



Large-Scale 3D Printing for Marine

Aug 2021





Safe Harbor Statement

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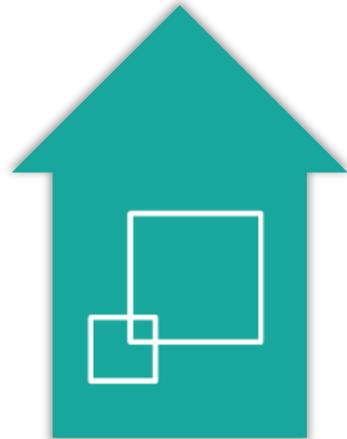
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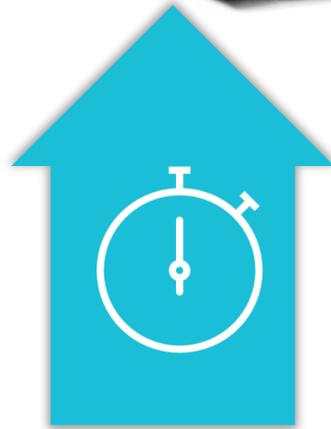
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**LARGE
VOLUME**

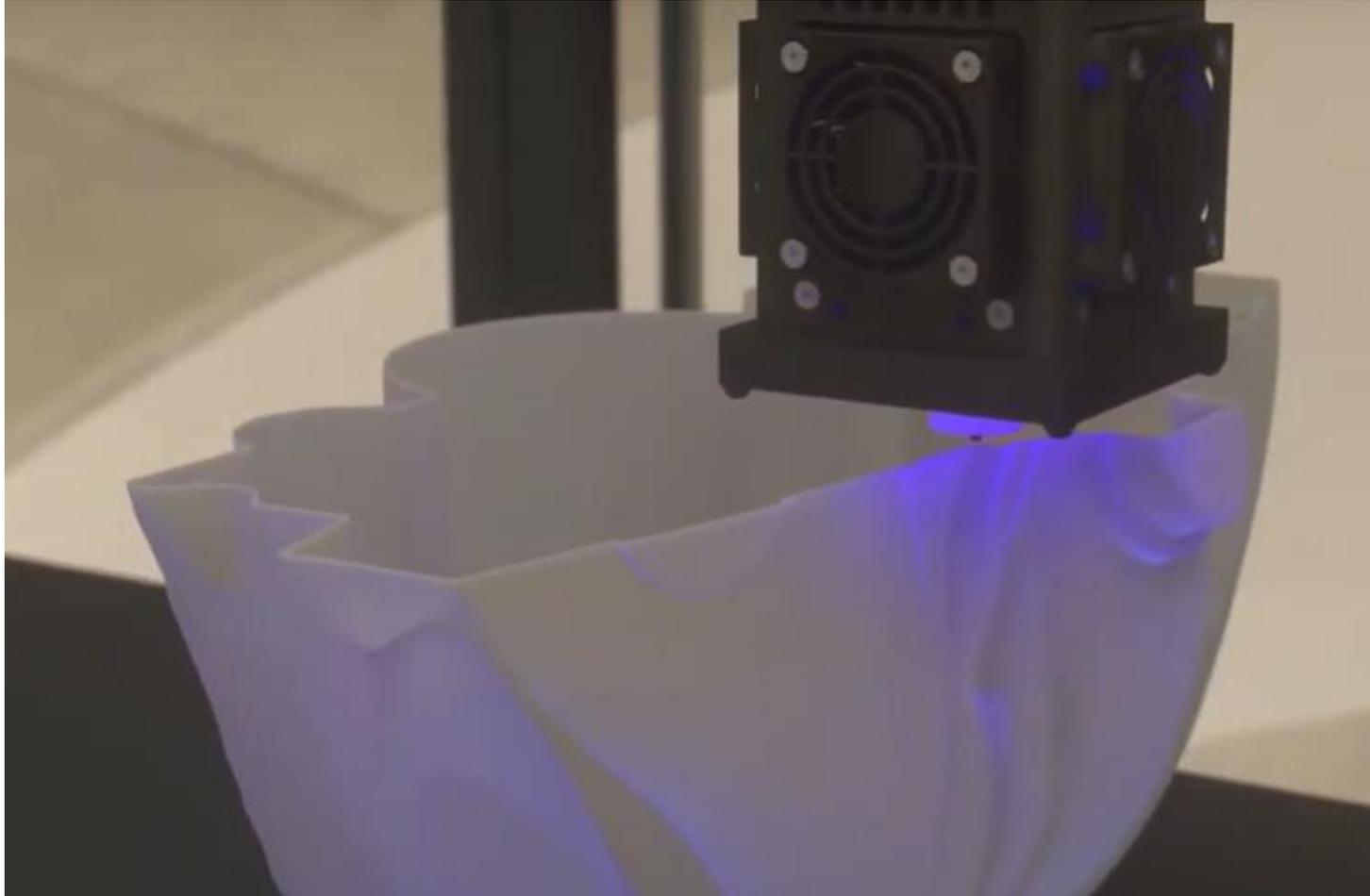


**RADICAL
SPEED**

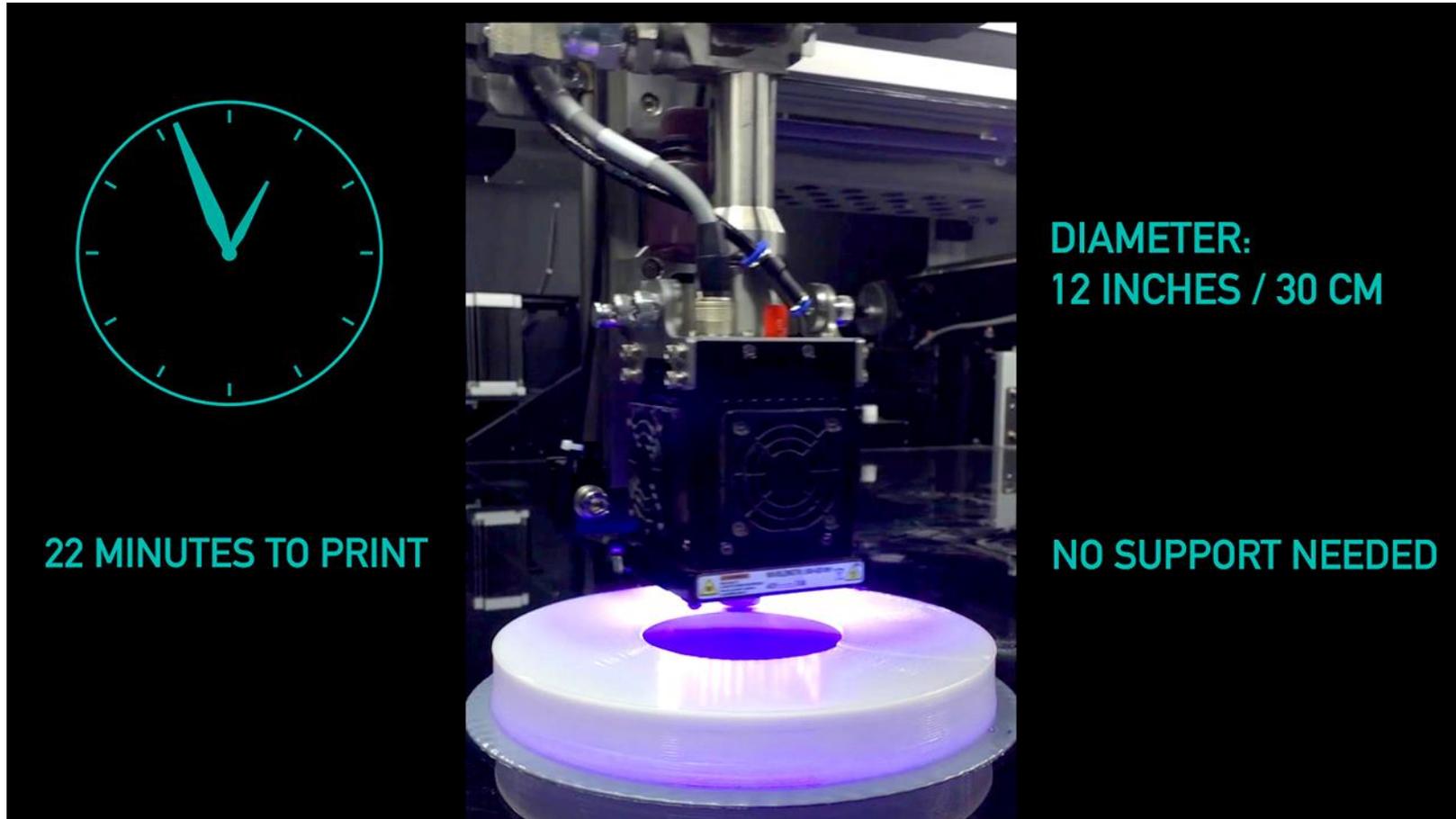


**DECREASED
COST**

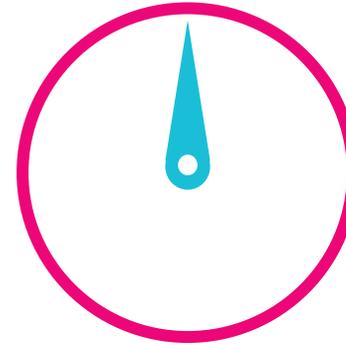
