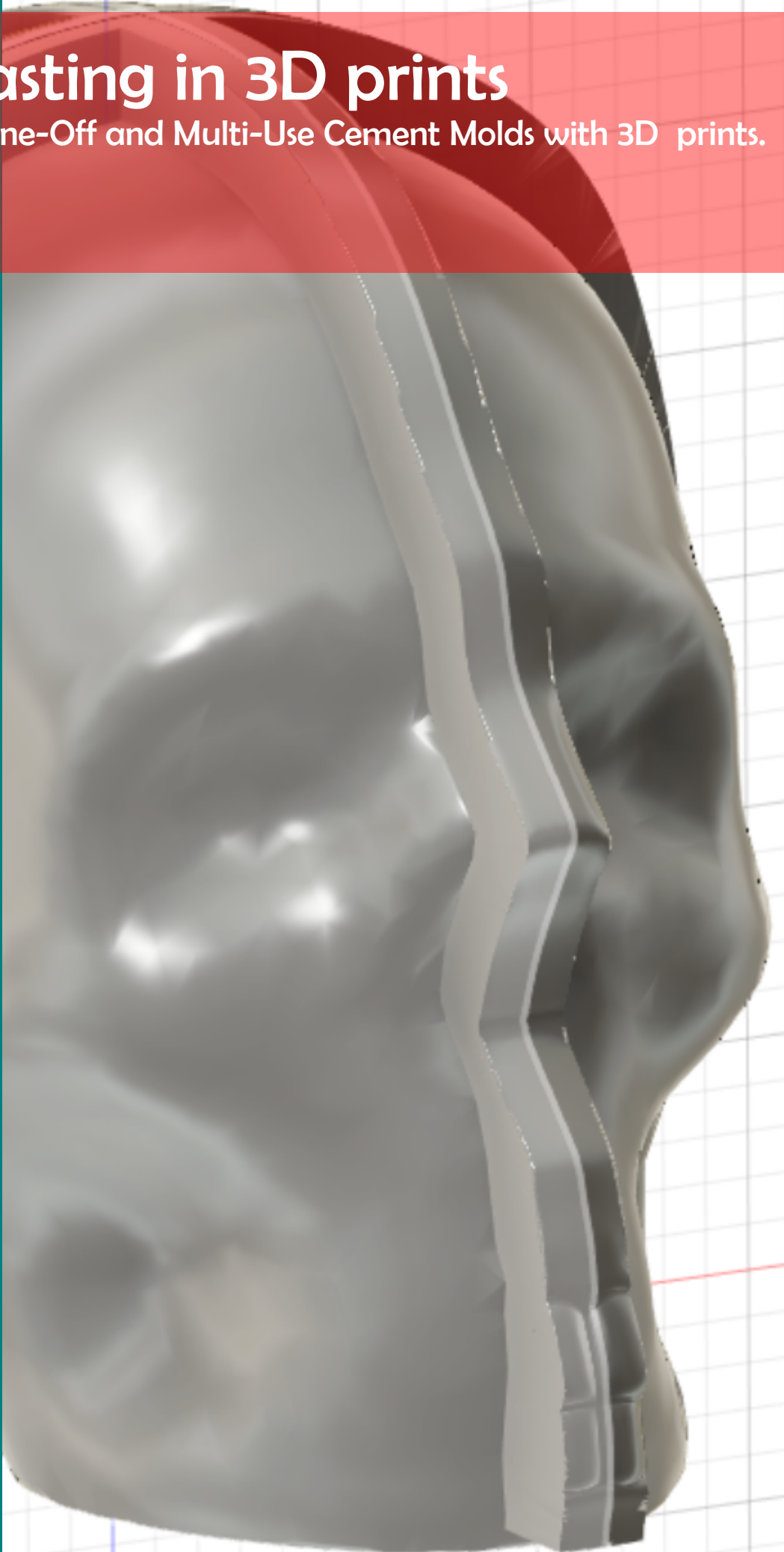


Cement casting in 3D prints

Guide to Creating One-Off and Multi-Use Cement Molds with 3D prints.

