



Aalto University
Media Factory

Digital_Fabrication_Studio.07

Molding & Casting - materials, finishes, processes

Massimo Menichinelli

massimo.menichinelli@aalto.fi

@openp2pdesign

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



12.10.2012



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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



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

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 holding custom weapons. On the left side, there's 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 custom weapons, weapons packs, and minifigs, followed by a section about the "March 15, 2012 - MAAWS, Black Minigun w/Brass Ammo Chain, MCP v3, & WWII Pack w/Russian Protos!" which was available at all resellers at 12AM March 16th, 2012. It includes images of the "Modern Combat Pack v3" and the "World War II Limited Edition Weapons Pack".

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

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

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

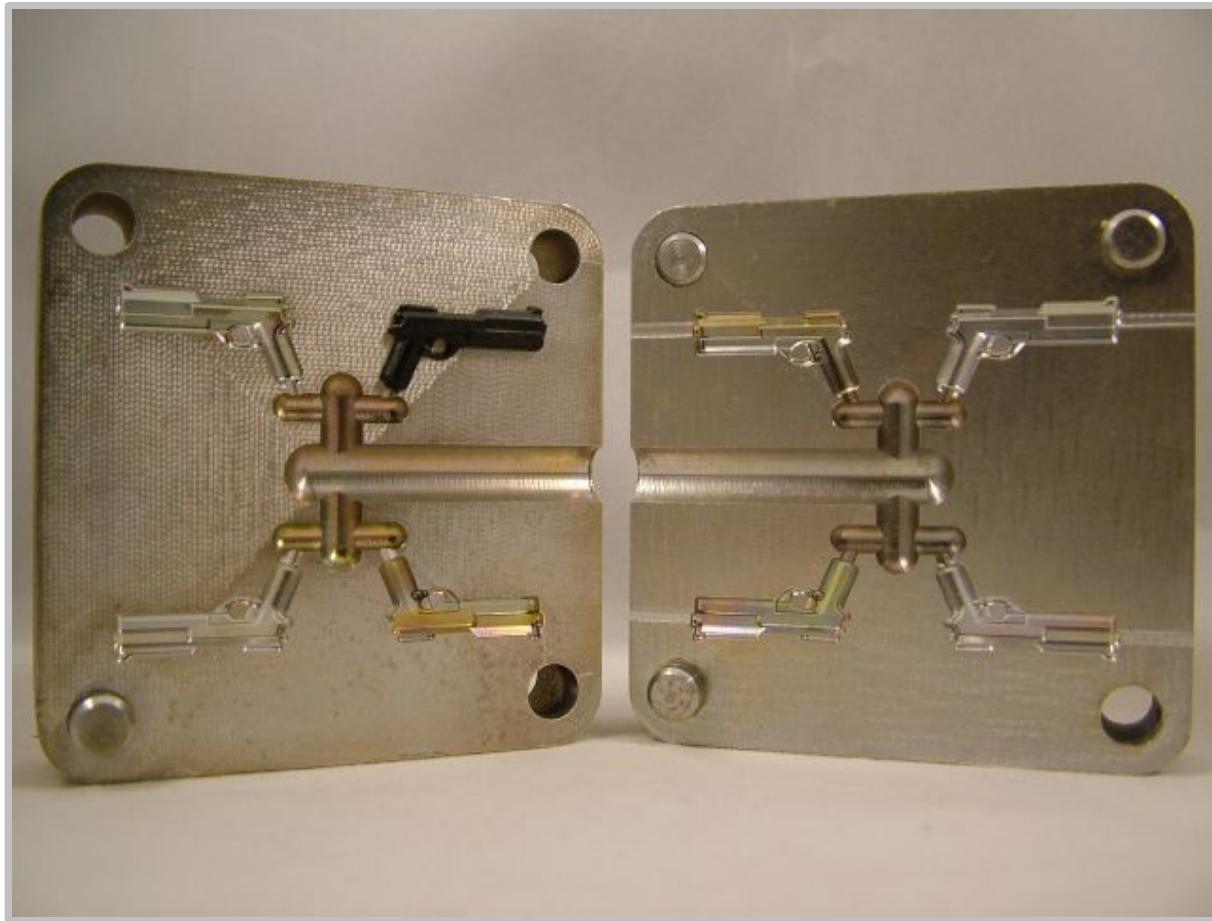
Source: <http://www.brickarms.com/>

Brickarms: hacking and casting LEGO toys



A set of pieces.

Brickarms: hacking and casting LEGO toys



The two-side mold (for injection moulding).

Brickarms: hacking and casting LEGO toys



The two-side mold (for injection moulding).

Brickarms: hacking and casting LEGO toys



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



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

Source: <http://www.flickr.com/photos/enigmabadger/6010441876/in/photostream>

Brickarms: hacking and casting LEGO toys



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 figures, including a knight, a wizard, and a Roman soldier. Below the illustration is a dark navigation bar with white text and icons. The main content area has a light gray background. On the left, there's a sidebar with a red header containing a fire icon and a list of recent posts. The central column features a blog post titled "3rd Annual BrickMagic LEGO Festival" with a date of April 25th, 2012, and an author of "admin". The post describes the festival, ticket prices, and location. At the bottom of the post are "Posted in products" and "No Comments". To the right of the blog post is a sidebar with a search bar and a section titled "Featured Items" showing various LEGO products like tactical helmets and vests.

Home | About | Contact | Contests | FAQ | Forum | Policies | Shop

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 HELM

“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'. The top navigation bar includes a search bar and an 'Advanced search' link. On the left, there's a sidebar with 'Categories' (Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, SALE) and a 'Bestsellers' section listing items like Beret - Medium Blue, Mushroom - Medium Blue, Powered Assault Helmet - Medium Blue, Knights Shield - Medium Blue, and Military Helmet - Medium Blue.

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 LEGO scooter with a rainbow graphic on the side panel. To the right of the image is a logo for 'BRICK FORCE' featuring a stylized flame. The product description notes that miniquins, MOCs, and minifigs are not included. It describes the scooter as a step-through design for motorist's feet, popular for urban transportation, and suitable for minifigs up to a certain size. The scooter is designed to accommodate standard 1x1 connection points. The parts list includes the scooter body, handlebars, wheels, front tire (narrow), and rear tire (broad). The price is \$6.25. The body, handlebars, and wheels are black.

(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 FORCE' with a yellow header bar containing a search field and an 'Advanced search' link. A sidebar on the left lists categories like Weapons, Headgear, Armor, Equipment, Instruments, Accessories, Hair/Beards, Animals, Decals, Chrome, Swag, Colors, and SALE. Below this are sections for Bestsellers (listing items 1 through 5) and Manufacturers. The main content area displays a product titled 'Spill/Splat - Trans Clear'. It features a yellow LEGO minifigure holding a large, translucent yellow umbrella, standing on a dark base plate with several translucent yellow puzzle-piece-like shapes scattered around it. The base plate has the words 'SPILL / SPLAT' printed on it. To the right of the image is a descriptive text block: 'Watch your shoes! Someone or something leaked. The contoured design is cleverly designed and anywhere else a mess is needed. Our valises used as a surrogate for almost any liquid substance? Beverages? Blood & Gore? It's up to you. Fit Guest CAD Modeler: Designed by Thrash'. Below the text are details about the product: SKU PL-ACCS-SPI, Quantity in stock 310 item(s), Weight 0.03 oz. The price is listed as \$1.00. At the bottom are buttons for 'Add to cart' and 'Add to wish list'.

