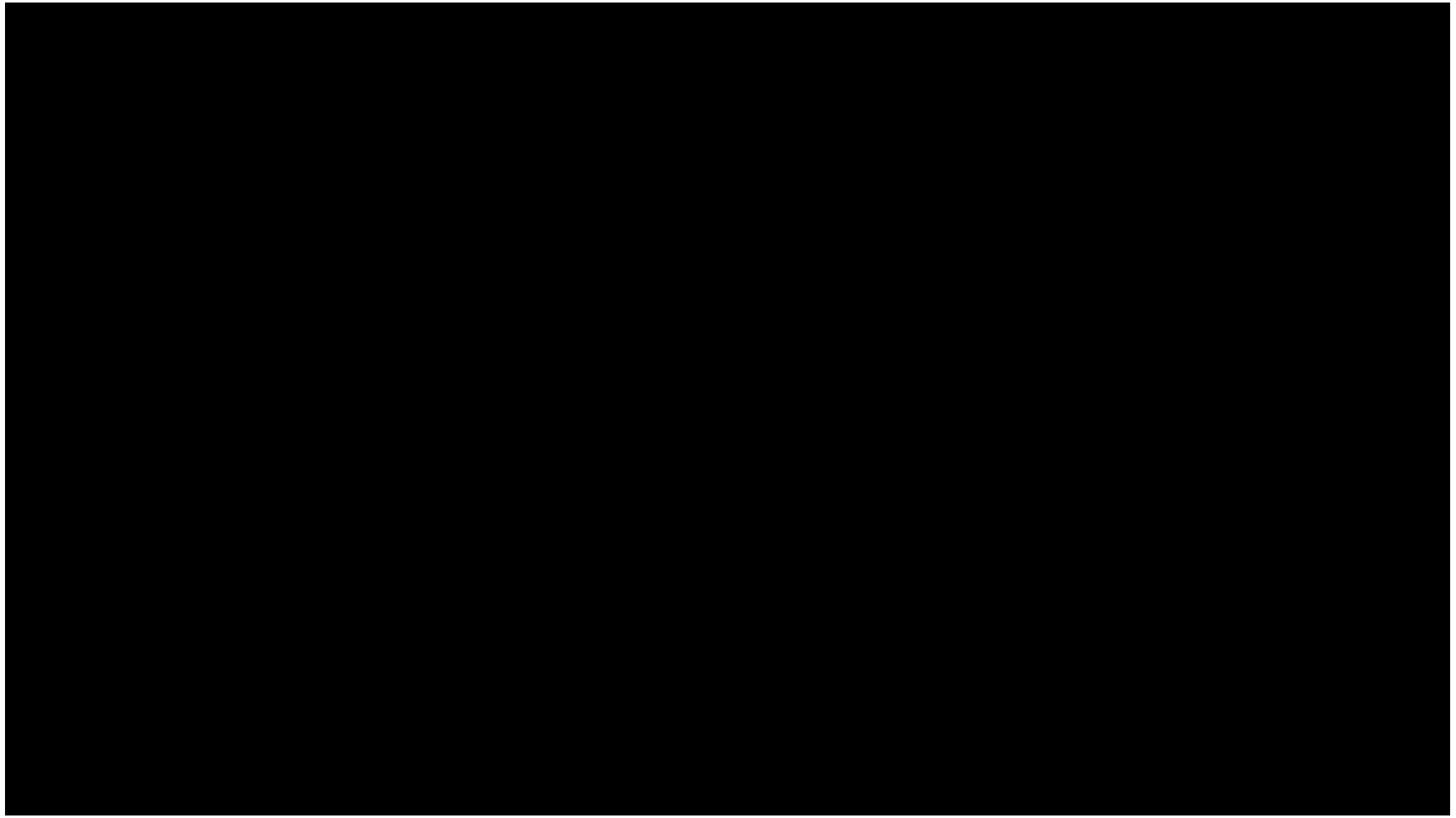
Aalto-yliopisto
Aalto-universitetet
Aalto University

Ainetta lisäävien menetelmien kehityssuunnat konepaja- ja valimoteollisuutta ajatellen