Jason Winfield



Introduction

In a realm where digital design seamlessly merges with tangible craftsmanship, a world of endless creative possibilities awaits. Imagine turning your wildest ideas into concrete reality, quite literally. The fusion of Autodesk Fusion 360 and the art of cement molding is a gateway to boundless artistic expression and practical innovation. This eBook, "Guide to Creating One-Off and Multi-Use Cement Molds with 3D prints." is your exclusive pass to this captivating universe.

In this book, we'll delve deep into the realm of cement molds powered by Fusion 360. If you're a design enthusiast, an aspiring artist, an inventor, or simply a curious individual eager to master the art of blending cutting-edge technology with traditional craftsmanship, you're about to embark on an exhilarating journey of creative discovery.

Cement molds, once regarded as mere functional tools, are evolving into unique art forms in their own right. With 3D printing and Fusion 360, these molds are breaking free from the confines of convention. This eBook will serve as your comprehensive guide, from the inception of an idea to the curing of your cement masterpieces.

Throughout the guide, we'll explore the intricacies of utilizing Fusion 360 to design custom molds for use with 3D printed parts. From the very basics to advanced techniques, you'll gain insights and skills that empower you to breathe life into your creative visions.

By the time you reach the final chapter, you'll possess the expertise required to craft an array of customized cement creations, from sculptural masterpieces to functional objects. Your designs will carry your unique artistic touch, and the fusion of Fusion 360 and cement molding will have no secrets left for you.

Get ready to embark on a journey where your imagination is the only limit. Welcome to the fusion of creativity and technology, the world of cement molding with 3D printed parts, all under the skillful guidance of Autodesk Fusion 360. Let's begin this transformative journey together!

Process

The Art of Creating Cement Molds: Unveiling Two Techniques

Creating cement molds with 3D printed parts is a fascinating blend of modern technology and traditional craftsmanship. The process involves transforming an ordinary object of your desire into a mold, allowing you to reproduce it in cement. The end result is a piece of art, a functional object, or a work of ingenuity limited only by your imagination. Here, we delve into the fundamental steps and two distinct methods to craft your cement molds.

Choosing Your Object:

Your journey begins with selecting the object you'd like to mold. This object, known as the "positive," is the original model from which you will craft the mold. It could be a piece of sculpture, a decorative item, or any item you wish to replicate in cement. Once you have your positive in hand, the transformation process begins.

Method 1: The Sacrificial Mold (Quick and Effective):

The first method we'll explore is the quick and straightforward approach, though it comes with a trade-off. In this technique, you'll create a mold around your positive object using 3D printed parts. This mold is designed for one-time use, as the process involves the inevitable destruction of the mold to extract the cured cement.

While this method offers a speedy solution for your cement molding projects, the trade-off is the loss of the mold. It's an ideal choice for those who require a simple, one-off mold and don't mind sacrificing it for the final product. This method is best suited for complex shapes.

Method 2: The Reusable Mold (Long-lasting Craftsmanship):

For those seeking a more enduring solution, we present the second method—a technique that takes a bit more time but offers the invaluable benefit of a reusable mold. With this approach, you'll construct a mold around your positive object, preserving the 3D printed structure. The result is a mold that can be used repeatedly for numerous copies. This method is best suited for simple shapes. Although with some work more complex shapes can be molded.

Required Materials

Method 1 Materials:

3D Printer: Access to a 3D printer to create the mold.

Slicing Software: Cura slicing software to prepare and convert your 3D model for printing.

Cement: The main material for casting your object. Choose a suitable type of cement for your project.

Heat Gun: A heat gun is essential for removing the mold

Method 2 Materials:

3D Printer: Your 3D printer serves as a key tool for creating the mold structure.

Fusion 360: A copy of Fusion 360 software, and the good news is there's a free version available for those on a budget.

Spray Paint: Spray paint is used for lining the inside of the mold for a smooth finish.

Sandpaper: Sandpaper helps in smoothing and refining the surface of your mold.

