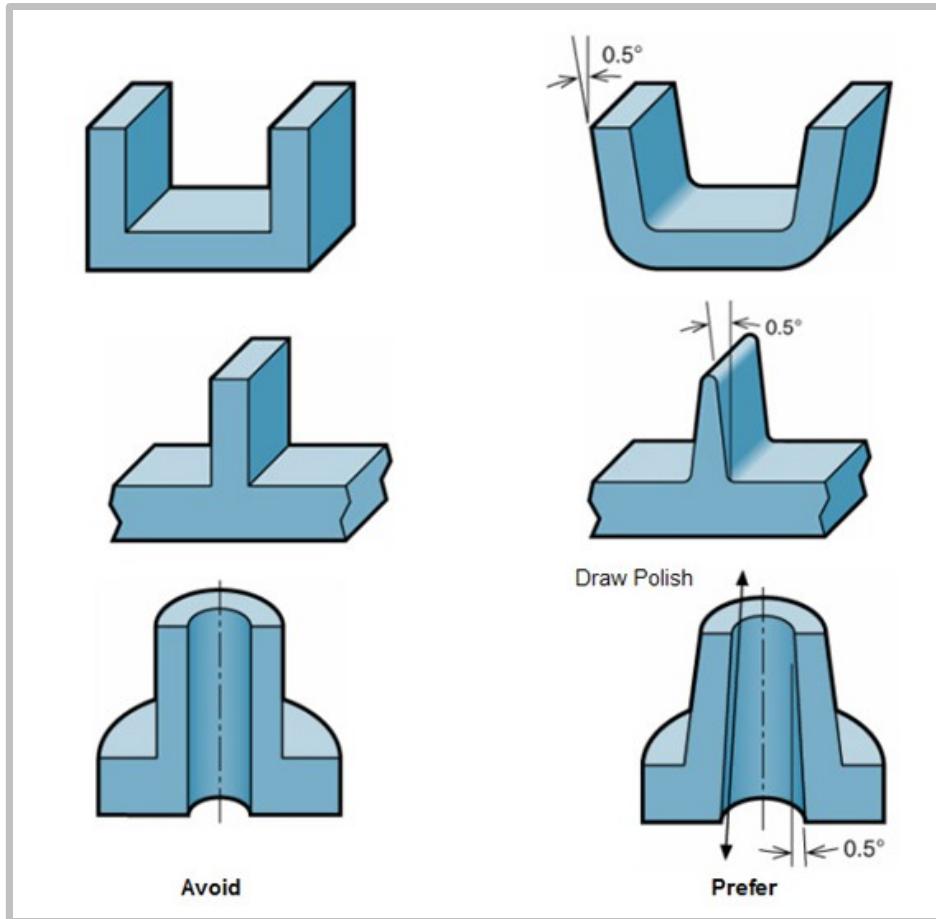
# 2-sides mold: full 360° objects



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Add a cone for pouring the final plastic into  
the mold (the mold will be vertical!).

# Draft angles: it may be hard to remove the part



In engineering, draft is the amount of taper for molded or cast parts perpendicular to the parting line. It can be measured in degrees or mm/mm (in/in).

Source: [http://www.bayermaterialsciencenaftha.com/checklist/draft\\_angle.html](http://www.bayermaterialsciencenaftha.com/checklist/draft_angle.html)  
[http://en.wikipedia.org/wiki/Draft\\_\(engineering\)](http://en.wikipedia.org/wiki/Draft_(engineering))