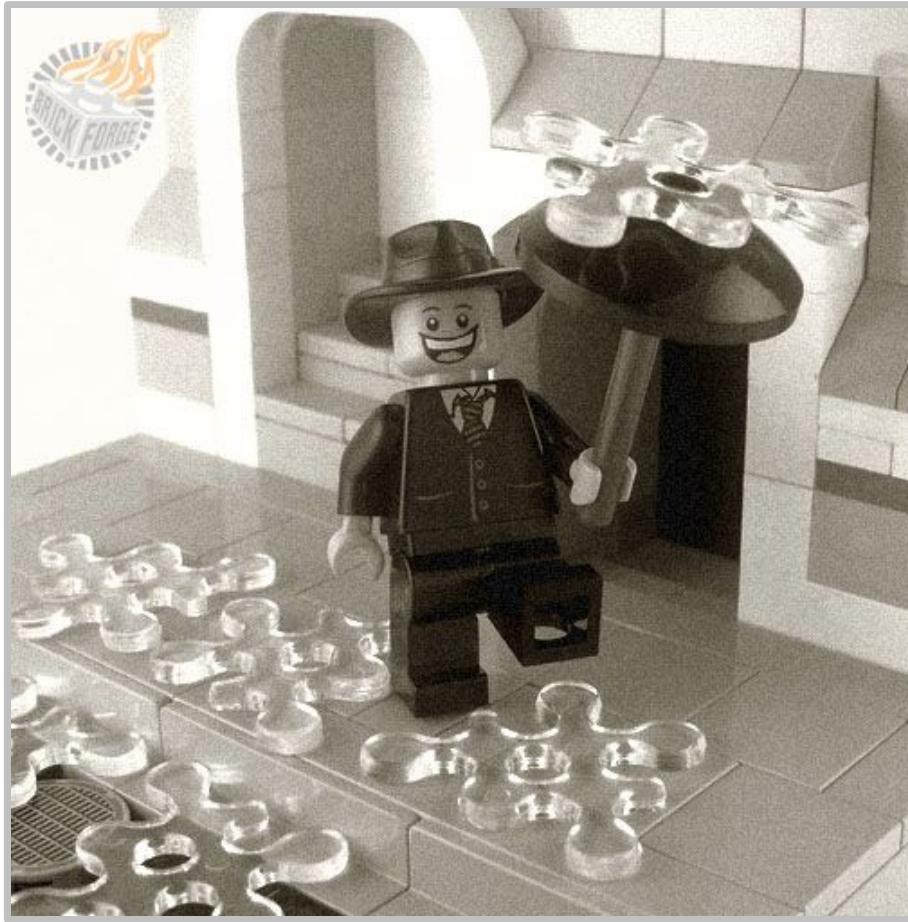
You can be even creative and play with the materials and their attached meanings...

BrickForge: hacking and casting LEGO toys



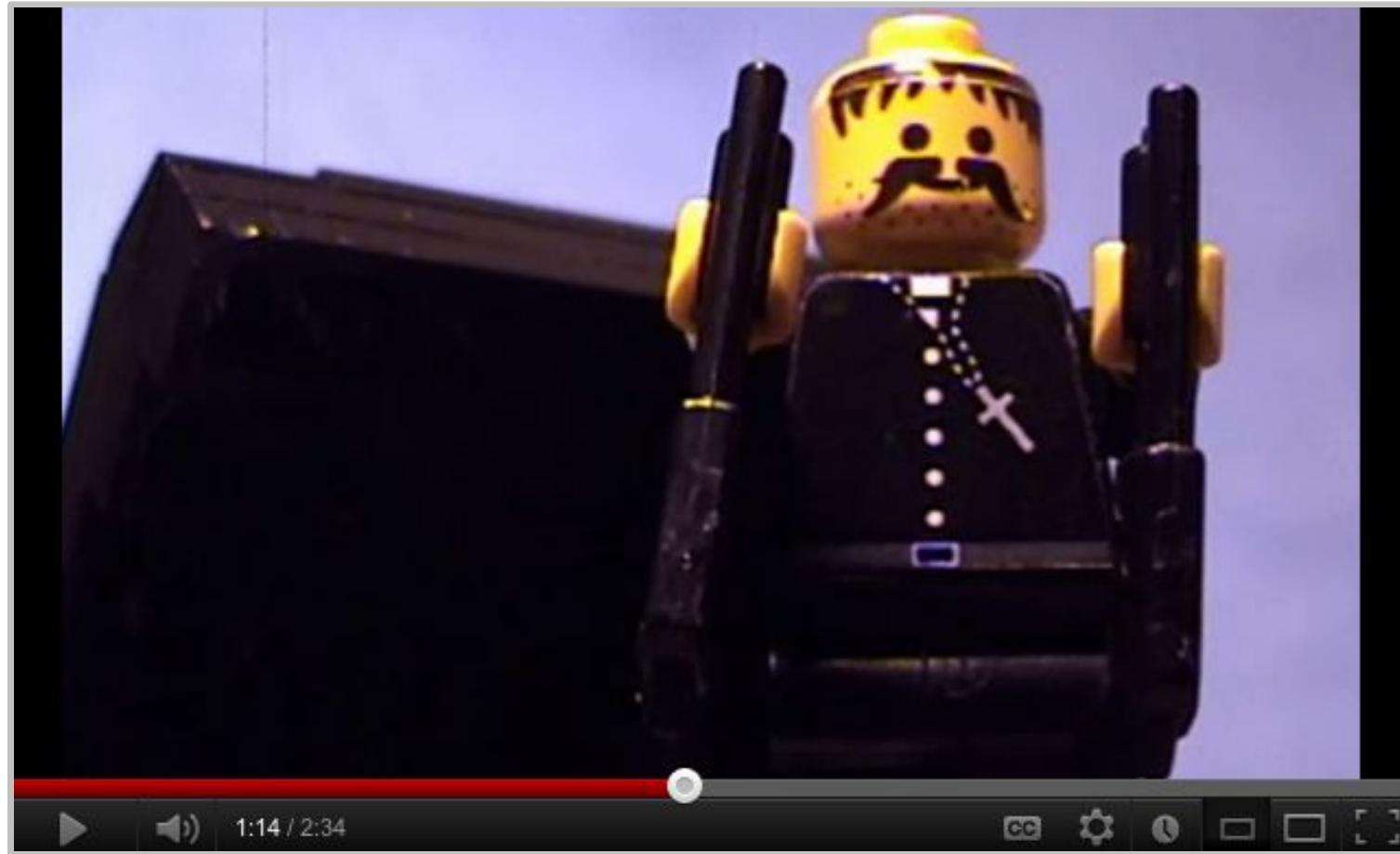
I mean, really creative....