Massivit Gel Dispensing Printing – GDP



Massivit Gel Dispensing Printing – GDP



Radical Speed Enables Large-scale Printing



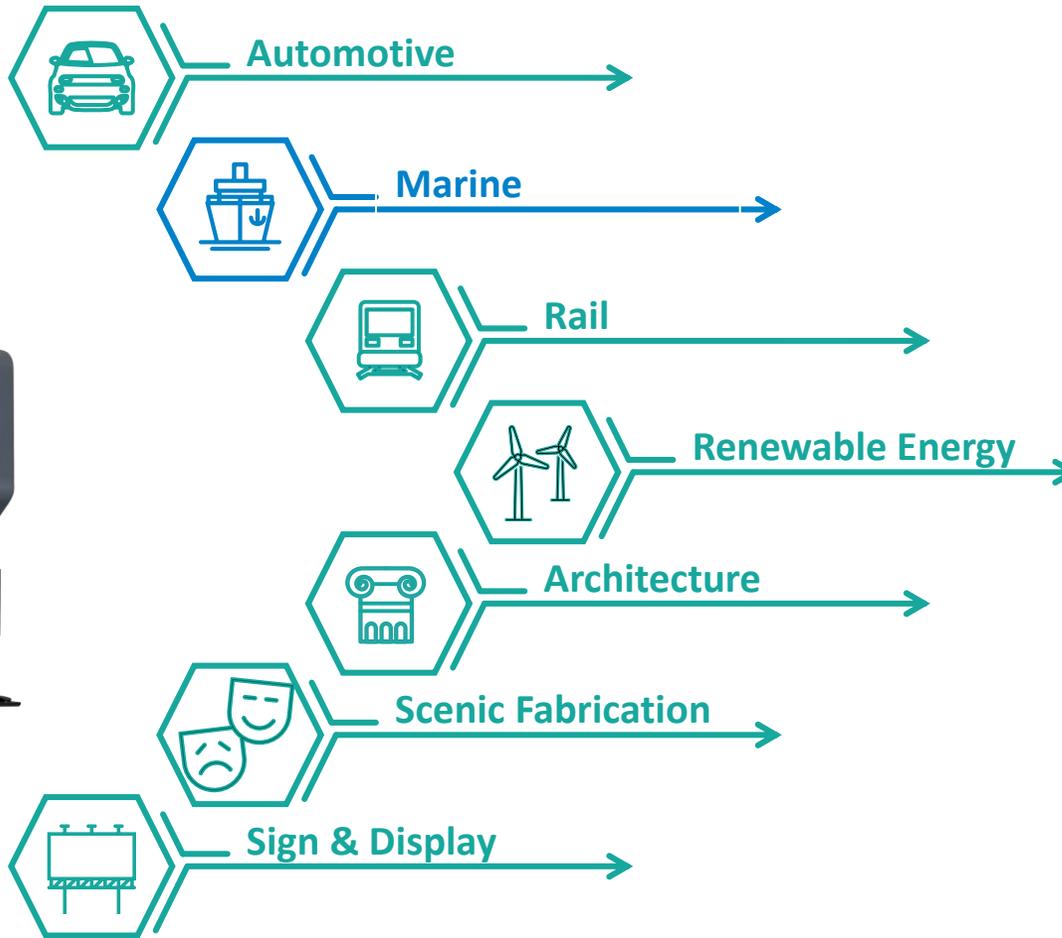
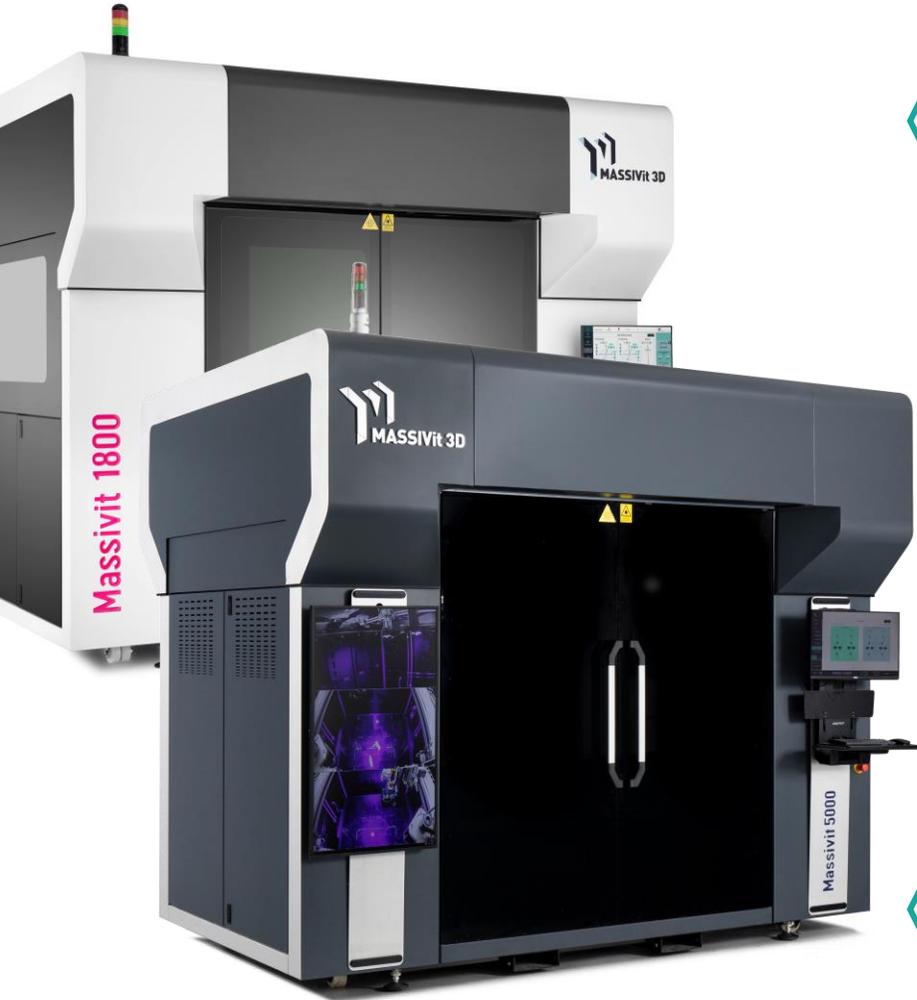
RADICAL SPEED:
Print a 6--foot part in
6 hours

