Plastic recycling by additive manufacturing

BUSINESS IDEA & GOALS

We develop and sell a turn-key solution for distributed recycling that is based on our 3D-printing technology.

1. Initial stage: **On-demand 3D-printing services**
2. Second stage: **Hardware sales and service packages**
3. Third stage: **Global platform for recycling and 3D-printing**

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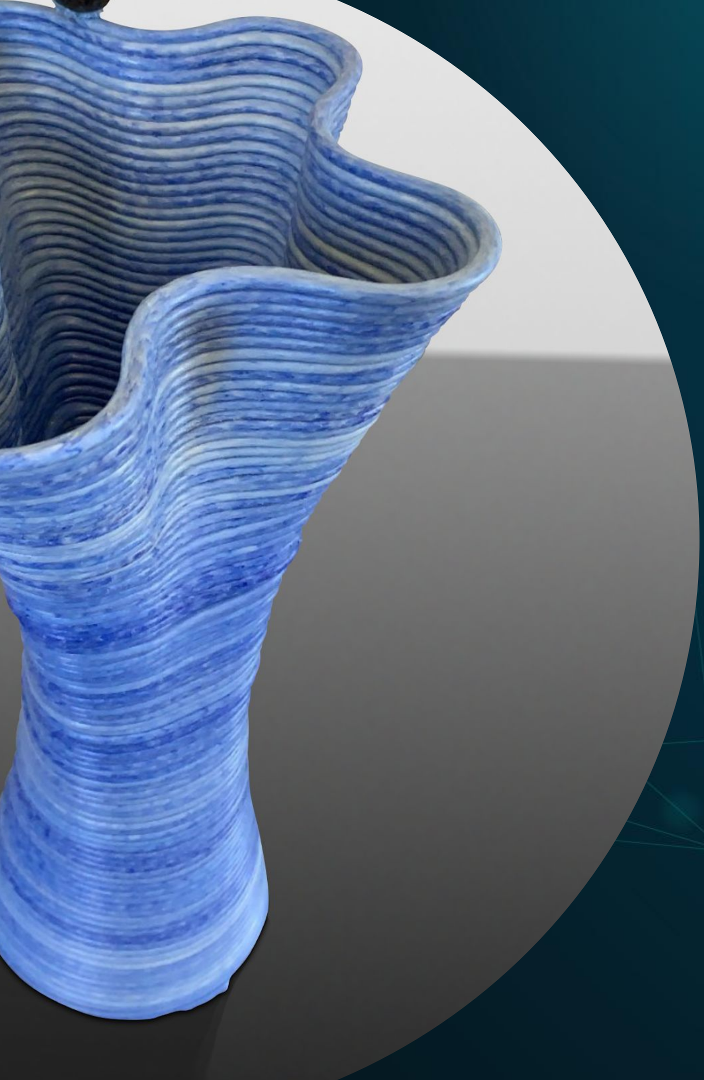
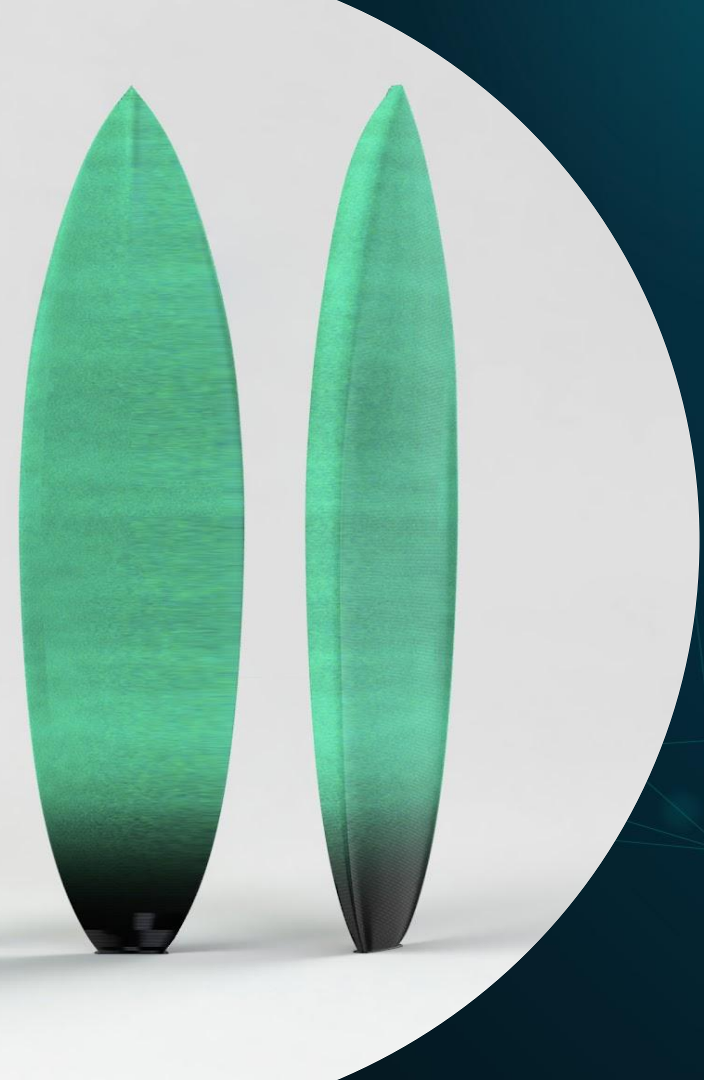


MISSION & VISION

Mission
Our mission is to fight the global waste plastic crisis with advanced recycling technology that is at the same time economically, ecologically and socially sustainable.

Vision
We want to be the global leader in distributed recycling by additive manufacturing (DRAM) offering both machines and the on-demand market platform. In our vision, we spark a change in manufacturing and logistics with a globally distributed local manufacturing network and a marketplace that brings together consumers, product designers and local manufactures.

Sustainable physical goods -
digitally designed, sold and delivered -
locally manufactured.



VALUE PROPOSITION

Values
As representatives of a new generation, we are committed to sustainability, equality, trust & open source.

Value proposition
We offer rapid technology and services for manufacturing very large objects (currently up to 1000 x 3500 mm).

By using waste plastic streams as feedstock we can reduce the carbon footprint of the process by 50% compared to the use of virgin plastic. A benefit that cumulates with every cycle.

Field of application
Furniture, water sports equipment, product scale models for marketing, stage and set backdrop for events, theater and movies, product development & prototyping, boat industry, construction industry, etc.