Strong Spring Clamps: These clamps are necessary for securely holding mold components together during the curing process.

Cooking Oil Spray: Cooking oil spray acts as a release agent, preventing the cement from adhering to the mold components.

Cement: The core material for creating your cement objects. Choose the appropriate type based on your project requirements.

For both methods it is recommended to use a face mask to filter any cement dust and safety glasses. Cement dust is not something to take lightly.

Method one

Selecting Your Object: The Foundation of Your Creative Journey

The inaugural step in your cement molding adventure is to carefully select an object you desire to transform into a mold. One of the unique aspects of our approach is that we won't concern ourselves with separating the mold from the cured cement later on, allowing us to choose relatively complex objects with intricate details and contours.

However, it's crucial to keep in mind that when pouring cement, it will fill from the bottom up. Therefore, consider the object's geometry and design. Any cavities or intricate recesses that the cement cannot easily access during pouring will result in what we call a "void" in the final product. Planning your object selection with this in mind ensures a successful and satisfying outcome.



To better grasp the challenge, let's consider an example: a figurine with intricate details, like a delicate chain and wings. While this figurine may be visually appealing, it presents molding complexities.

The intricacies, such as the chain links or fine wing structures, pose a significant challenge when pouring cement. As the cement flows from the bottom, it might not reach and fill these intricate areas entirely. Instead, air gaps might form, preventing proper molding.

When pouring your cement the area in red will be empty as there will be an air pocket,

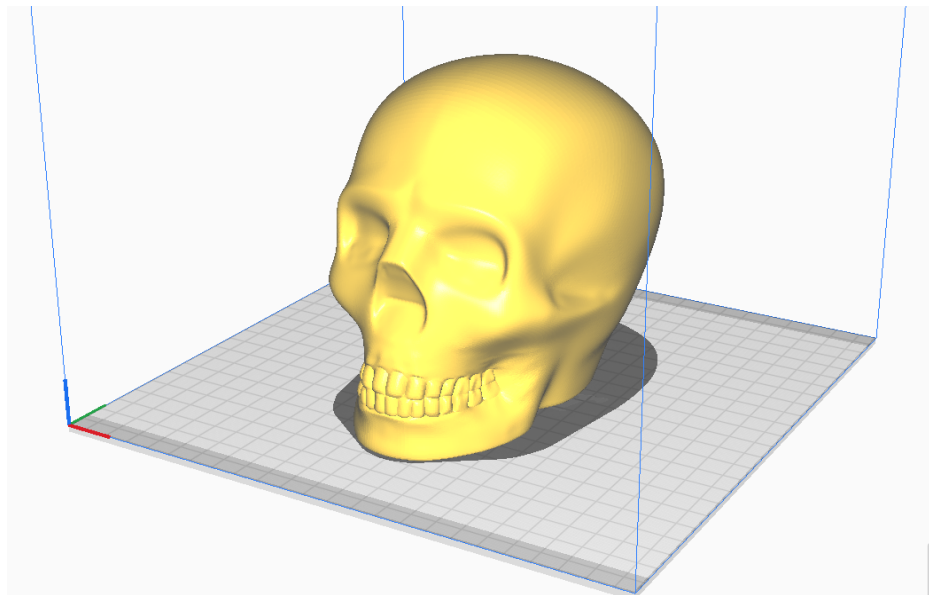


Now, let's explore an ideal object for cement molding – a skull. Unlike complex figurines with intricate details, the skull represents a perfect choice. It boasts a smooth and relatively uniform surface, devoid of small, hard-to-reach areas that might cause air gaps or molding concerns.



Creating the mold

Open you object in Cura slicer.