VERTICAL SPEED:
14'' per hour
35cm per hour

MEGA SCALE:
4' x 5' x 6'
1.11 x 1.45 x 1.8m



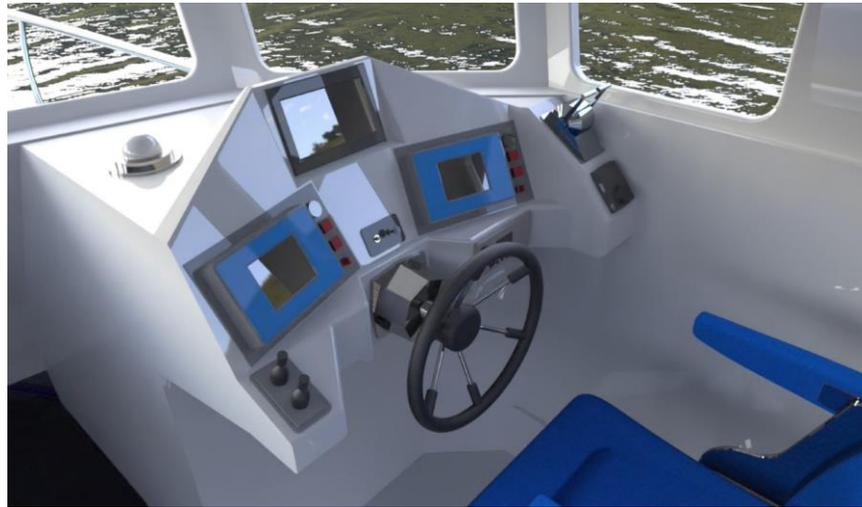
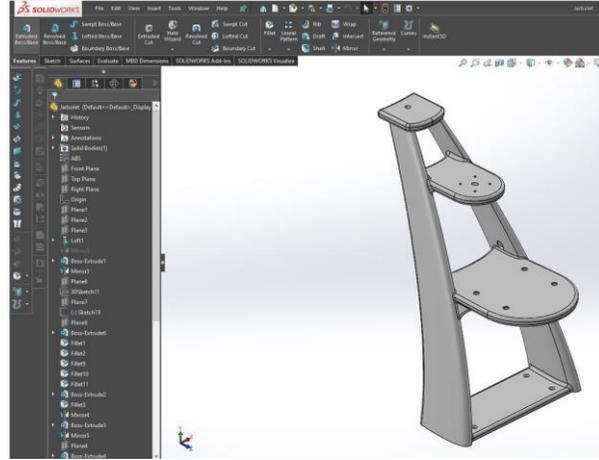
Markets – Massivit 3D



Massivit 3D addresses a crucial market need where **SPEED** and **SIZE** are required



Full-Scale Parts, Molds, Prototypes



Business Case Study

Velum Nautica



Why a Large-Volume Build 3D Printer?