BLOFT'S PATH SO FAR

2018/05 — Development of the large-scale 3D-printer starts

2019/03 — Company is founded

2019/04-07 — Pilot printing projects:
Minna Parikka / High heel replica
Forum Virium Helsinki / Robot bodywork

2020/05-10 — Bloft MK2
Agile experiment:
Baltic Sea Challenge / City of Helsinki

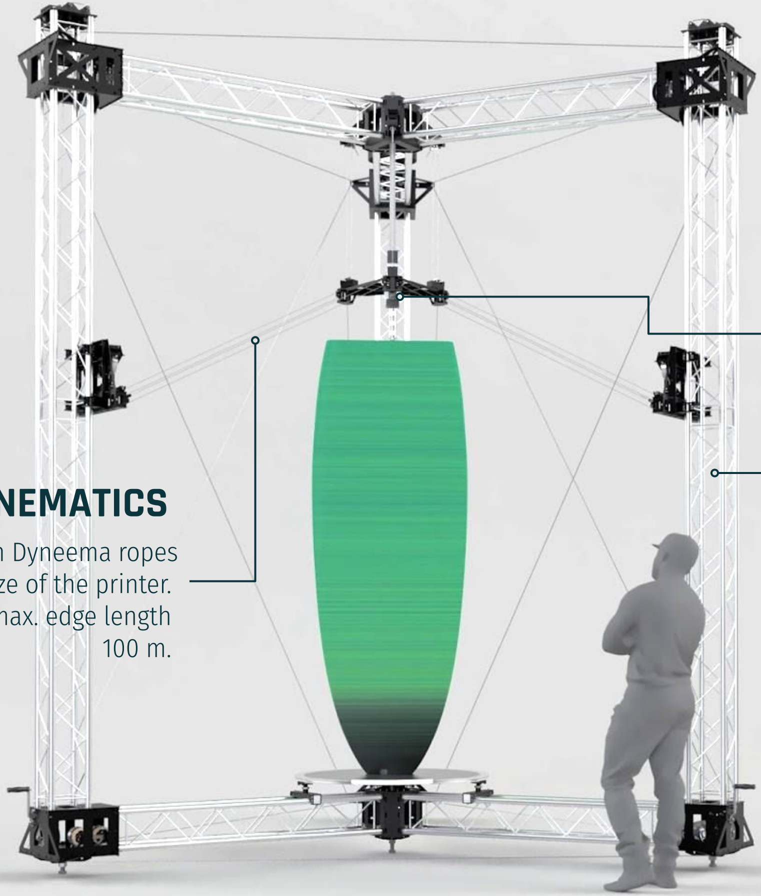
2020/09 — Bloft MK2 exhibited during the Helsinki Design Week

2021/03 — Bloft Mk2 is operational

2021/06 — Start of on-demand 3D-printing service

2022/02 — Fortum Viren -chair is launched

BLOFT MK2 3D-PRINTER - ONE OF EUROPE'S LARGEST



CDPR-KINEMATICS

High strength Dyneema ropes define the size of the printer. Theoretical max. edge length 100 m.

PELLET EXTRUDER

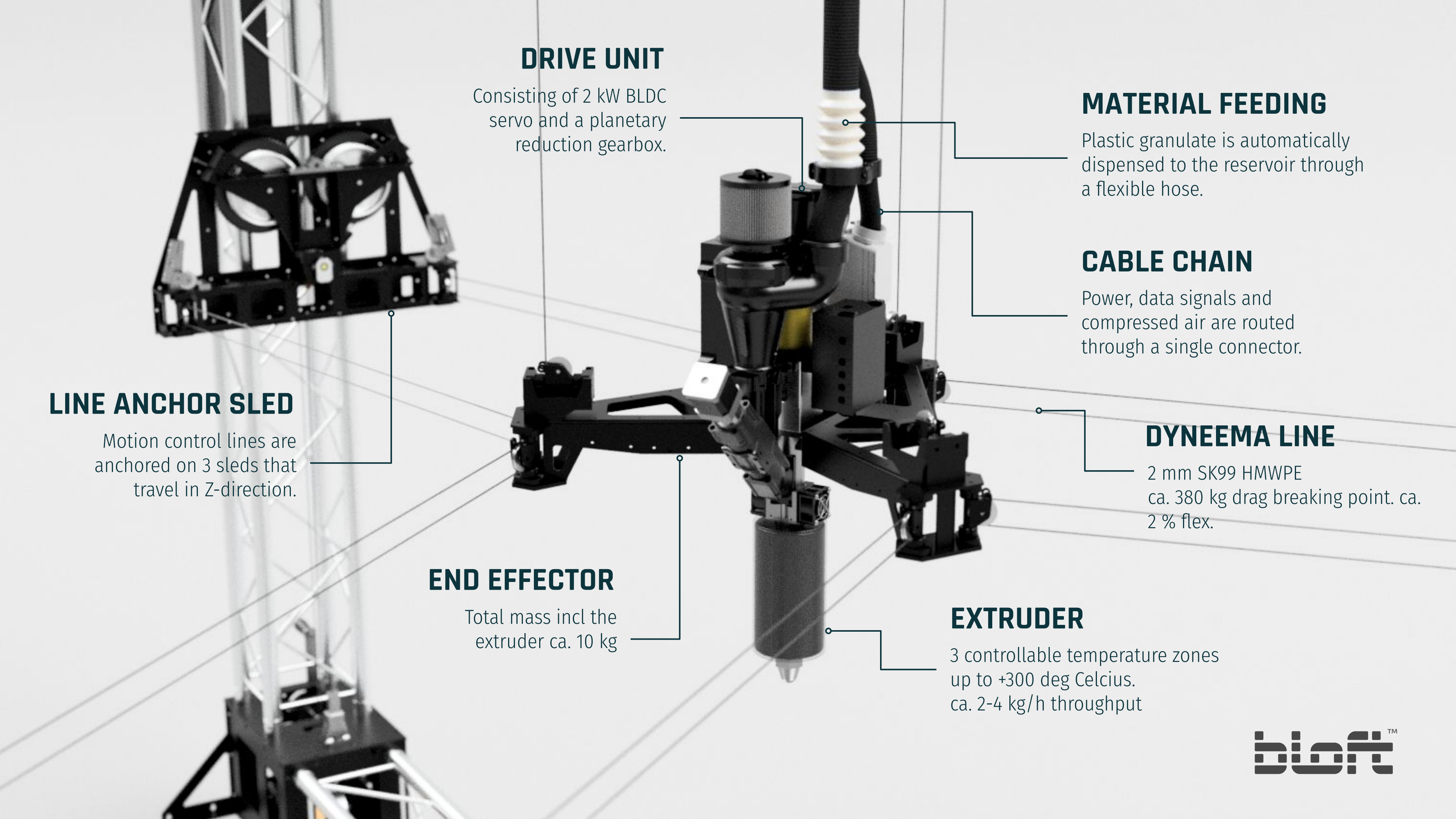
The fused granular fabrication (FGF-technology) enables printing directly with granulated plastic.

FRAME

Easily extendable thanks to the modular truss system.