Mika Salmi 30.10.2026

3D tulostettu raketti



Sisältö

3D-tulostus uutisissa ja 3D-tulostuksen kokoluokka

Kuka ja mistä

Valimoteollisuus ja konepajat esimerkkejä

Kalevala Koru, Metso-Outotec, Hetitec

Wärtsilä, Valmet,

3D-tulostus puolustusteollisuudessa

Patria, miniFactory,

Aseiden 3D-tulostus

Tulevaisuus

Uutiset

- Auto
- Talo
- Lentokone
- Ruoka
- Aseet
- Elimet

(osat, työkalut, muotit etc…)

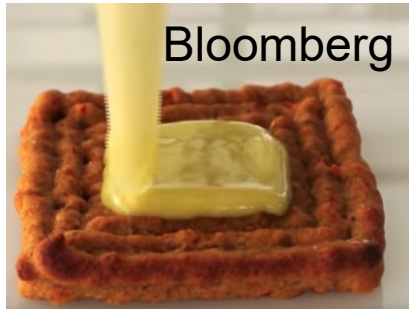
ETH Zurich





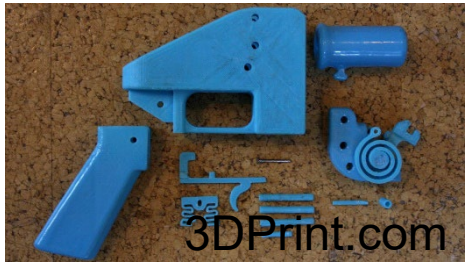


Local motors





Mashable

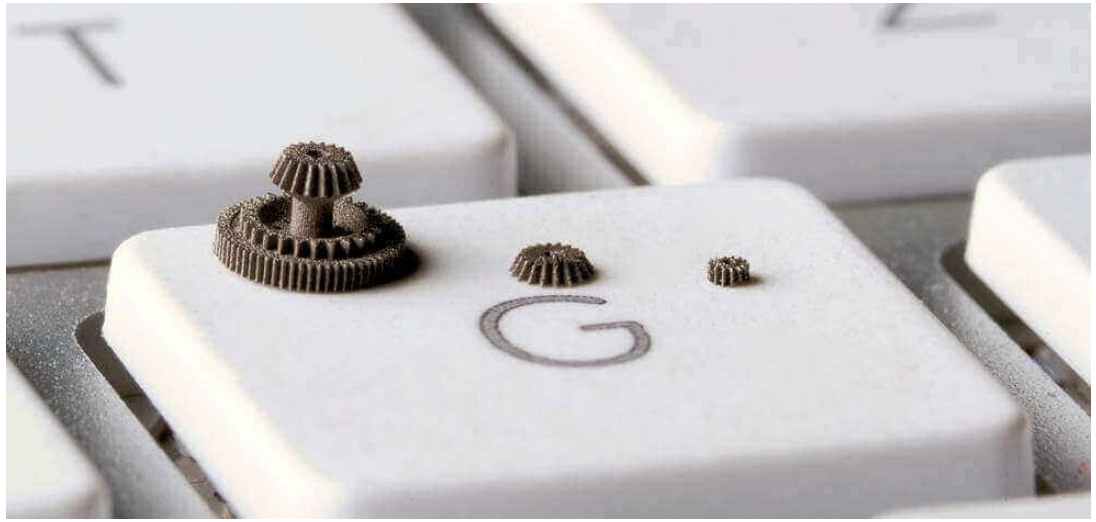






A!