Background

Velum Nautica provides **structural repairs of yachts** made of composite materials.

The company sought modern 3D technologies – 3D scanners and a 3D printer to enable **production of complex, customized body parts, molds, and prototypes.**

Solution

They decided to adopt a Massivit 3D printer which has provided “***unbeatable production speed.***”

-Bože Radan, Lead Design Engineer, Velum Nautica

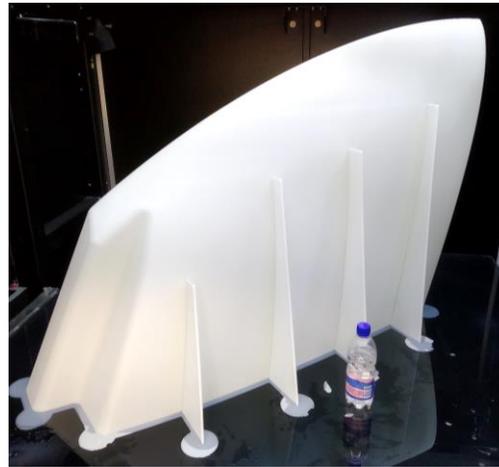


Fiberglass Reinforced 3D Printed Yacht Extension

A common upgrade to a Yacht is a nice and easy to climb “Swimming Deck” at the stern. Old boats usually do not have a swimming deck or have folding deck which is very heavy. Using Massivit 3D printing we were able to produce a costume swimming deck



A. Before



B. 3D Printed Extension



C. Installation



D. Finishing

Fiberglass Reinforced 3D Printed Yacht Extension



*“ With traditional fabrication technology, we cannot ensure **100% symmetry** for 2 parts.*

*The Massivit 3D printer is digital technology with an integrated slicer which **guarantees we end up with symmetrical parts.** ”*

Load & Durability

VELUM
NAUTICA



“Vessel body parts are required to withstand a minimum load. The 3D-printed parts serve as a base geometrical form. We can easily pass the required load by reinforcing parts with fiberglass or carbon fiber or Kevlar or internal expandable foam (the Massivit 3D printer prints hollow).”

Custom Radar Mast

Radar masts are a common upgrade for vessels. It is often challenging to find space for them, so yacht repairers and designers need to be inventive with their shape and position, as well as to match the aesthetics of the vessel.

Until now, radar masts have **conventionally been produced using stainless steel** which presents **limitations** in design.

Digital AM provides complete design flexibility and Massivit 3D printers produce hollow models which can easily house cables and connectors out of view for any life-saving equipment.



Custom Radar Mast #1 ->Speed



100% Customized Design



A customer required a new radar but there was no room anywhere on the vessel. A unique, custom mast was designed and printed **hollow** so as to hide the radar cables inside, enabling a sleek design. The customer was extremely happy with the results and the vessel was taken to sea without any issues.

Custom Radar Mast #1 ->Speed



Printing Hollow Parts
Enables Invisible
Cables & Filler



Invisible Cables- Clean Design

Radarmast #2 - Speed

A customer needed a radar mast suitable for his vessel in terms of design and functionality. Velum Nautica 3D printed the mast in a single part in just **2 hours**, consuming **~2 kg** of material. The part was finished, guides for cables were inserted, and it was then reinforced with fiberglass and filled internally with strengthening foam.



Radarmast #3 - Flexibility

While producing Radar Mast #2, a different client noticed the part and requested the same mast, with a “**variation**”: an additional section for a navigation light.

This change was implemented on the 3D file **within a few minutes**. The new mast was then printed within **2 hours**.



*final product photo is missing

Speed → Freed Up Resources

VELUM
NAUTICA

The logo consists of the word "VELUM" in a bold, blue, sans-serif font. Below it is the word "NAUTICA" in a bold, dark red, sans-serif font. A blue anchor is positioned below "NAUTICA", with its top ring centered under the letter 'A'.