PRINT VOLUME

Currently approx. 2,75 m^3 - ∅ 1000 x 3500 mm
In near future approx. 11 m^3 - ∅ 2000 x 3500 mm


DRIVE UNIT
Consisting of 2 kW BLDC servo and a planetary reduction gearbox.
MATERIAL FEEDING
Plastic granulate is automatically dispensed to the reservoir through a flexible hose.
CABLE CHAIN
Power, data signals and compressed air are routed through a single connector.
LINE ANCHOR SLED
Motion control lines are anchored on 3 sleds that travel in Z-direction.
DYNEEMA LINE
2 mm SK99 HMWPE
ca. 380 kg drag breaking point. ca. 2 % flex.
END EFFECTOR
Total mass incl the extruder ca. 10 kg
EXTRUDER
3 controllable temperature zones
up to +300 deg Celcius.
ca. 2-4 kg/h throughput
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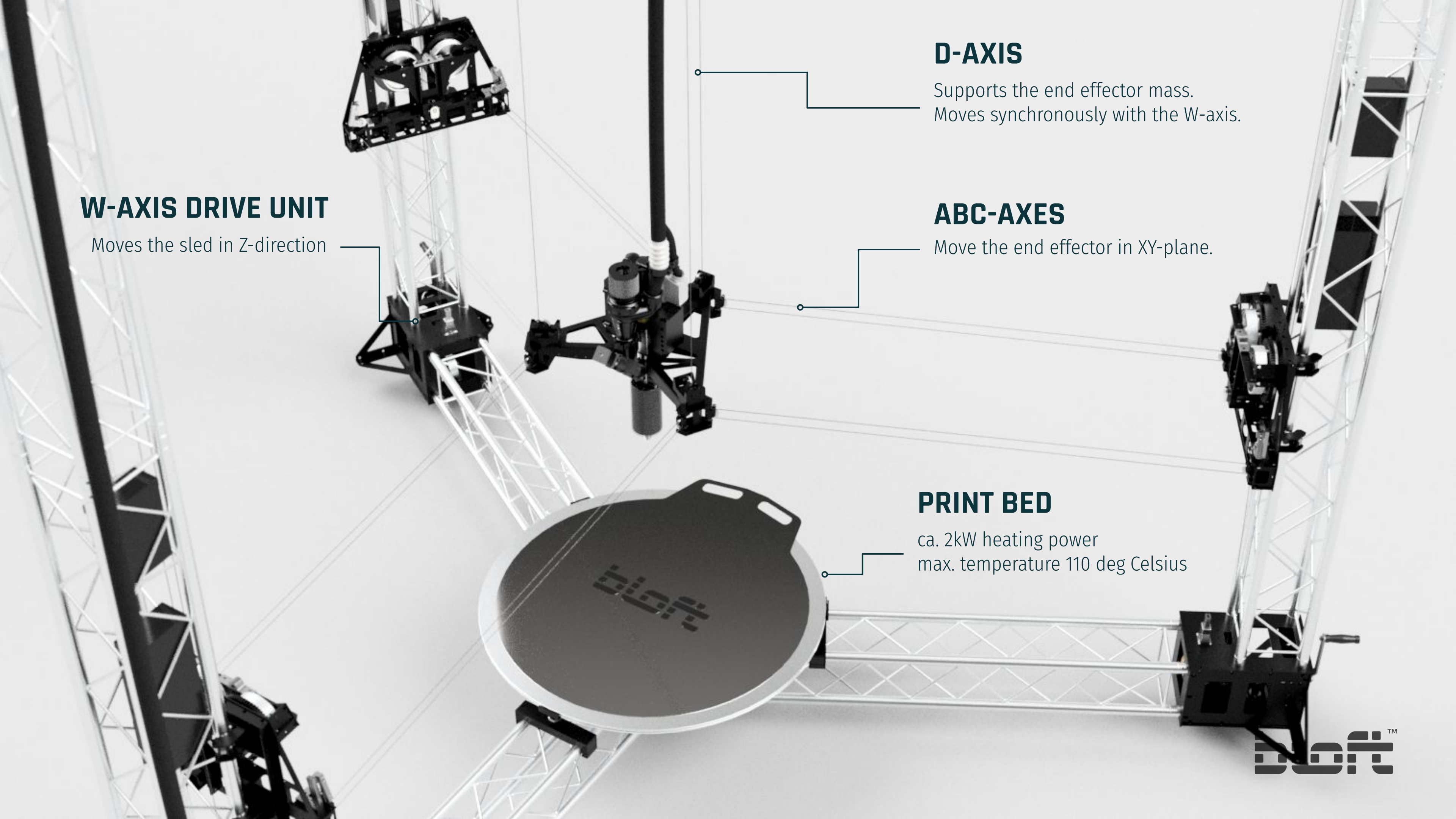

D-AXIS
Supports the end effector mass.
Moves synchronously with the W-axis.
W-AXIS DRIVE UNIT
Moves the sled in Z-direction
ABC-AXES
Move the end effector in XY-plane.
PRINT BED
ca. 2kW heating power
max. temperature 110 deg Celsius

KEY HARDWARE

ODrive
High performance motor control

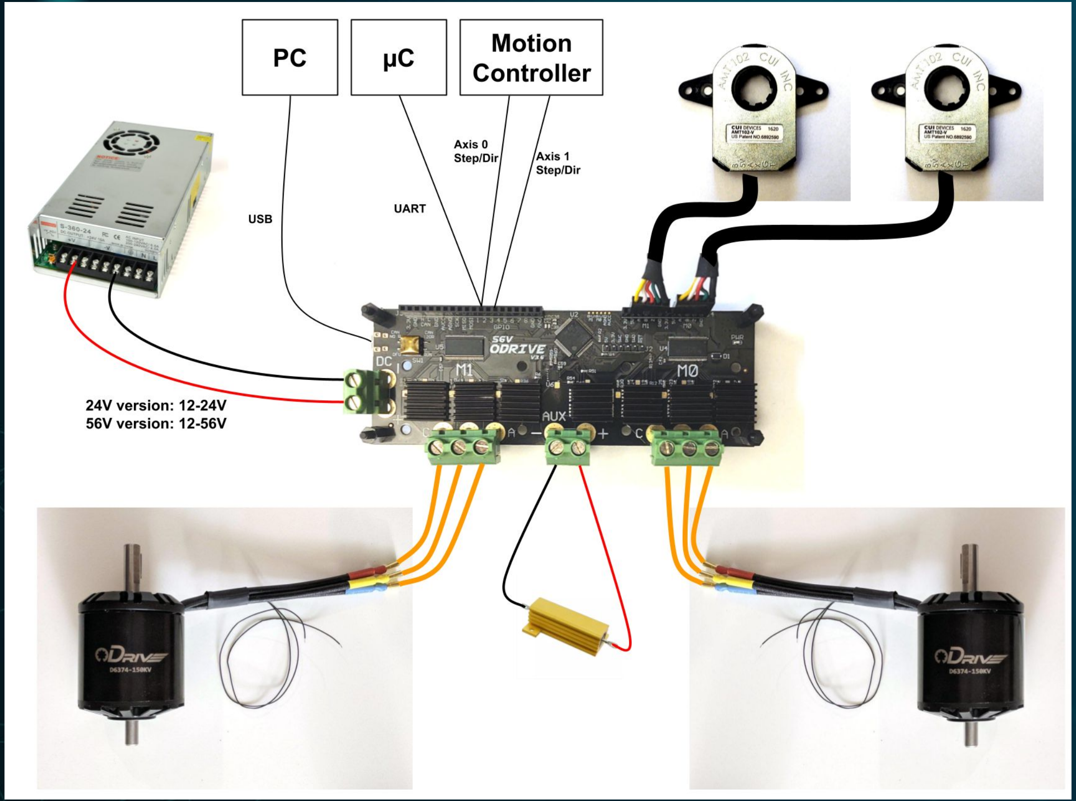
Duet3D

Odrive Robotics

Offers an open-source ecosystem for controlling regular BLDC-motors as powerful and fast servo motors.

Duet3D

Developer of the widely used open-source controller for 3D-printers and other numerical controlled systems.