Mikä on 3D-tulostuksen kokoluokka

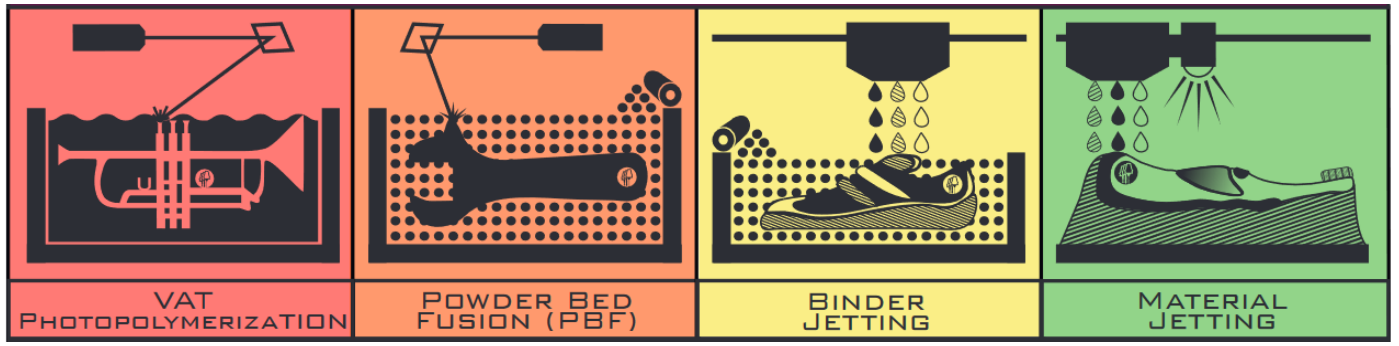


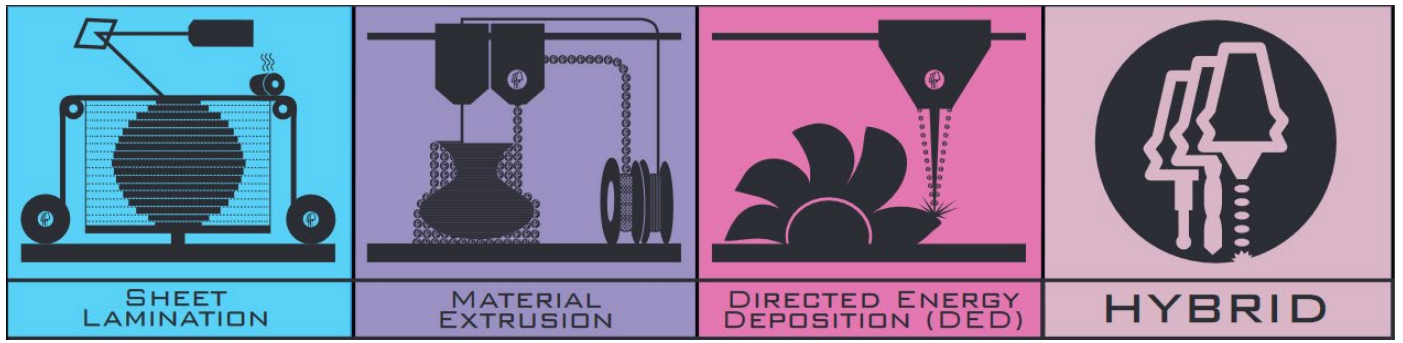
Microprint



imperial.ac.uk/

3D-tulostus – seitsemän eri tekniikkaa





Background

2008
Started 3D printing research

2009
Master of Science (Technology) with Extended Curriculum in Science
Helsinki University of Technology

2013
Doctor of Science (Technology)
Aalto University,
Medical applications of additive manufacturing in surgery and dental care

2021
Title of Docent
Faculty of Medicine, Helsinki University
Digital design and manufacturing

2022
Title of Docent,
National Defence University, Digital Design and Manufacturing Technology

2022
Aalto University
Assistant Professor – Sustainability in Manufacturing

2026 Aalto University Associate Professor – Sustainability in Manufacturing
Head of Materials to Products Group

2026 Highly Ranked Scholar - Prior Five Years:#19 in 3D printing and #65 in Manufacturing in the World

2024-2026 Stanford University, World's Top 2% Scientists, Career

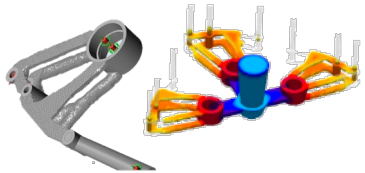
Editor Progress in Additive Manufacturing (ISSN 2363-9520)

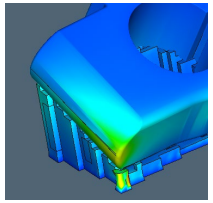
President of Finnish Rapid Prototyping Association 2020-2025