BrickForge: hacking and casting LEGO toys



I mean, really creative....

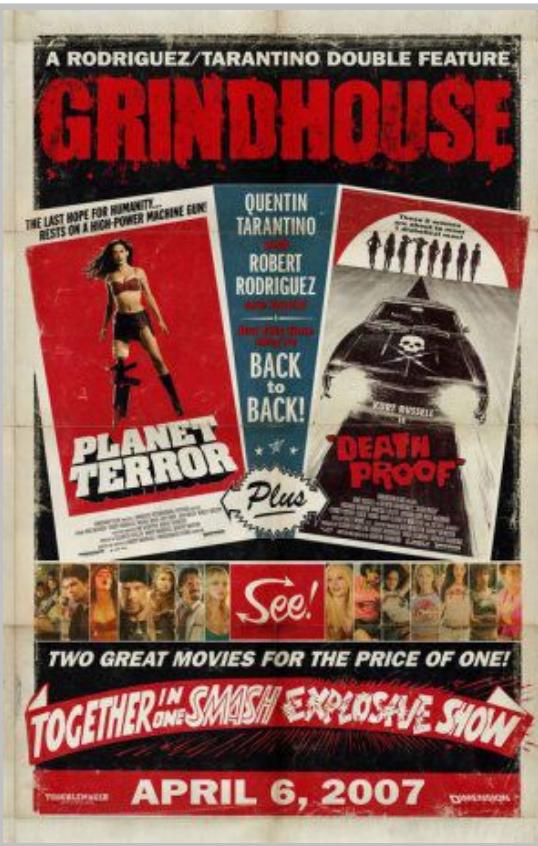
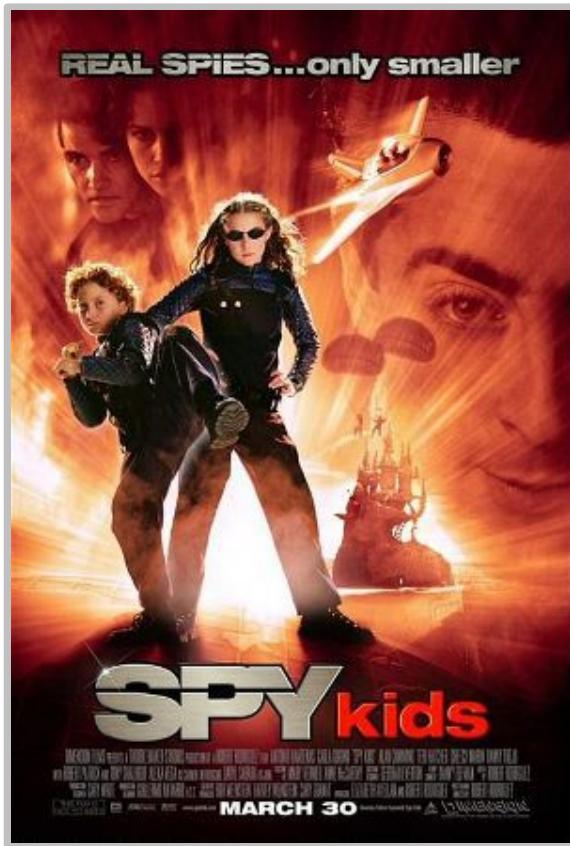
... and what can I do with these toys?



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/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!



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

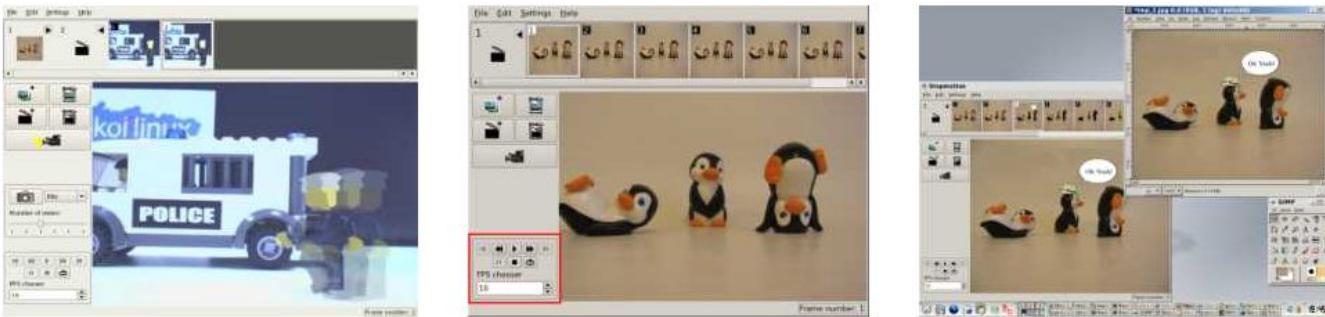
Source: <http://www.flickr.com/photos/catsy/5948099285/in/pool-1206921@N23>

<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 graphic 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 "BUY NOW" button. A search bar and language selection dropdown are also present. The main content area shows a sidebar with various applications like Architectural Restoration, Aquarium Decoration, and Model Making. The central article is about SORTA-Clear® Translucent Silicone Rubber, detailing its properties and applications. It includes a photo of hands working with the material, a "Click To Enlarge Image" link, and links to Technical Bulletin, MSDS, and Videos And Photos.

Smooth-On SINCE 1955
MAKE IT NOW!

Materials to **SCARE** the **LIFE** out of you™

About Us Seminars Tech Support Contact Us My Account BUY NOW

Home Technical Info How-To FAQ's Videos & More New Products Distributors Mold Makers Exchange

Search ▶ Search Select Language Powered by Google™ Translate

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
- Taxidermy

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

Click To Enlarge Image

TB Technical Bulletin
MSDS
Videos And Photos

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 with a banner featuring a scary clown and the text "Materials to SCARE the LIFE out of you™". The main navigation menu includes links for About Us, Seminars, Tech Support, Contact Us, My Account, and a shopping cart icon labeled "BUY NOW". Below the menu is a secondary navigation bar with links for Home, Technical Info, How-To, FAQ's, Videos & More, New Products, Distributors, and Mold Makers Exchange. A search bar and language selection tool are also present. The left 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. The main content area 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 features exceptional tear and tensile strength, especially useful for extracting models via cutting. It is ideal for making prototype, jewelry or other molds of any configuration where model visibility is important. It can be cast into urethane, epoxy or polyester resins without a release agent. Other materials like wax and low melt metal alloys can also be cast into it. It 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 red circle highlights a sidebar on the right containing links for "Click To Enlarge Image", "Technical Bulletin" (labeled TB), "MSDS", "Videos & Photos", and "FAQs".