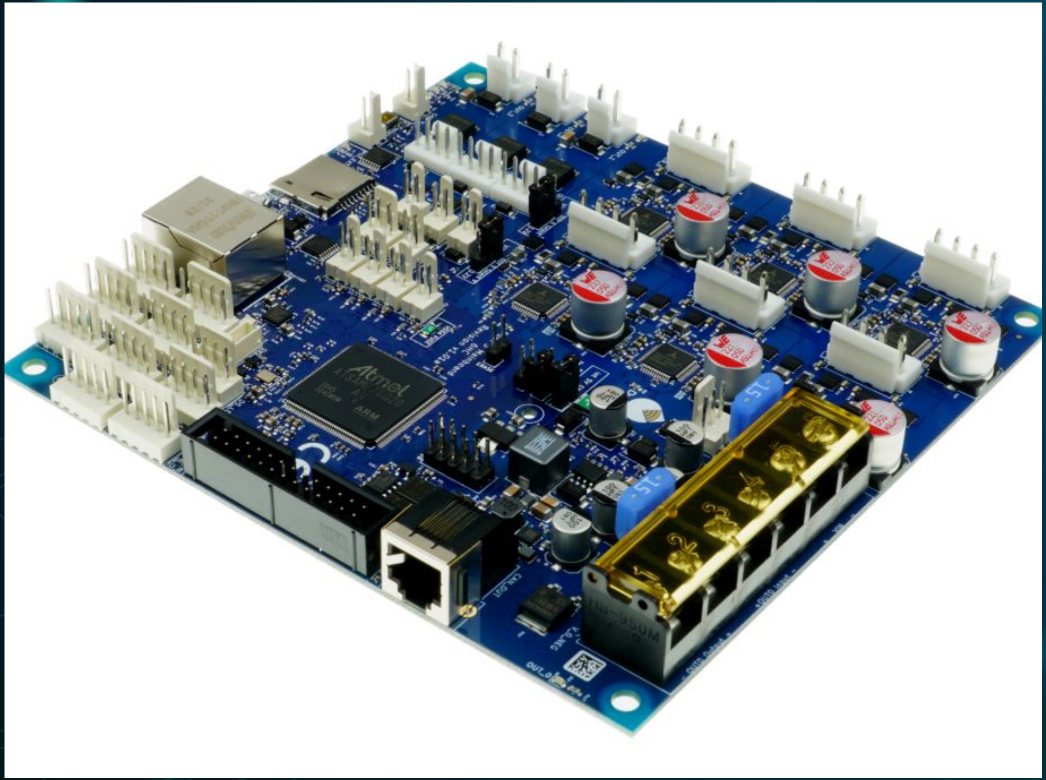
Key specs

- Controls two motors.
  24V and 48V versions available.
- Peak current 120A per motor.
- Continuous current depends on cooling,
  up to 60-80A.
- Encoder feedback for arbitrarily precise movements.
- Supports two braking modes:
  Brake resistor & Regenerative braking.
- Optional use of a battery means you can achieve very high peak power output with only a modest power supply.
- Open source: Hardware, Firmware & Software

CONTROL MODES

- Goto (position control with trajectory planning)
- Position commands
- Velocity command
- Torque command

USB -- Custom protocol, open source PC, RaspberryPi, etc.,
Step/direction -- Existing motion controllers, **UART** -- Arduino (with library), mBed, etc.
Servo PWM/PPM -- RC Receivers, Arduino, etc, **CAN** -- Basic custom protocol
Some general purpose digital and analogue pins



Duet 3 control board

- 32 bit Atmel ARM Cortex-M7 MCU up to 300 MHz.
- CAN-FD BUS for connecting multiple expansion boards and tools.
- Dedicated SPI Bus to Single Board Computer (SBC). Alternatively connect over an Ethernet network.
- Nine I/O connectors with 3.3V output signal level and 30V-tolerant inputs.
- 4 thermistor/PT1000 inputs. Support for two temperature daughterboards for up to 4 PT100 or thermocouple sensors.
- 12-32V operating voltage
- Runs RepRapFirmware 3.x – Supports all common machine geometaries, easily configurable for your specific machine requirements.
- Open source hardware and software

Product family includes a range of expansion boards, tool boards, LCD-displays, breakout boards and further addons. Connection via CAN-FD or dedicated GPIO-pins.