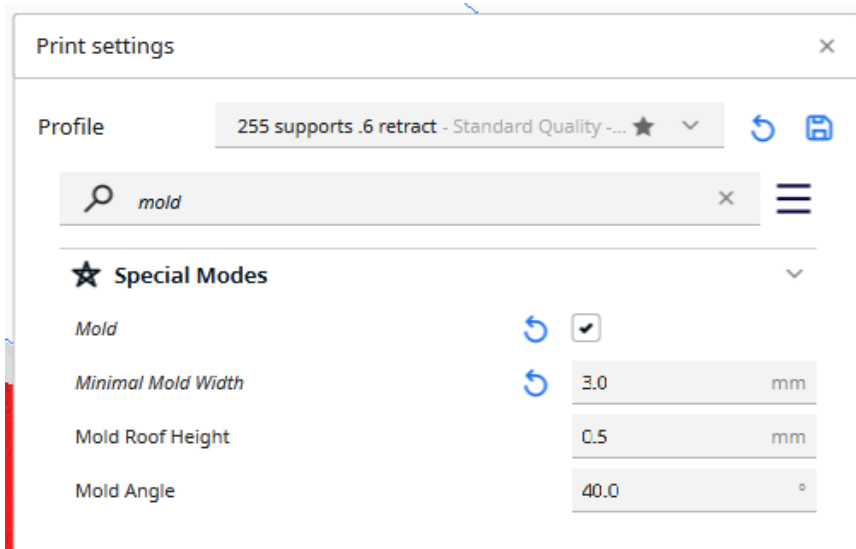


In Cura, navigate to the "Print Settings" menu.

Locate the search field within the settings menu.

In the search field, type "mold" and press Enter or click the search icon.

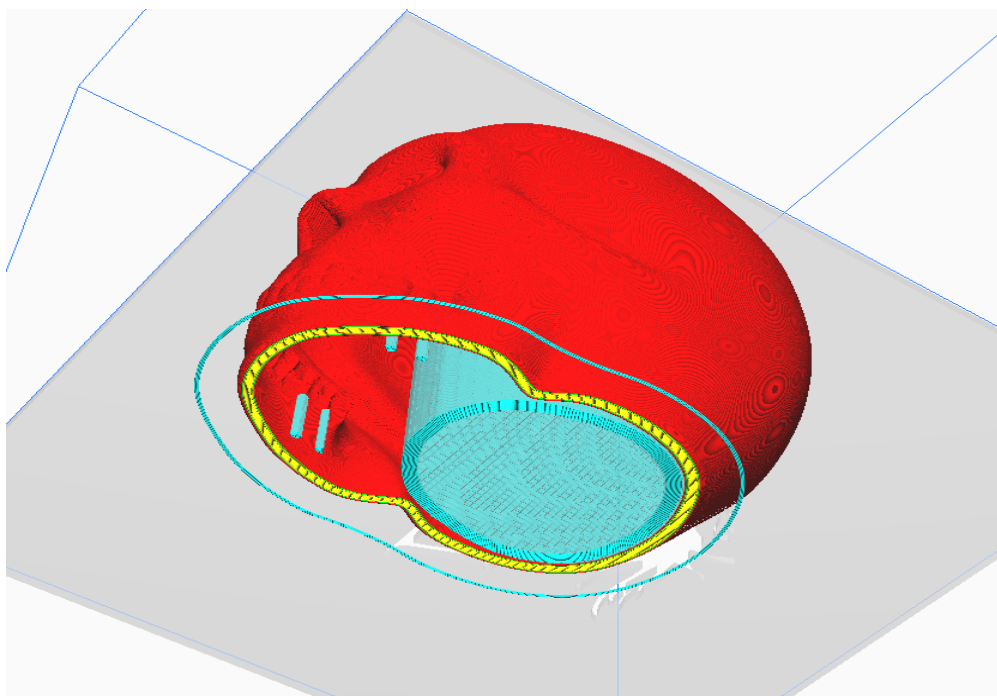
Look for an option related to creating a hollow object or shell. When you find it, select the checkbox to enable this feature.



With the hollowing option selected, proceed to slice your 3D model as you normally would.

After slicing, click on the "Preview" or "Preview Mode" option within your slicing software.

In the preview, you'll notice that the slicer has intelligently generated a hollow object, perfect for your molding project. This hollow structure will allow you to pour cement, creating a mold within the 3D printed shell.