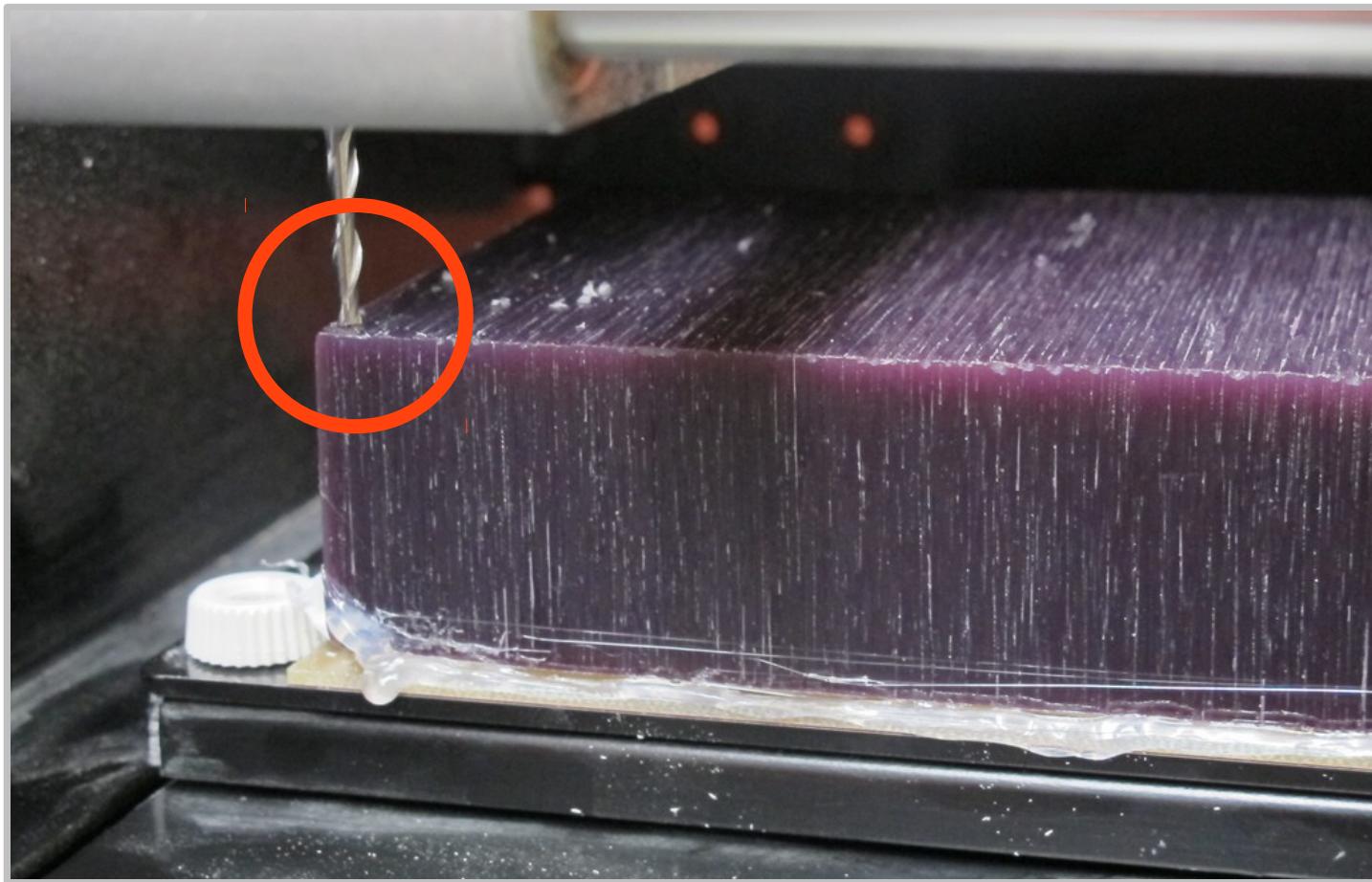


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03.