SOFTWARE & DEVELOPMENT

Languages

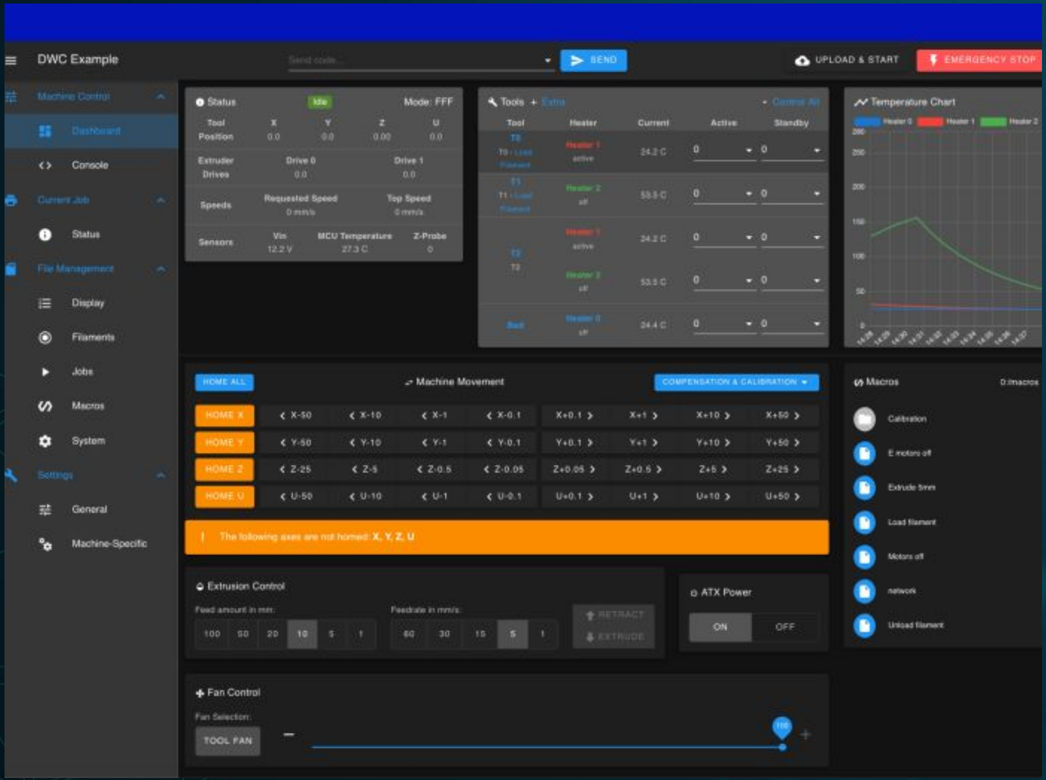
- C++
- Python
- JavaScript

Software

- Eclipse IDE
- Arduino IDE

Development Tools

- Arduino
- Raspberry
- Seeedstudio Grove
- Espruino

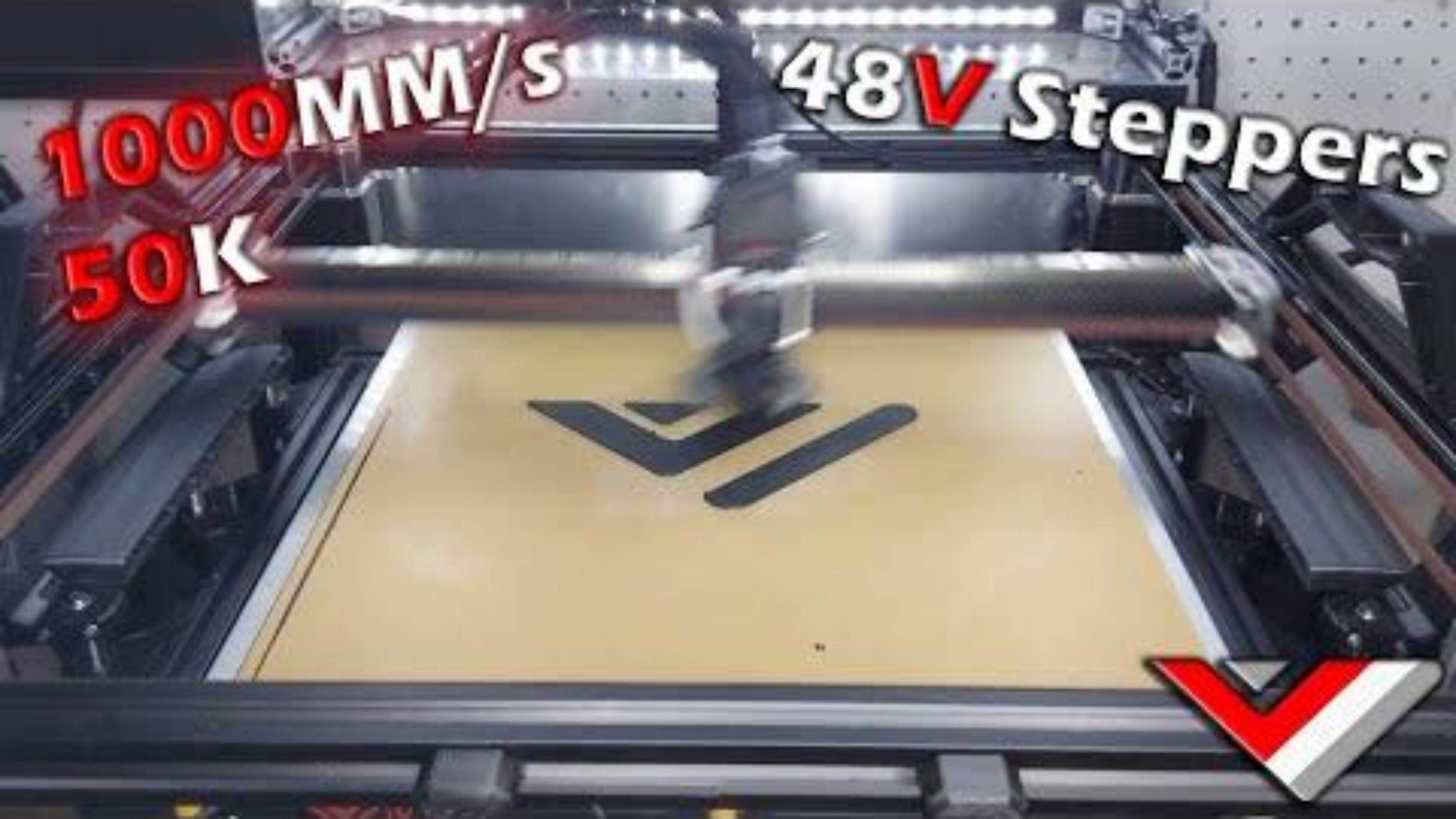


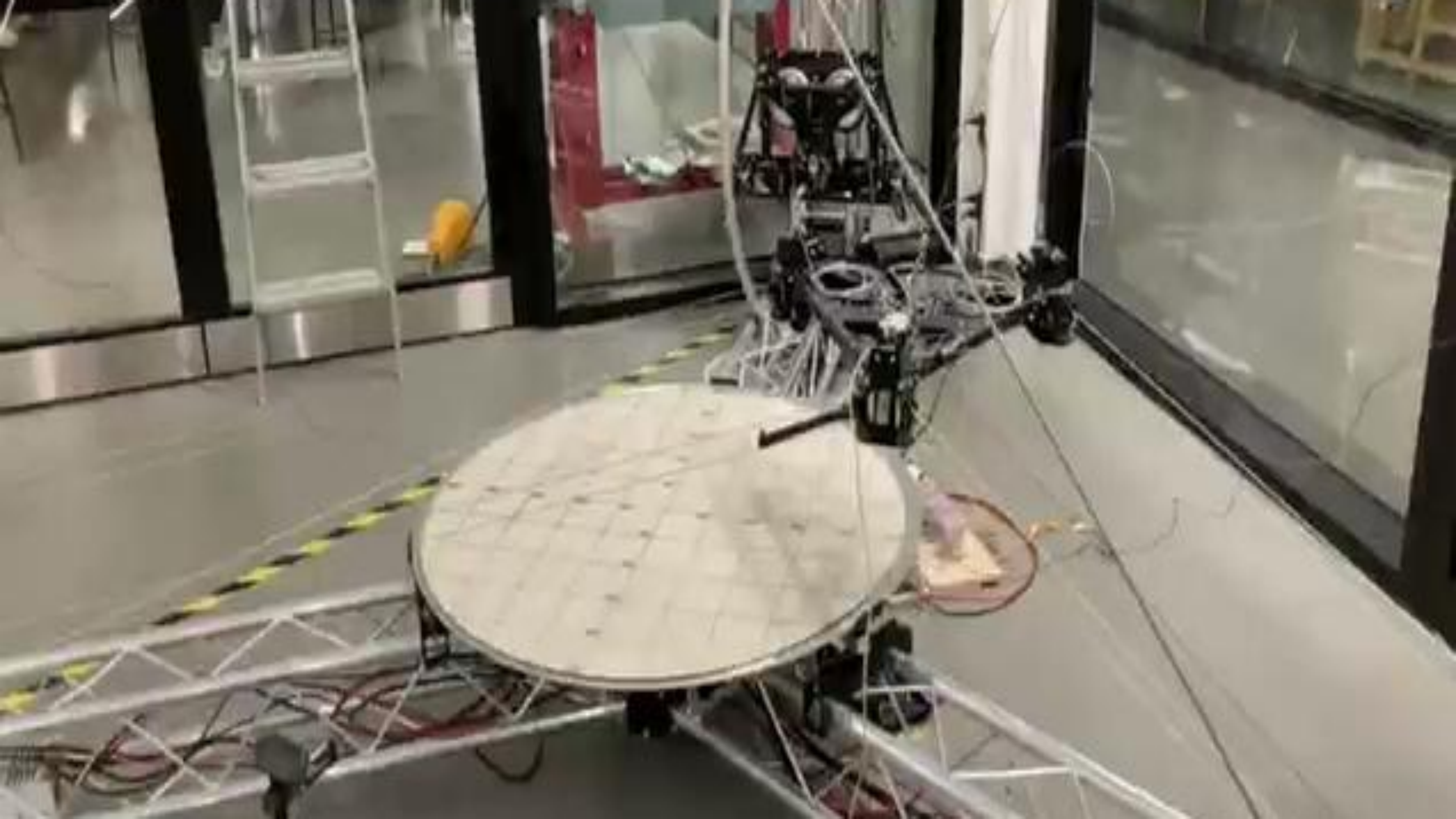
Duet Web Control

- Duet hardware controlled through a web interface or a touchscreen.
- Can also be remotely controlled either through its own web interface or the OctoPI print server solution.
- Fully customizable API
- Broadly used in the industry
- Wide user and developer base and regular software maintenance

Odrivetool & GUI

- Very powerful command line tool for configuration and real time monitoring of the system
- First web based interface available
- Open source


1000MM/s
50K
48V Steppers



FUTURE DEVELOPMENT PATHS

COMPOSITE EXTRUSION

End-use parts with continuous carbon fiber infusion

5-AXIS PRINTING

Additional axes enable printing without supports and printing on existing 3D forms

TOOL HEADS

Tool heads for different use cases, extruders for paste-like materials, milling heads, laser cutting head, inspection camera, etc.