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 graphic 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 "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

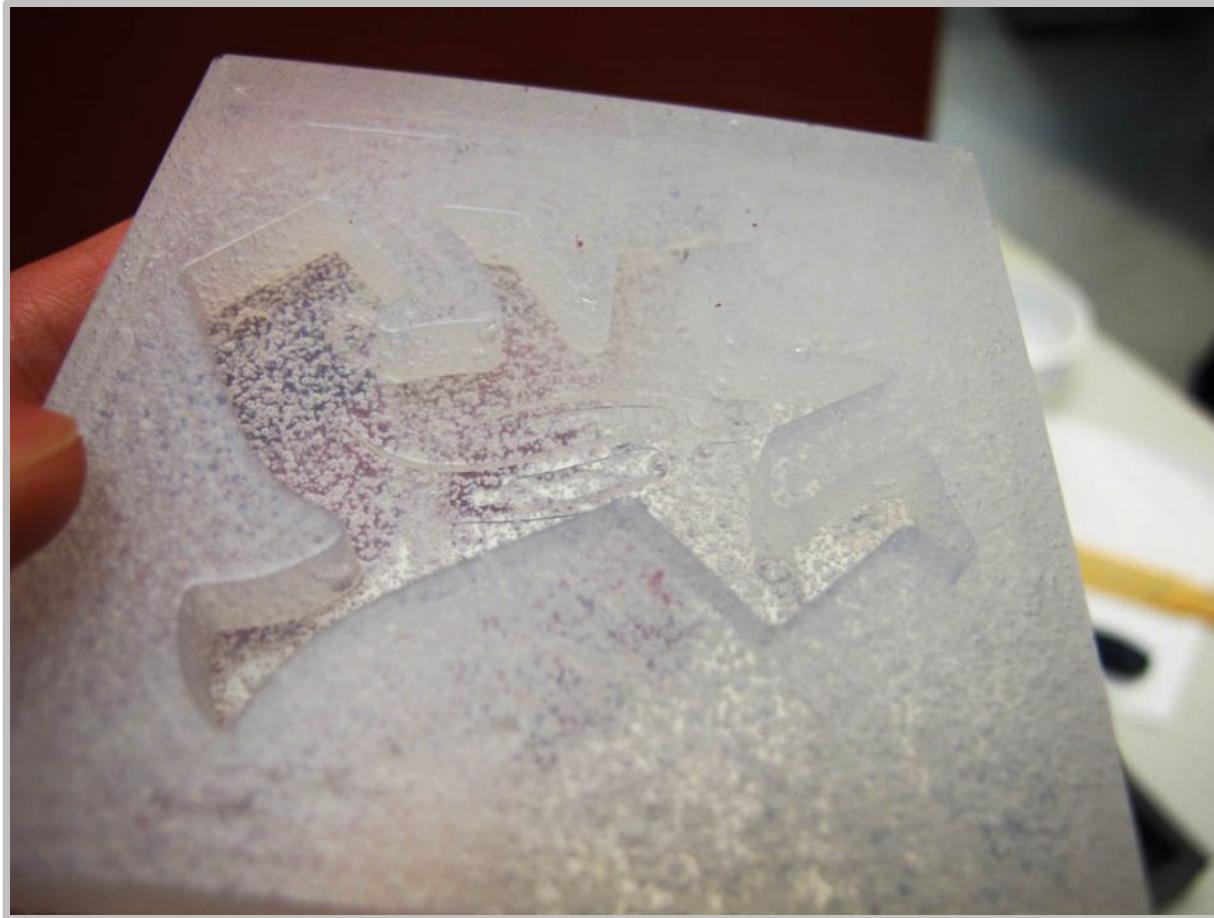
Also check if your material is food safe!

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 four images: a hand holding a mold with a purple pattern, a red brick building, a close-up of red circular objects, and three men standing next to each other. A horizontal menu bar follows, containing links for Restaurointi, kynttilät, betonityöt, koristeet, harrasteet, prototypit, kuvanveisto, taide, erikoisefektit, and various business applications. A sidebar on the left lists product categories: Tarjoustuotteet, Uudet tuotteet, Silikonikumit, Lifecasting, Polyuretaanihartsit, Vaahtomuovit, Polyuretaanikumit, Oheistuotteet, Muotoilusavet, Kynttilä- ja saippuamateriaalit, Valmispaketit, Epoksit, and Etusivu. The main content area features a search bar with a "Haku:" field, a dropdown for "Kaikesta tuoteryhmästä", and a "Hae" button. It also includes a Facebook link and a catalog thumbnail for "Smooth-On Catalogue". Text on the page encourages users to participate in a competition for a 600 euro prize. A large central text block reads: "Kaikkea mitä tarvitset muotin valmistukseen ja valutöihin". To the right are three service boxes: "Asiakaspalvelu" with contact info, "Muottitietoa" with a brief description, and "Materiaalilaskuri" with a brief description. At the bottom right is a call-to-action button: "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)



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

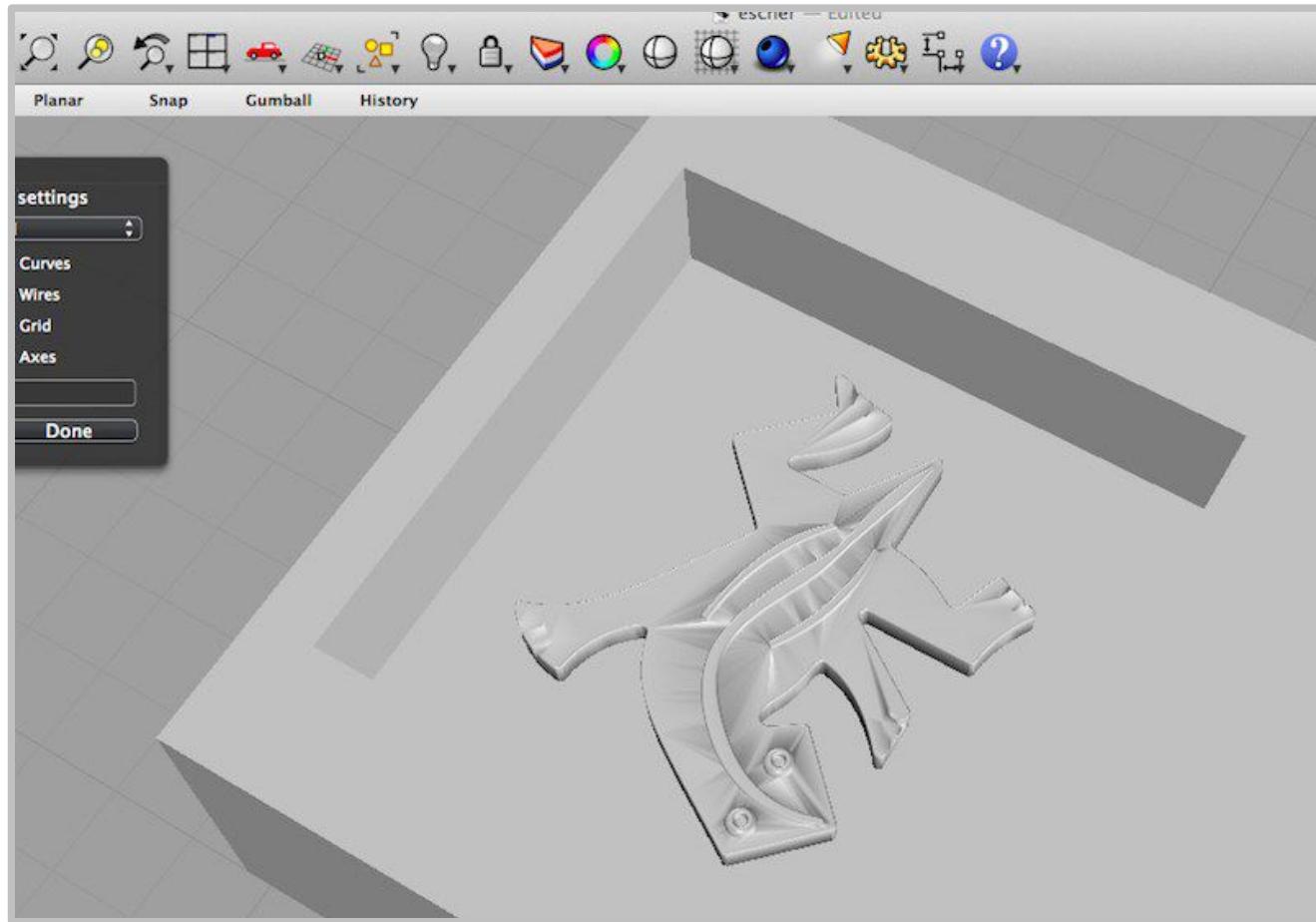
Source: <http://www.flickr.com/photos/aaltofablab/7073792943/in/photostream>