*“ We use our Massivit 3D printer to produce **molds within a few hours** that would usually take **2 team members a few days** to produce using wooden panels. This frees up our workers to work on other projects at the same time.”*

Speed → Bowsprit Printed in 3 Hours

A customer required a bowsprit to serve as a step for entering the front of a **30-passenger vessel**. It would be a highly visible element, so it needed to be **perfectly symmetrical**.



a. Print



b. Measures & Install



c. Reinforced



d. Finished

Speed → Bowsprit Printed in 3 Hours



With traditional technology and processes, this would have taken **2 full days** utilizing **2 team members full time (14 hours)** to create a mold for fiberglass with resins. Velum Nautica was able to 3D print it in just **3 hours** and ensure it could withstand the required load.

The Massivit 3D printer replaces 2 stages: mold production + body part production.

“Bimini” - Sun protection- Size challenge



A customer wanted a hardtop for a vessel.
One piece mold 3D printed using Massivit 3D Printer

a. Printing the mold



b. Assemble the mold



c. Polish the mold



d. Part produced with the mold

“Bimini” - Sun protection - Size Challenge

Final part produced , polished and installed



Exhaust Cover - Time-Sensitive Task

An **exhaust cover** was needed as the client's original exhaust cover had been lost. This job was time-sensitive as the part could only be installed on the vessel outside of the water.

The entire cover needed to be produced within just 4 days. The 2nd existing exhaust cover was detached from the vessel and 3D scanned in order to duplicate it. A CAD model was then created from the 3D scan followed by a symmetrical mirrored model. The exhaust cover was 3D printed in **3:35 hours** and required only **4 kg** of printing material.