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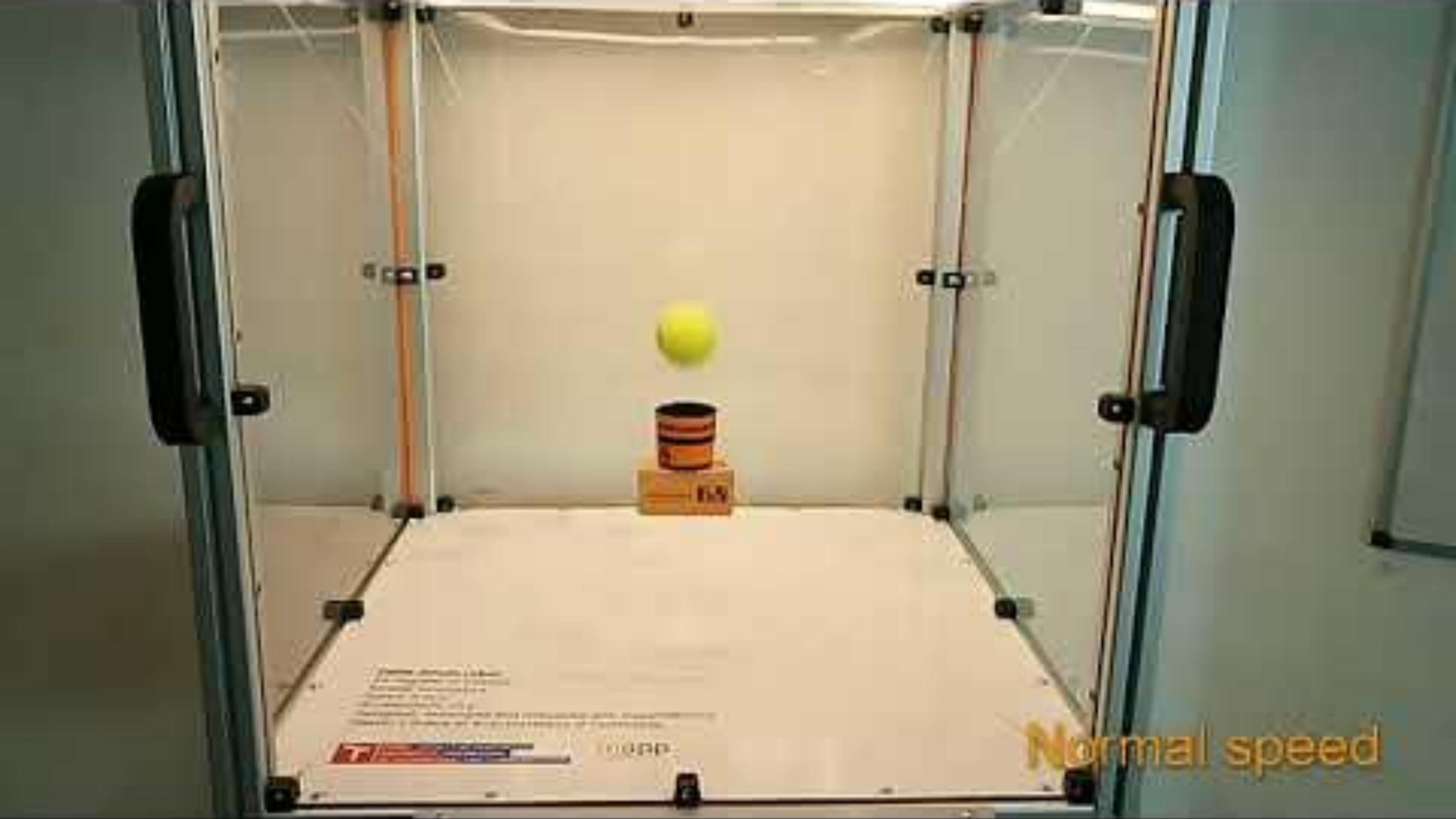
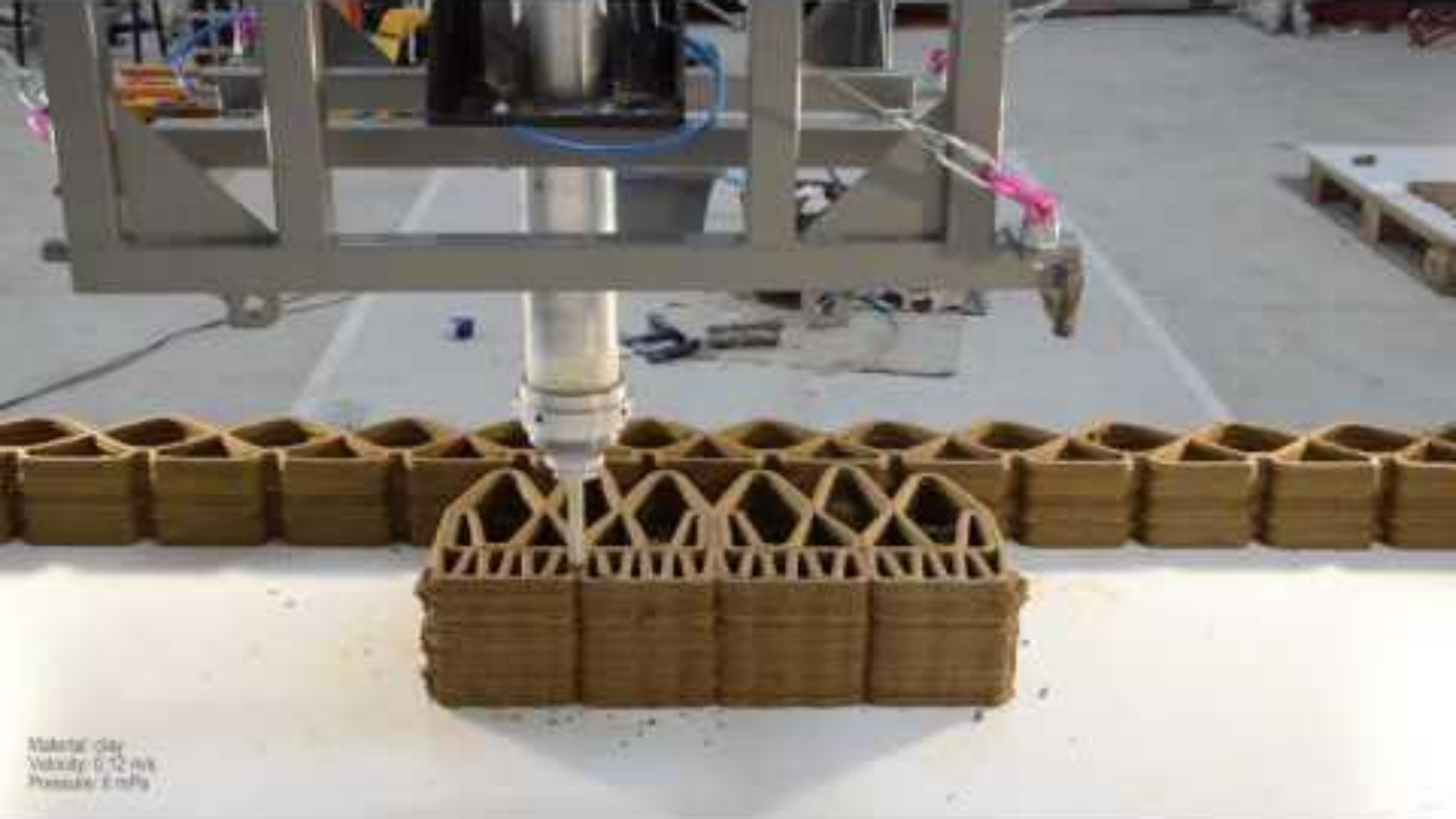