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



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>

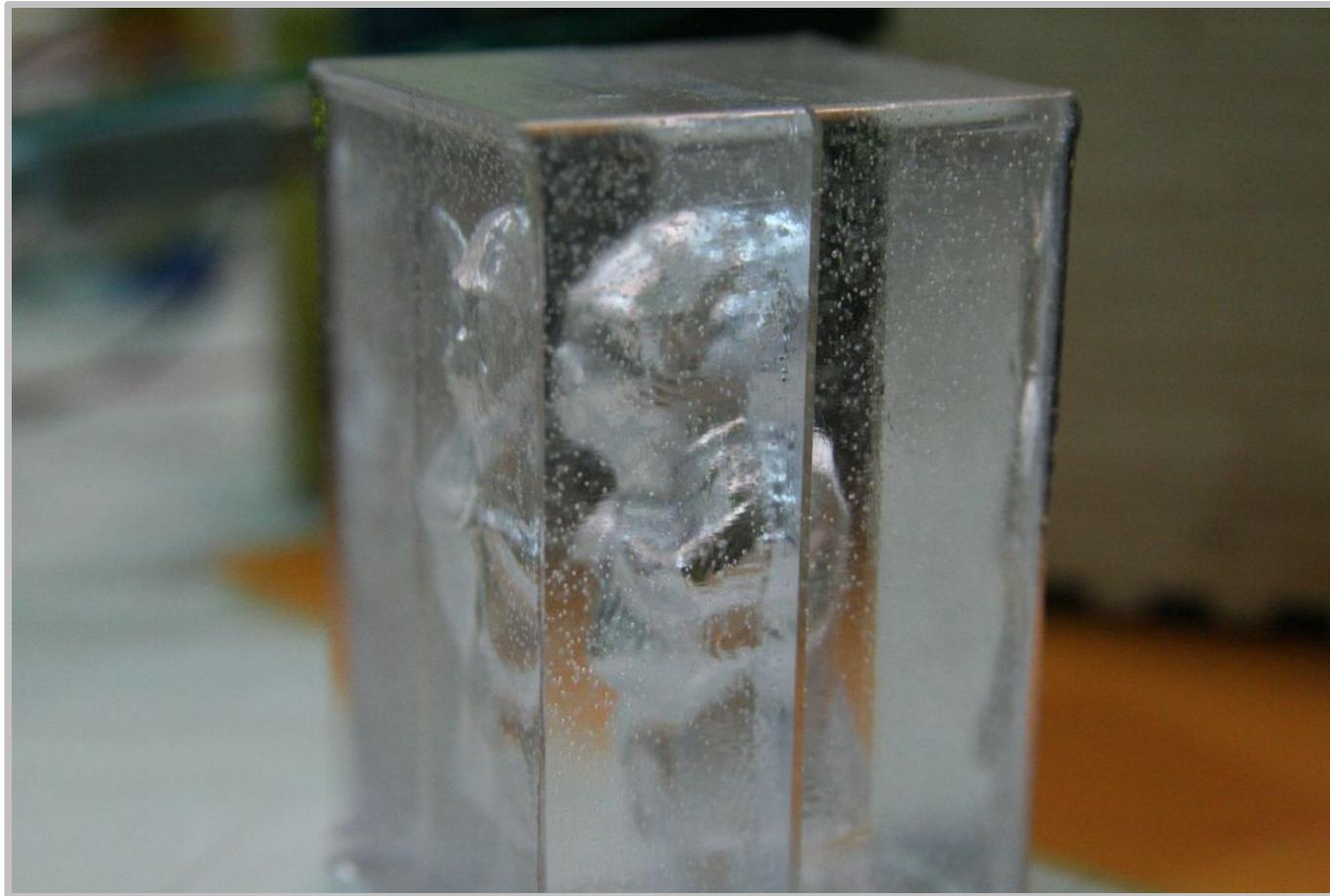
2-sides mold: full 360° objects



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