# Milling and Casting: How to create a mold and use it

# Always, set the Zero: X, Y, Z

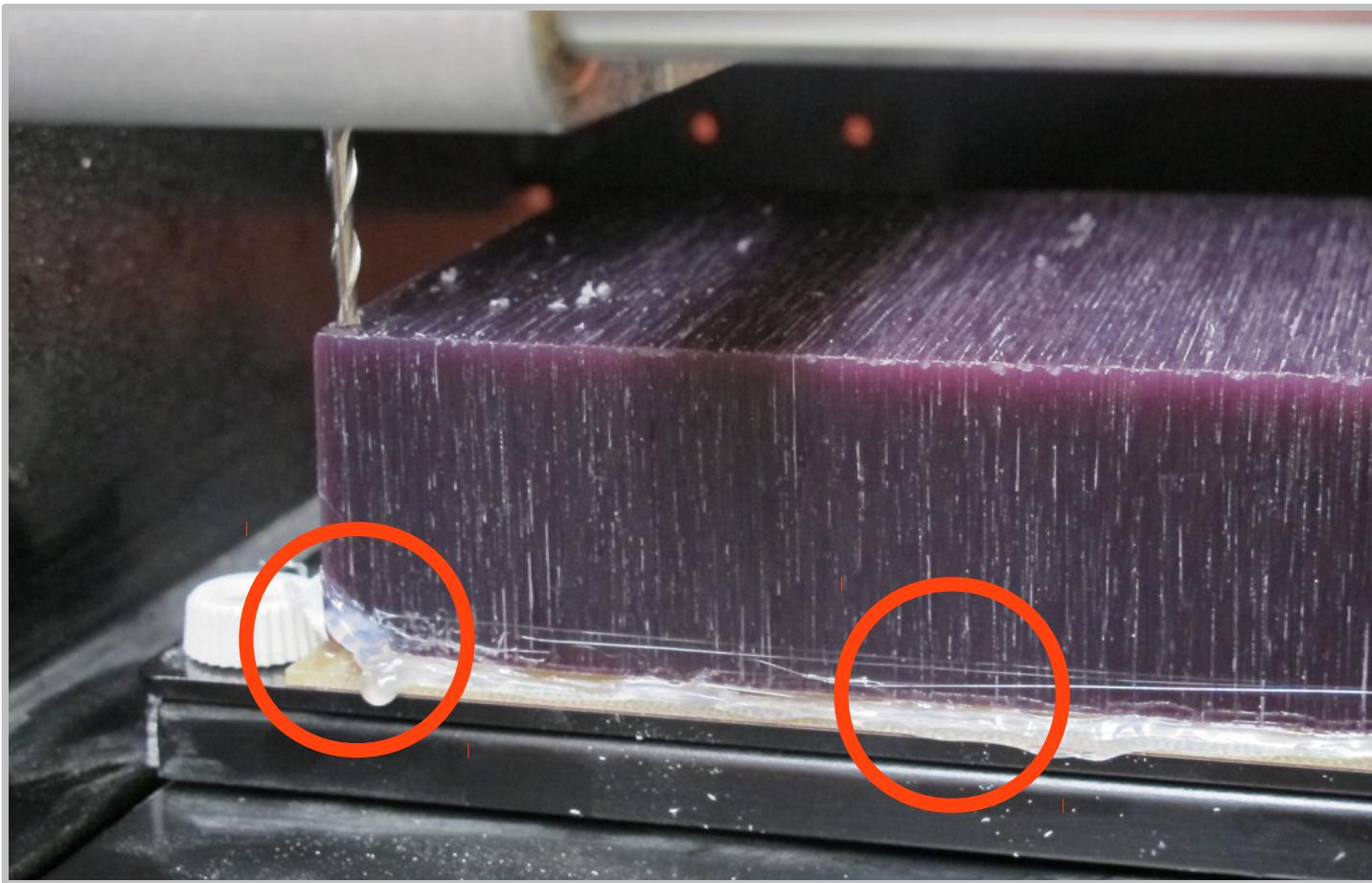


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And write down the X and Y coordinates! Furthermore, don't mill around it, so you can preserve it for future passes.