a. CAD file



c. Reinforced



d. Assembly

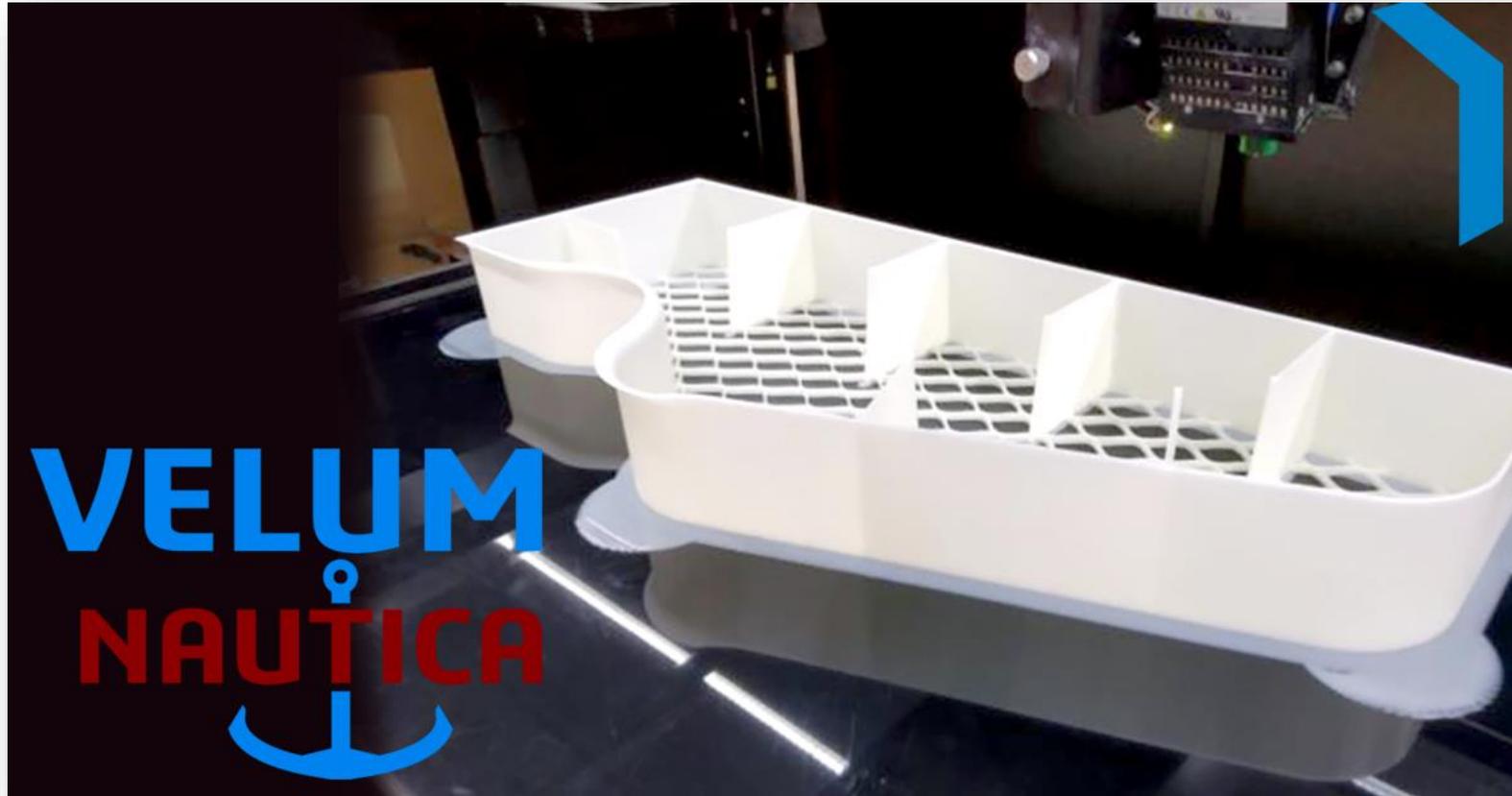


b. Printed Part



e. Final Part Installed

Full-Scale Molds Allow Hermetic Closure



Printing a **full-scale mold or end part in 1 piece** means that an entire bathroom can be produced with a **hermetic closure**, preventing water from entering. This benefit is **the most sought-after factor for vessel parts**.

Full-Scale High Bathroom Mold – 1 Piece

The ability to print the entire bathroom in one part prevents water from rising above a given height which could damage the vessel.

Printed part on left and end part on the right:



Full-Scale High Bathroom Mold – Flexibility

After preparing a bathroom mold, a quick change was needed. The extra part was printed and fitted accordingly.



a. Mold preparation



b. Mold "fixed" by adding a printed extension



c. Final "fixed" mold

Custom Design & Geometries

VELUM
NAUTICA



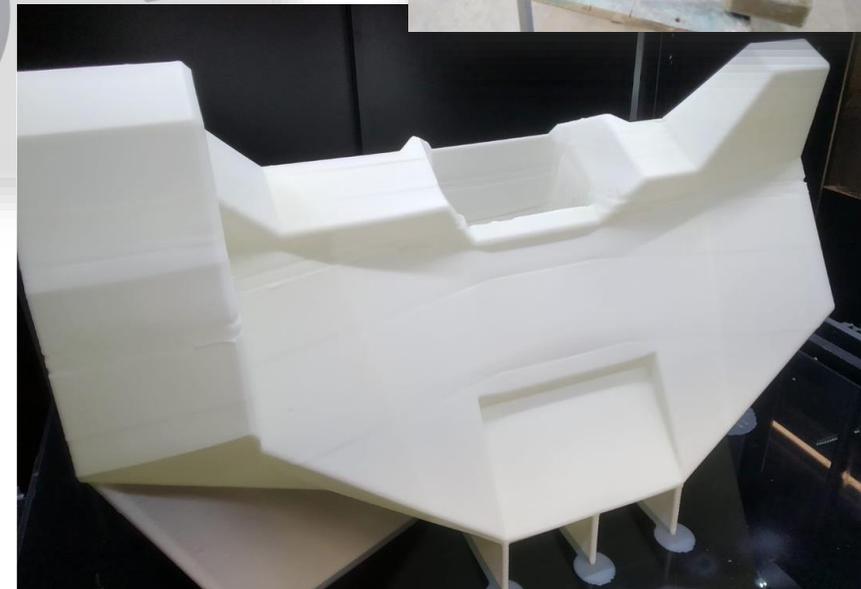
“Wooden molds cannot facilitate unusual designs or shapes. Now, we’re able to create any geometry at the click of a button.”

Custom, Ergonomic Dashboard

Velum Nautica design and print this dashboard with the Massivit 3D printer in an **ergonomic and aesthetic** manner, enabling the skipper to see all screens and the view ahead. With traditional production, it would take **more than 2 weeks** just to **create one mold**.

Part printed in **8 hours using** Massivit 3D printer (no need for mold)

Velum Nautica plan to produce many more dashboards due to the **production speed** and ability to provide **unlimited designs**.