Preparing and Pouring Cement: A Crucial Step in the Process

Once your 3D printed object has completed printing, you're ready to embark on the next exciting phase: pouring the cement.

Start by carefully following the instructions provided on the cement packaging to create the cement mix. It's essential to achieve the right consistency. Aim for a mixture that isn't too dry, as overly dry cement can make pouring challenging. Simultaneously, avoid an excessively watery mix, as this could lead to undesirable volume reduction as the mold dries.

As cement is generally an affordable material, it's wise to take a generous approach when preparing your mix. There's nothing more frustrating than running out of cement halfway through the molding process. To avoid such interruptions, it's a good practice to mix more cement than you initially anticipate needing..

Keep in mind that as the water in the mix evaporates during the drying process, the level of cement will naturally reduce. Therefore, a well-balanced consistency is key.

Safety is paramount in this creative endeavor. Ensure that you are working in a well-ventilated area to minimize exposure to cement dust and fumes.

For personal protection, don a safety mask and goggles. These safeguards are crucial to prevent cement particles from coming into contact with your eyes or respiratory areas, safeguarding your health throughout the molding process.



Filling the Mold and Eliminating Air Bubbles: A Delicate Process

Once your mold is ready, begin by filling it to the brim with your cement mixture.

Next, gently tap around the mold's exterior. This tapping action serves a crucial purpose: it helps air bubbles within the cement rise to the surface and escape.

As you tap and air bubbles evacuate, you'll notice that the level of the cement within the mold drops. This is a normal part of the process.

To maintain a full and well-formed mold, keep topping up the mold with more cement as needed while continuing to tap. The additional tapping helps ensure that air bubbles are efficiently evacuated, resulting in a smoother and more refined finish.

Casting Removal: Preserving Your Art with Care

After allowing your mold to cure for the recommended period, which is typically 24 hours or as per the instructions on your cement packaging, it's time to unveil your creation.

This technique, as previously mentioned, involves a trade-off: it will result in the destruction of the mold. However, the method you choose for removal is at your discretion.

Given that 3D printed objects become malleable when subjected to heat, a recommended method is to use a heat gun. Carefully apply heat to the 3D printed mold, softening the plastic and making it easier to peel away from the casting.

Exercise caution when dealing with intricate areas of your mold. These sections may require more precision to avoid any damage to the casting or the mold.

If you have access to a flame torch, you can also consider using it to burn off the PLA (polylactic acid) plastic. This method can be effective but should be approached with safety as a top priority.

Always prioritize safety throughout this process. Ensure you're working in a well-ventilated area, wear appropriate safety gear such as safety goggles, and exercise care when handling heat sources. This approach guarantees a successful and secure removal of your casting from the mold, preserving your artistic creation.

Method 2: Creating Reusable Molds in Sections

In our second method, we take a strategic approach by crafting molds in sections, allowing us to effortlessly detach the mold from our object for future use. Not only does this method enable us to preserve our 3D printed tools for multiple projects, but it also equips us with valuable skills to streamline the molding process.

We will embark on a journey to create the tools needed for crafting reusable molds and provide a step-by-step guide within Fusion 360. This approach empowers us to produce molds that can serve us time and again, amplifying our creative possibilities and efficiency.

By the end of this method, you'll have the knowledge and resources to design and produce molds that offer the flexibility and convenience of reuse, opening up a world of creative potential. Let's dive into the process and unleash the power of reusable molds.

Leveraging Fusion 360: Your Gateway to Creative Possibilities

In this method, we introduce Fusion 360, a versatile 3D design software that offers free licenses for individual use. You can easily access this software by searching for "Fusion 360 for personal use" through a web search engine. Once you've obtained and installed Fusion 360, you're well-equipped to continue our creative journey.

Fusion 360 is a powerful tool that enables you to design and sculpt intricate 3D models with precision and flexibility. It will serve as our digital canvas, where we'll craft the tools and molds that empower our creative ventures. So, by acquiring Fusion 360, you've unlocked the gateway to a world of endless possibilities in the realm of 3D design and molding. Let's proceed and explore the remarkable potential that awaits.