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Aalto University

Strategy & focus areas in AM

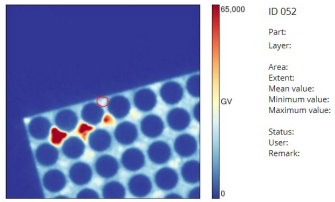


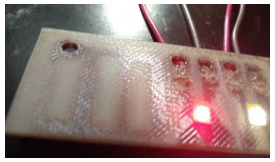












Applications & business

Spare parts

AM products and services

High performance

Sustainability

Business operations

Medical

Industrial

Design for 3D printing

Optimization

Simulation

Computational geometry

Lattices

Materials

4D

Plastics

Ceramics

Composites

High entropy alloys

Biomaterials

Shape memory alloys

Conductive plastics

Multimaterials

Metals

Technology

Quality

Post processing

Artificial Intelligence

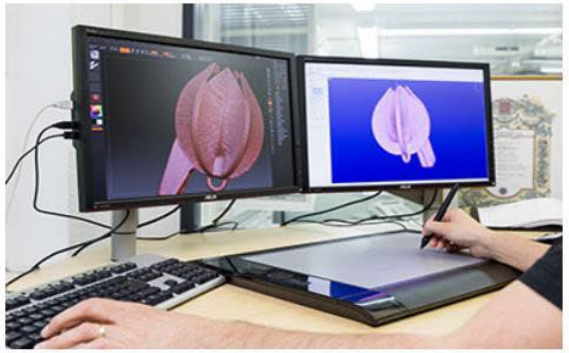
Materials processing

AM Since 1992

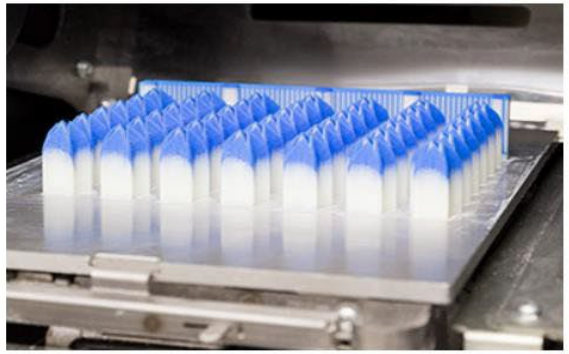
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Aalto-universitetet
Aalto University

Valimot ja konepajat

Kalevala Koru



Also this can be a goldsmith's tool. The 3D model of the Snow Flower is being prepared using the drawing pad and the computer.



Snow Flowers printed in blue wax with a 3D printer.

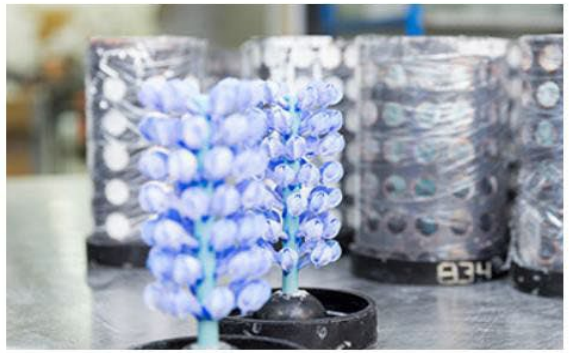


Some of the wax models are still created traditionally by hand. Hot wax is injected inside a rubber mold and the solidified wax model is carefully removed from the mold.





The wax flowers are ready for the next stage.



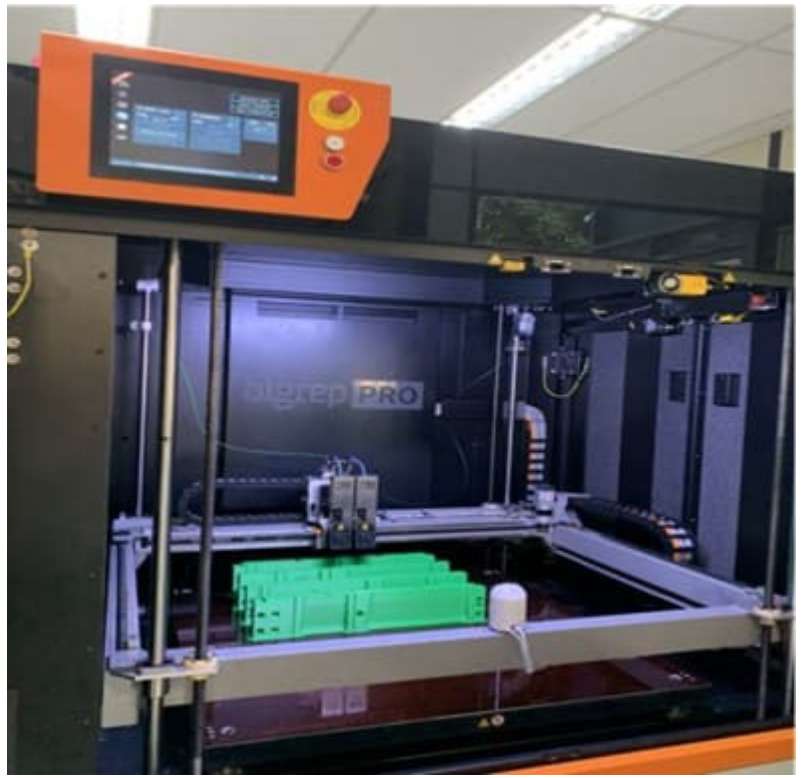
The wax models are attached to a wax pole forming tree-like structures. The trees are placed inside a cylinder which is then cast with plaster. Numbers on the cylinders mark the different treatments each cylinder receives depending on the jewelry model that is being produced.