Normal speed

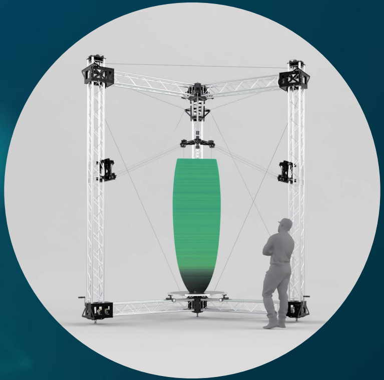

Side view
Trajectory in CRPM Workspace


Material: clay

THE MOST IMPORTANT PRODUCTS & SERVICES

On-demand additive manufacturing

Our service portfolio includes design & 3D-modeling for additive manufacturing as well as the production of the designs.

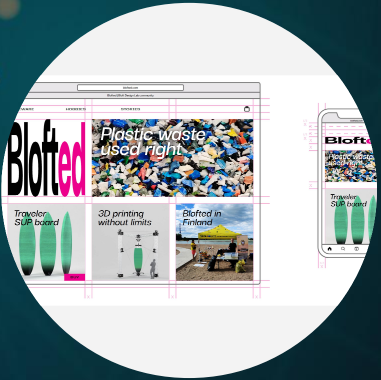


Bloft Mk2 large-scale 3D-printer

Revolutionary technology of this unique 3D-printer beat every other solution on the market in cost effectiveness. In future extendable up to a radius of approx. 100 meters.

Badass Pellet Extruder

A low-cost FGF-extruder with a throughput of approx. 2-4 kg/h (depending on polymer) enables up to 10-20x faster 3D-printing, even with granulated waste plastic.



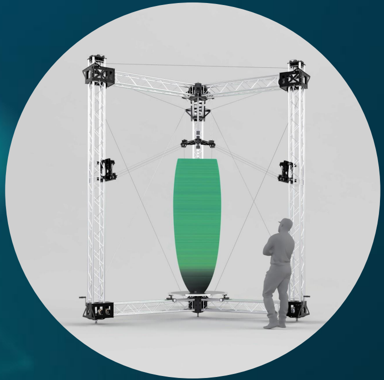
Blofted.com An online marketplace

First global marketplace for digitally sold and delivered physical products. Production will be handled by a local representative of the Bloft-printers network.

PRODUCT LAUNCH

On-demand additive manufacturing

Launch in September 2021

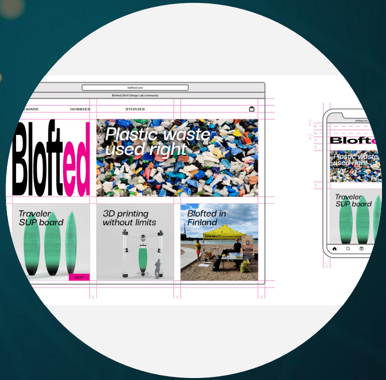


Bloft Mk2 large-scale 3D-printer

Anticipated launch in early 2023

Badass Pellet Extruder

Anticipated launch in fall 2022



Blofted.com An online marketplace

In near future

FIELD OF COMPETITION

1. **Direct competition: On-demand additive manufacturing**
   Currently we are the *only* commercial service provider of large-scale additive manufacturing in Finland.

2. **Direct competition: Large-scale 3D-printer hardware**
   Several european and US companies are offering 3D-printers in the 1 m^3 class. A handful of companies offer even larger printers - up to 10 m^3.

   No one offers a solution with similar extendability and versatility as we do.

3. **Indirect competition**
   We are competing with traditional manufacturing service providers.

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COMPETING MANUFACTURING METHODS

Subtractive Manufacturing

Robotic hotwire cutting of EPS
Multi-axis CNC
Laser cutting

Additive Manufacturing

SLS - Powder bed printing
FDM - Filament printing
Material jetting

Moulding

Blow moulding
Injection moulding
Rotational moulding

Casting/lamination

Thermoset resin casting
Class fiber lamination
Carbon fiber lamination

FGF-extrusion

+ Freedom of form
+ Cheaper feedstock
+ No waste
- Not absolute precise

FGF-extrusion

+ Much faster
+ Cheaper feedstock
+ Wider feedstock variety
- Not absolute precise

FGF-extrusion

+ Freedom of form
+ No cost for moulds
+ Cheaper for small batches
- Not absolute precise

FGF-extrusion

+ Freedom of form
+ No cost for moulds
+ Cheaper for small batches
+ Recyclable end product
- Not absolute precise

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OPERATIONAL COST FACTOR

The biggest barrier in adopting additive manufacturing for serial manufacturing is the cost of feedstock.

Our system is based on the use of industry standard plastic pellets, which is at least ten times cheaper than FDM-filament. The FGF-technology used in our printer also accelerates the printing process at least by factor 10.

Recycled pellets reduce the feedstock cost by approx. 50% compared to virgin pellets. By using shredded waste plastic, it is possible to turn the *feedstock cost into a profit* by incorporating waste management in the service portfolio.