New Business Generated

VELUM
NAUTICA


*“ Most of our business involves **repairs** for vessels. However, often when a customer approaches us for a repair, they see the workmanship possibilities enabled by our large-format Massivit 3D printer, and then end up **requesting additional, unrelated custom-built parts** for their specific needs. ”*

3D Printed Air Vent Diffuser

An air diffuser was required to **fit an existing hole** in a vessel wall, and to maintain the same air pressure. A circular connection was needed with a specific diameter on the opposite end. The part was custom designed for this purpose and laminated, while maintaining its shape.



a. Printed Part



b. Reinforced



c. Installed

Other Applications

Molds

Prototyping



Molding Applications



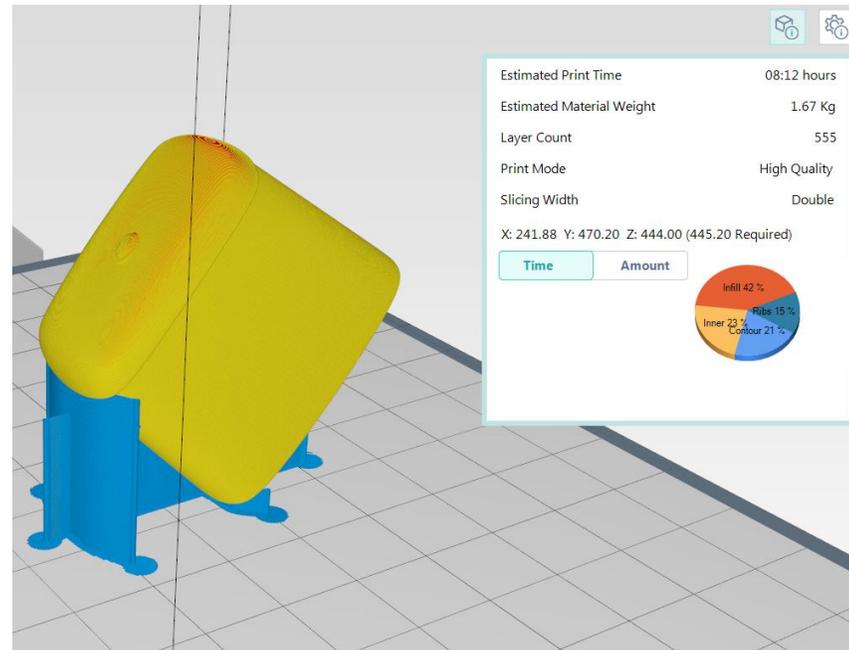
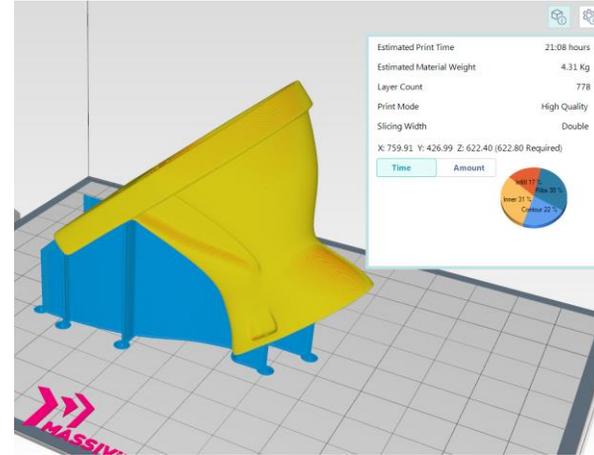
Patterns for sandcasting



Patterns for thermoforming

Fitment Prototyping

2 parts print
simultaneously
in one printer
in
less than 21
hours!



Furniture

Interior vessel part can be 3D printed with the Massivit 3D printer
Freedom to design and demonstrate design concept



3D printed Mold

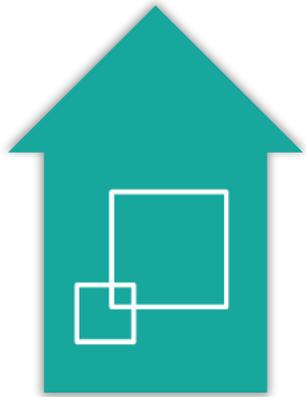
A 3D printed mold can be printed and filled with many types of filling materials. In this case it was filled with concrete, however any filling material can be used such as Epoxy.



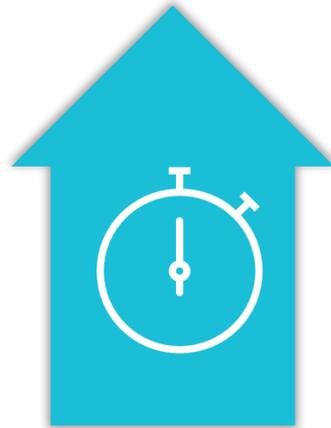
a. 3D printed mold



b. Using concrete as a filler



**LARGE
VOLUME**



**RADICAL
SPEED**



**DECREASED
COST**

Thank you