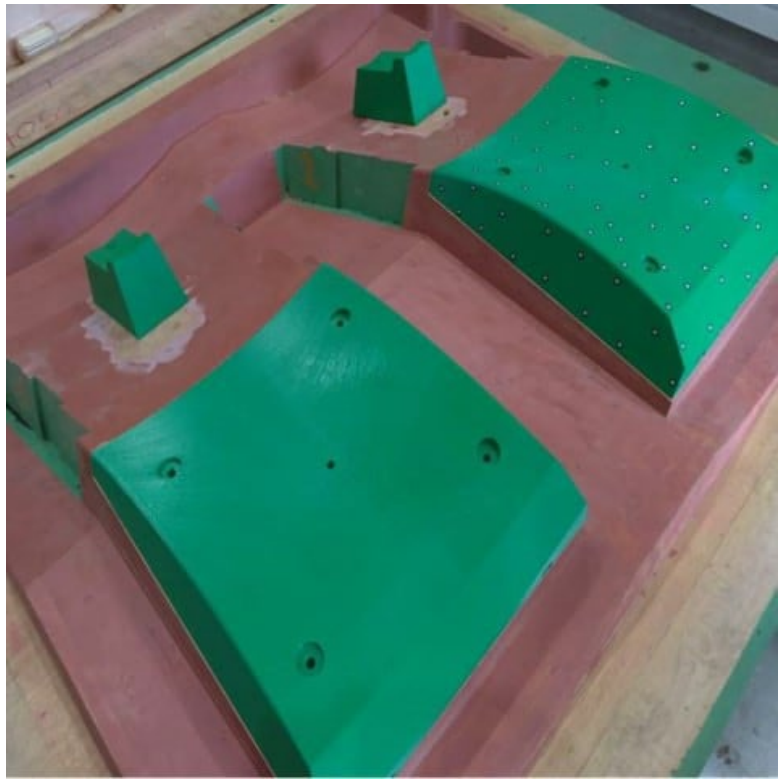


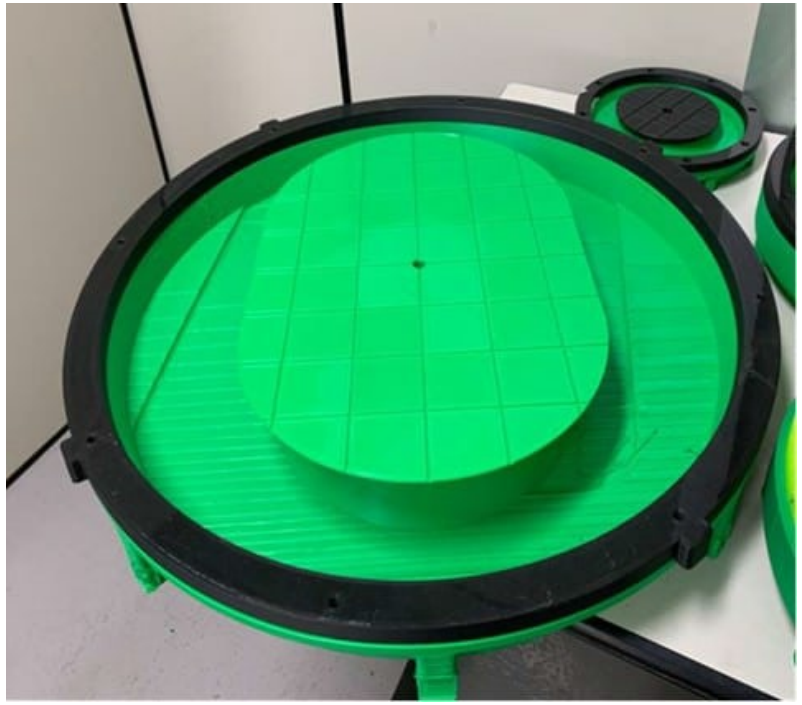
The wax has been melted off from the cylinder and replaced with molten metal.