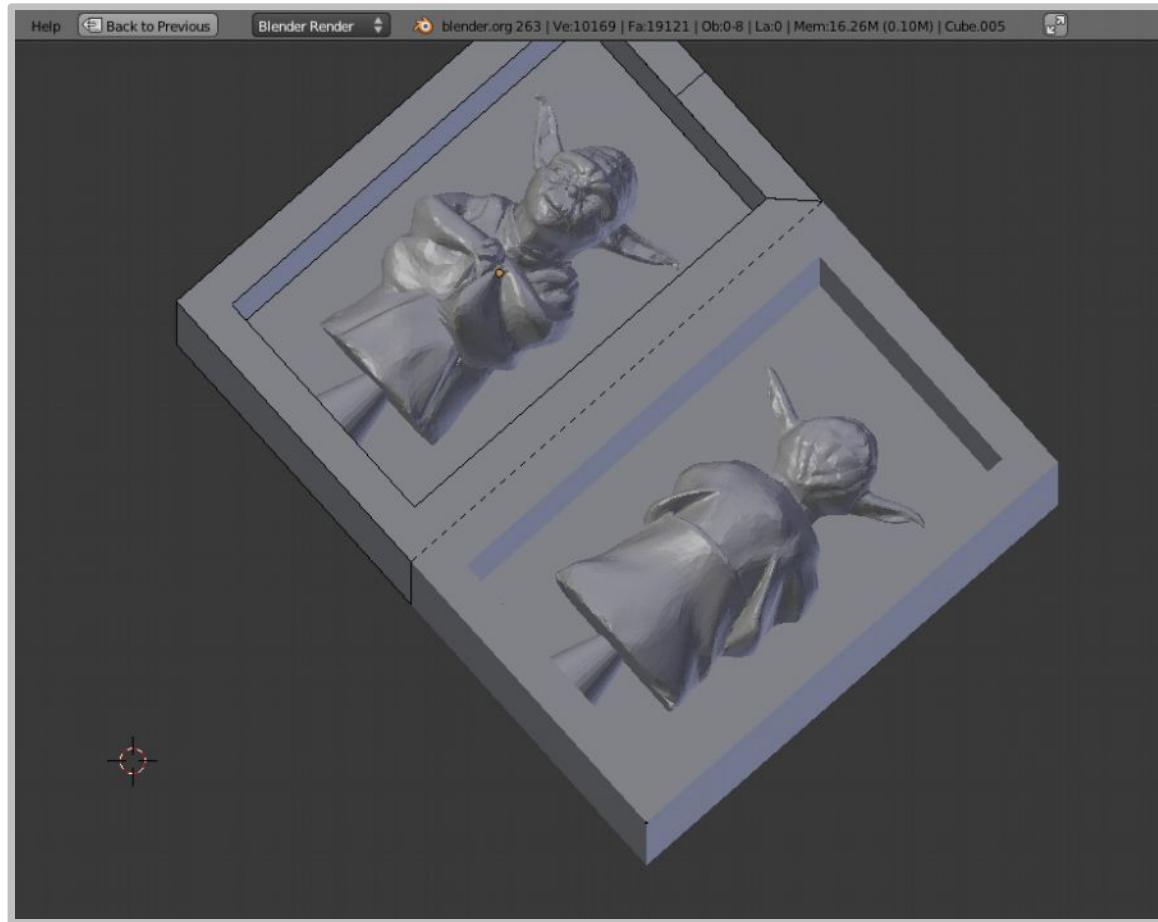
2-sides mold: full 360° objects



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.

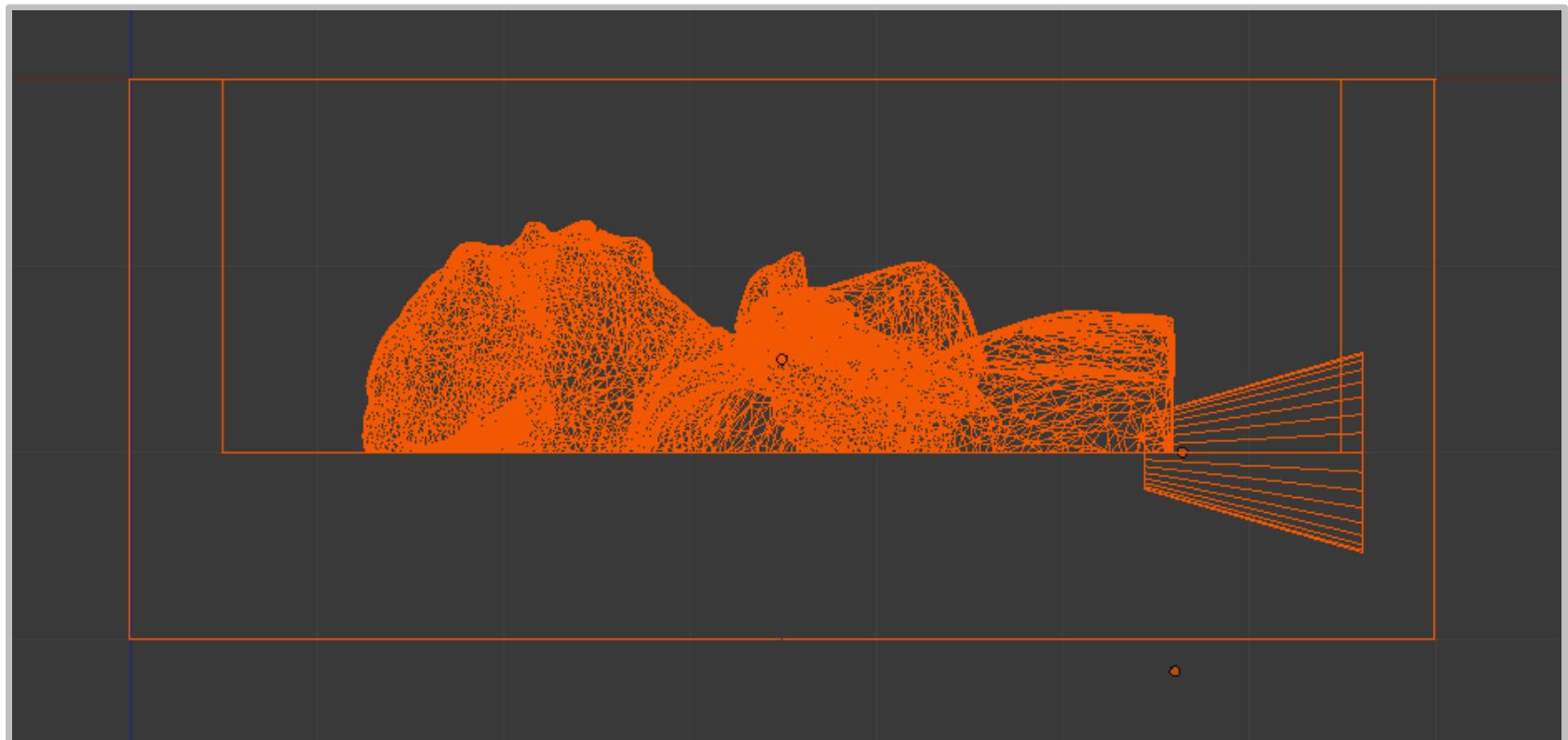
Source: http://www.flickr.com/photos/massimo_menichinelli/6766270509/in/photostream