Source: <http://www.flickr.com/photos/aaltofablab/6924563776/in/photostream>

# Always, use double side tape

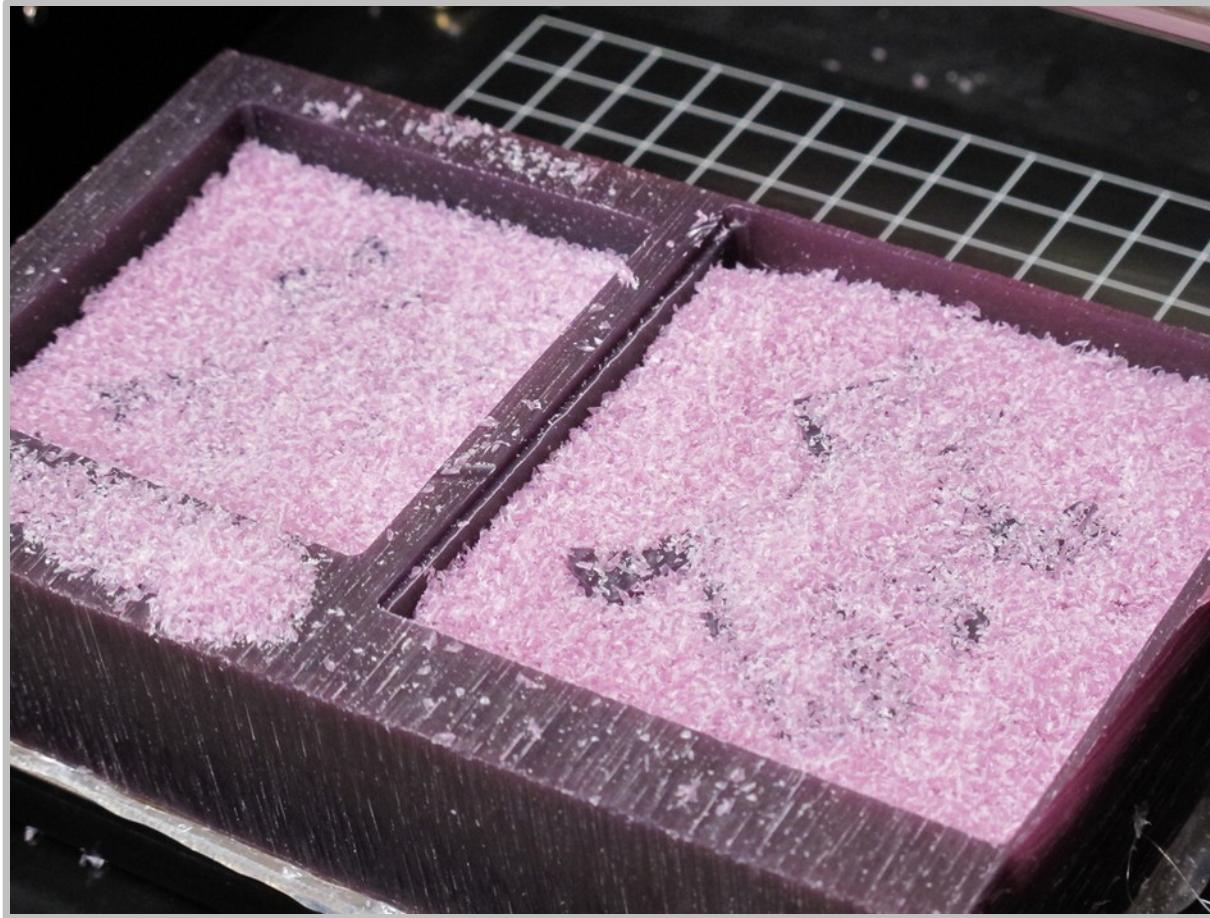


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Use double side tape to stick the modeling wax block to the milling machine, and hot glue if the tape is not strong enough.

Source: <http://www.flickr.com/photos/aaltofablab/6924563776/in/photostream>

# Mill it :)



---

You may need to clean the machine to check the progress, but  
**always press the View button** before doing it!!!

Source: <http://www.flickr.com/photos/aaltofablab/6924566732/in/photostream/>

# Mix and stir the components



Most of the time you will have to mix two separate components, **always check the instructions**, you may need to balance by volume or by weight.

Source: <http://www.flickr.com/photos/aaltofablab/7070850521/in/photostream>

# Use the demoulding spray



---

It will help you when taking the mold away from the wax block.

# Pour the silicon with a steady flow



You want to avoid the formation of bubbles inside the mold (or you will have to cast it again), so be careful when pouring the silicon.

Source: <http://www.flickr.com/photos/aaltofablab/6924789764/in/photostream>

# Wait ... and repeat!



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Check the instructions! Sometimes it help for demoulding to leave the stick on the mold ... sometimes not!

Source: <http://www.flickr.com/photos/aaltofablab/7073738569/in/photostream>



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Media Factory

# Thank you!!

Massimo Menichinelli  
Aalto Media Factory  
[massimo.menichinelli@aalto.fi](mailto:massimo.menichinelli@aalto.fi)  
[@openp2pdesign](https://openp2pdesign.net)  
<http://www.slideshare.net/openp2pdesign>