Metso-Outotec



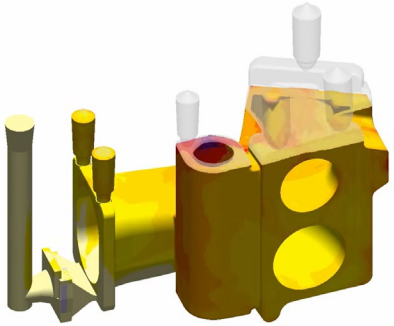


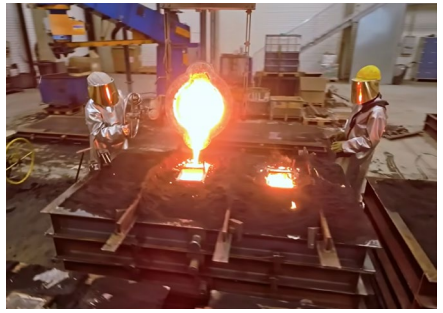
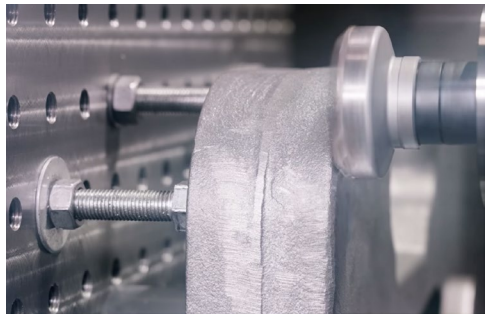


Bigrep

Hetitec

Offer
Order
3D-modeling & Casting simulation — Day 1
Mold printing — Day 2
Mold preparation — Day 3
Melting & Pouring — Day 4
Machining
Delivery — Day 5