2-sides mold: full 360° objects



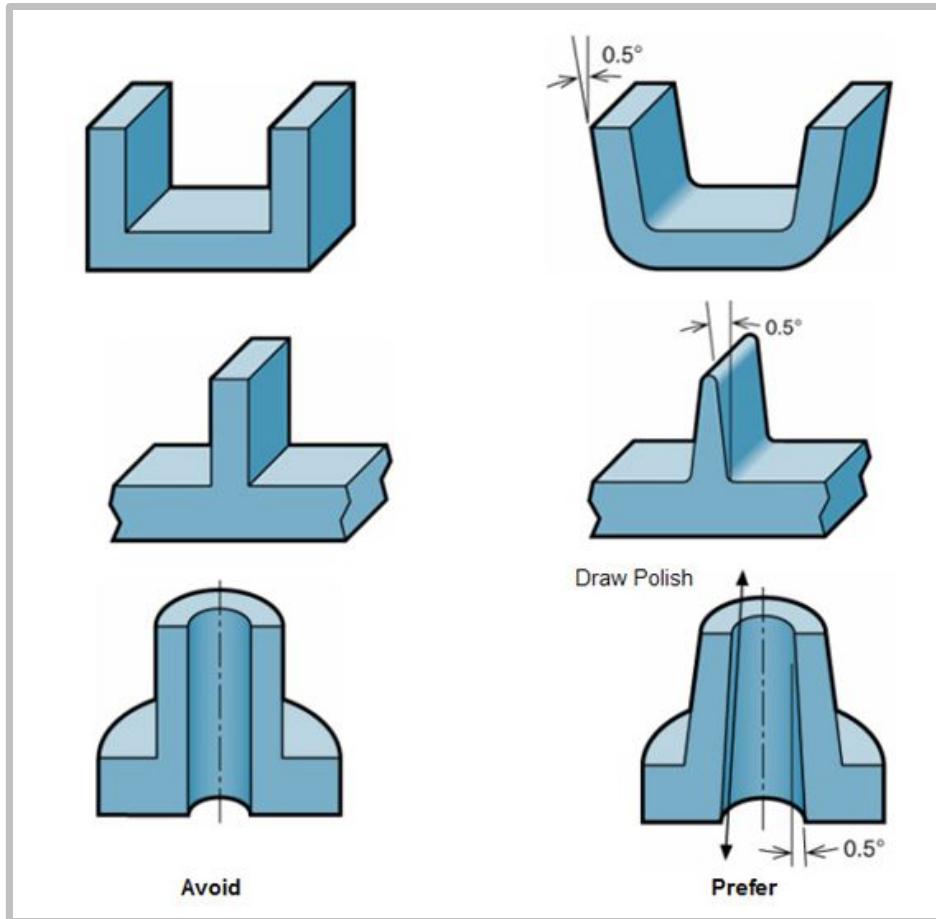
For objects that are 360° (not just a relief) you will need a two-sides mold, so think about how to split the model in two.

2-sides mold: full 360° objects



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://en.wikipedia.org/wiki/Draft_\(engineering\)](http://en.wikipedia.org/wiki/Draft_(engineering))

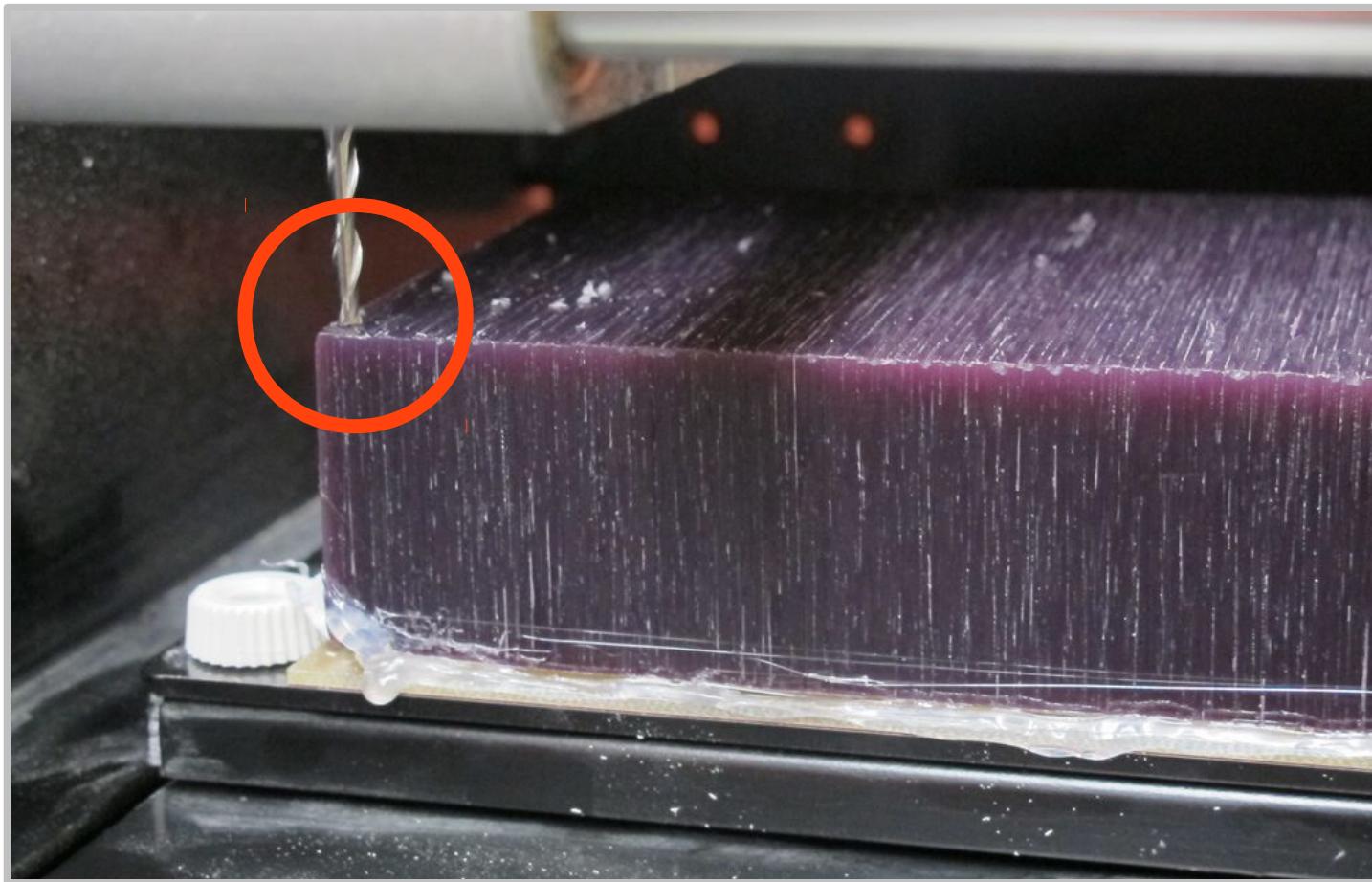


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03.