10x

Cost **reduction**
Granulate vs. FDM-filament

10x

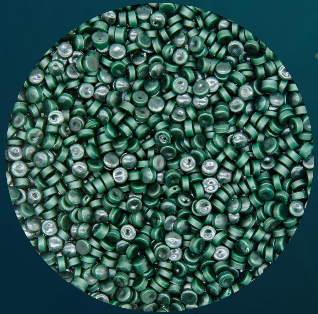
Speed **increase**
FGF vs. FDM-printing

3D-PRINTING FEEDSTOCK BENCHMARK

Stratasys filament
Closed ecosystem
200 €/kg

Ultimaker filament
Open ecosystem
40 €/kg

Virgin pellets
Industry standard
2-4 €/kg



Recycled pellets
Commercially available
0.5-1.5 €/kg

Regrind plastic
Self-shredded
0-0.5 €/kg

Mixed rPP flakes
Post-consumer waste

Fortum Circo PP
Post-consumer waste

rPET flakes
PET bottles

rPET flakes
100% ocean plastic

StoraEnso Durasense
50% wood fibers, 50% PP

Mixed rPP flakes
Collected from Helsinki shorelines

rPET pellets
PET bottles

BrightBio
PLA mixed with ash from industrial waste streams

Durasense Ocean
50% wood fibers, 50% rPP

PP/HDPE co-polymer
100% ocean plastic (ghost net)

rPET pellets
PET bottles

UPM Formi
PLA/PP +30% cellulose


ADDRESS


POLYPROPEENI
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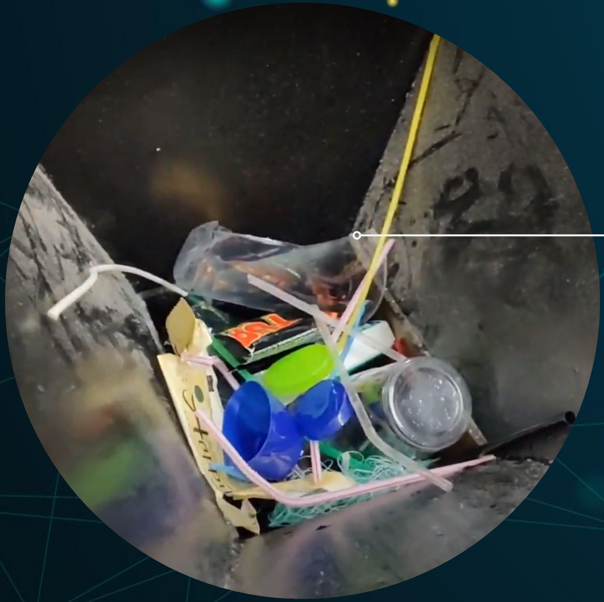
TURNING PLASTIC WASTE TO A RESOURCE



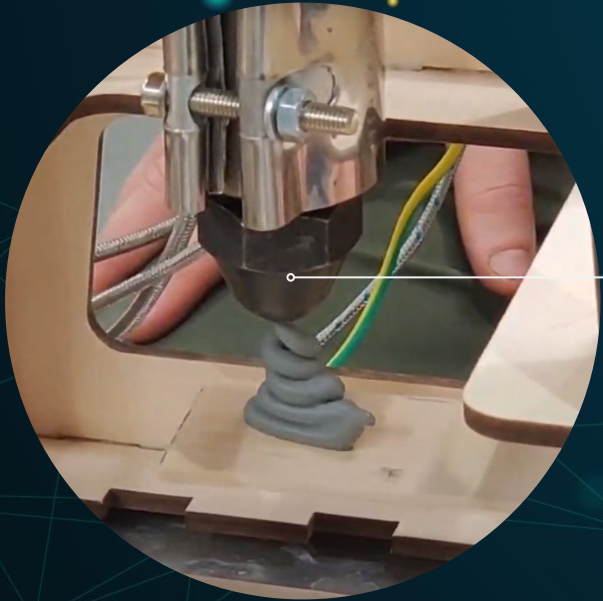
SHREDDING

Washed and sorted waste plastic granulated with an industrial shredder

NEW FEEDSTOCK

The shredder produces a granulate of 3-5 mm flake size

PLASTIC RECYCLING BY EXTRUSION



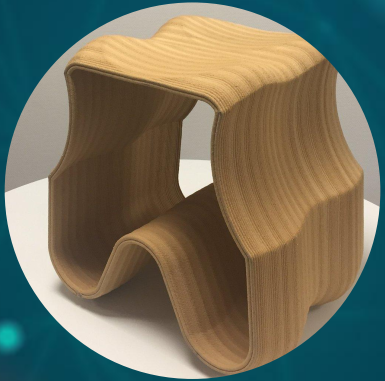
EXTRUSION

The plastic granulate is melted in the extruder and pressed through a nozzle

3D-PRINTING

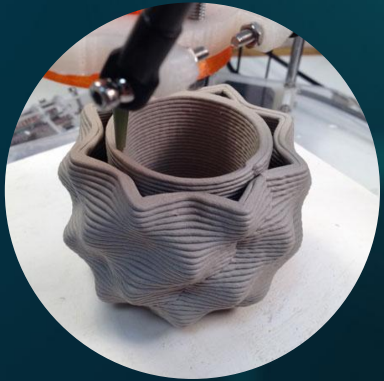
Our extruder is small & light enough to be attached to a large 3D-printer

COUNTLESS POSSIBILITIES WITH LARGE-SCALE 3D-PRINTING



Wood & fiber composites

Recycled plastic



Clay

Concrete

CASE EXAMPLES

MARINE INDUSTRIES

World largest 3D-printed polymer-based object. A full scale motor boat hull.

Printed in 72 hours
Weight 2.2 tons

Video

CASE EXAMPLES

CONSTRUCTION INDUSTRIES

32.5 m2 house 3D-printed out of concrete in 24 hours for less than $4.000.

CASE EXAMPLES

PRODUCT DESIGN

Fortum Viren Chair printed out of Fortum Circo / rPP-Cellulose composite.

Circo PP-CF30 is made of finnish post-consumer plastic waste with 30% added cellulose fibers.

CASE EXAMPLES

TOOLING & JIGS

3D-printed moulds reduce milling time and feedstock needs.

Faster tool and die development. Many options to use 3D-printed tools directly in production.

Cheaper remanufacturing of moulds by recycling old 3D-printed moulds.

TRACTION

PAYING CUSTOMERS

Printing services / experiments

SPONSORING & COLLABORATION

TRACTION

THE BALTIC SEA CHALLENGE

Helsinki

PILOT PROJECT 2020

Our 3D-printer/FGF extruder was tested as part of the Baltic Sea Challenge by the City of Helsinki. The objective was to validate the use of ocean plastic as 3D-printing raw material.

Final report (in finnish)

fortum

VIREN-CHAIR 2021-22

Together with the Fortum Waste Solution department we validated the use of Finnish post consumer plastic waste as 3D-printing material and printed several prototypes of a chair made of plastic waste.

Fortum Viren website

TEAM BLOFT DESIGN LAB

ATTE LINNA

CEO & Lead Designer

Bachelor of Arts, Industrial Design
Associate of Arts, Graphic Design

+5 years experience in advertising
+6 years experience building 3D-printers and electric vehicles

Speaks natively finnish and german
Work fluency in english

VILLE OJALA

Mechanical Engineering, Prototyping & Building

Bachelor of Arts, Industrial Design
Carpenter

+3 years experience prototyping, metal works and mechanical engineering

Speaks natively finnish
Work fluency in english

VARPU SAVOLAINEN

Marketing & Communication

Bachelor of Science, Urban Geography

Co-founder of ROMU Company

Active in Helsinki University Community

Speaks natively finnish
Work fluency in english

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FUTURE TEAMMATES

MAYBE YOU

Automation Expert

BEng or graduate engineer (automation)

Experienced with:
Embedded systems
Firmware development
Sensors

Understanding of:
Robotics
Kinematics

YOU TOO

Software Development

Suitable degree in software engineering

Experienced with:
C++, Python and JavaScript
Cloud computing

Understanding of:
Machine learning
Machine vision

SEE YOU IN FUTURE

Interested to know what it holds for you?

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