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

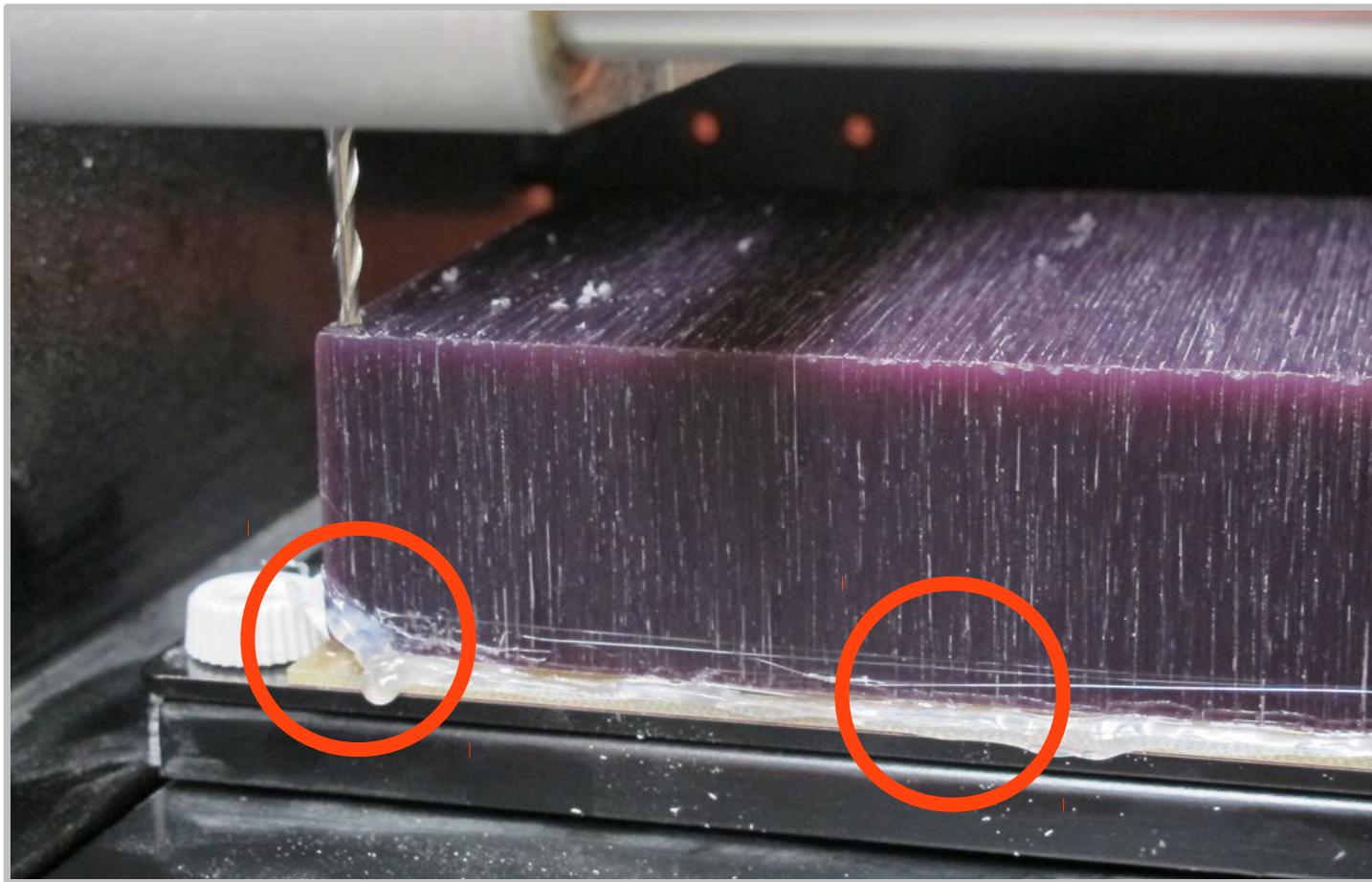
Always, set the Zero: X, Y, Z



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>

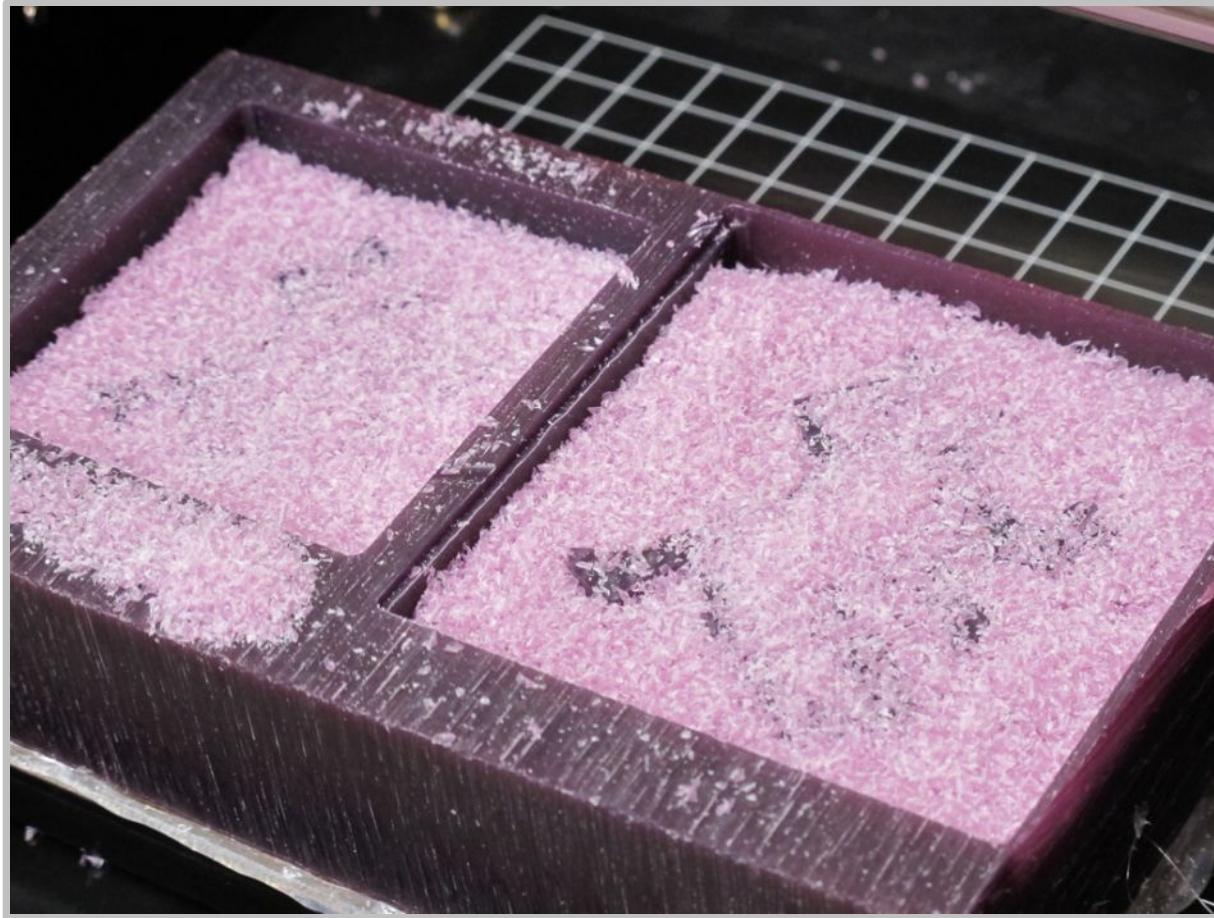
Always, use double side tape



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!



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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04.

Exercise:

design a mold for your 3D scan, mill it and cast a mold and a part out of it.

A”

Aalto University
Media Factory

Thank you!!

Massimo Menichinelli
Aalto Media Factory
massimo.menichinelli@aalto.fi
@openp2pdesign
<http://www.slideshare.net/openp2pdesign>



12.10.2012