Wärtsilä - Jauhepetisulatus





Wärsilä, Oqton

Valmet - Additive Manufacturing Technology Center in Tampere

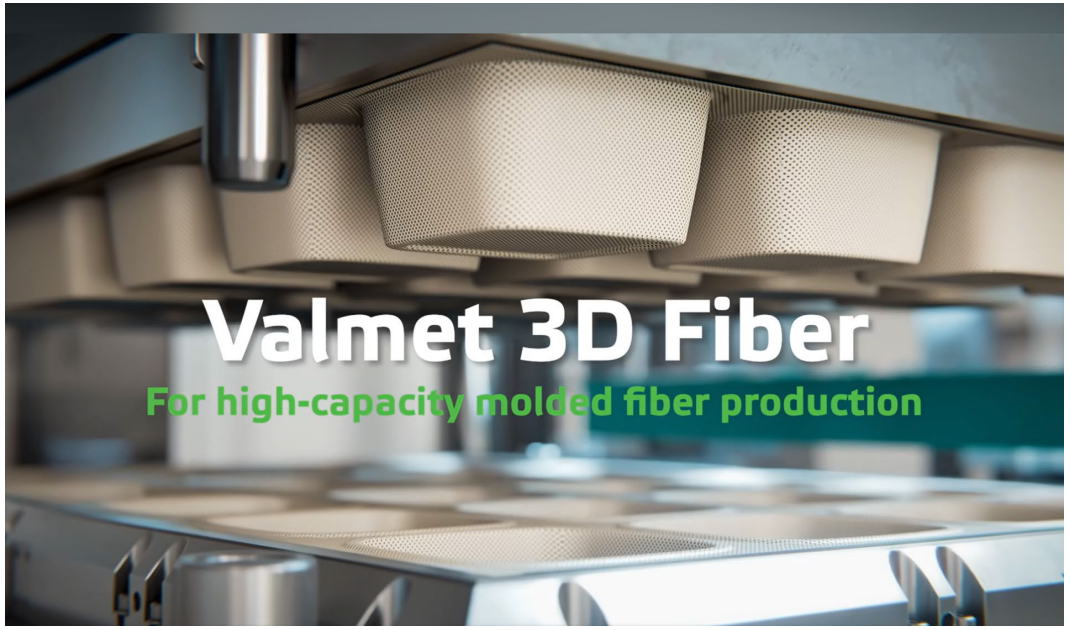


Valmet

Valmet - Jauhepetisulatus



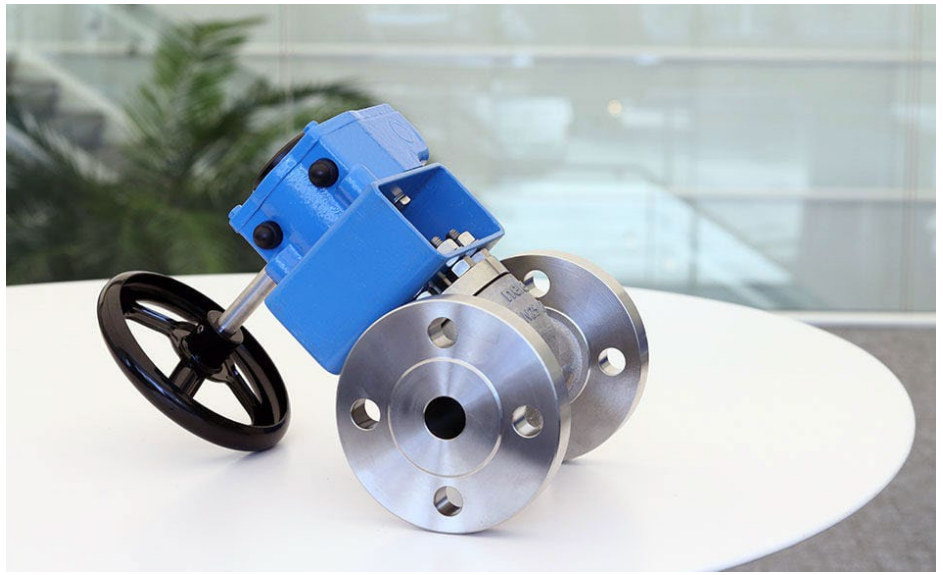
Muoto products by Metsä Spring

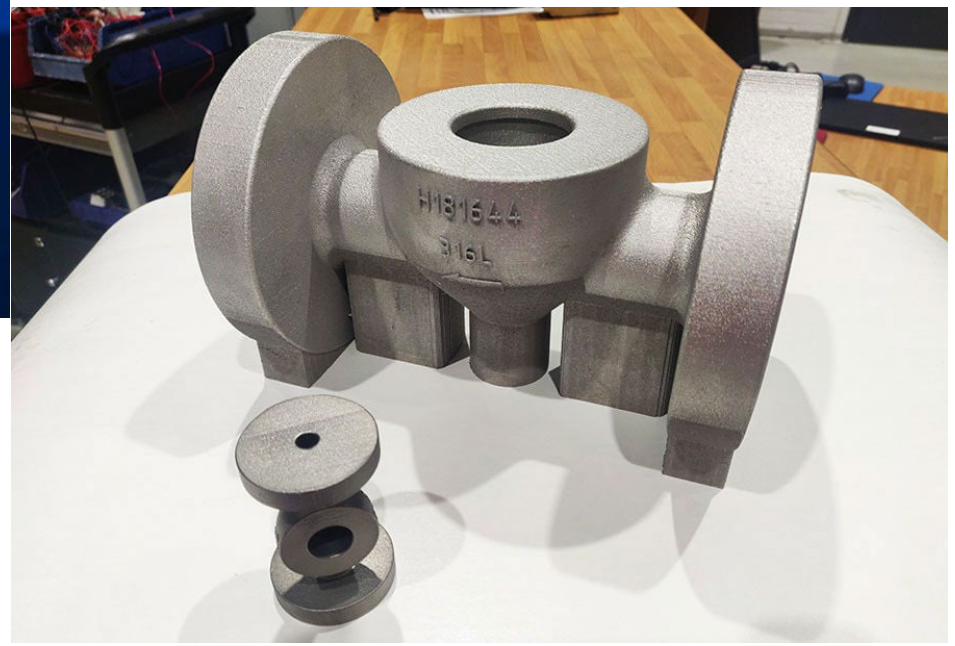


Valmet - Jauhepetisulatus



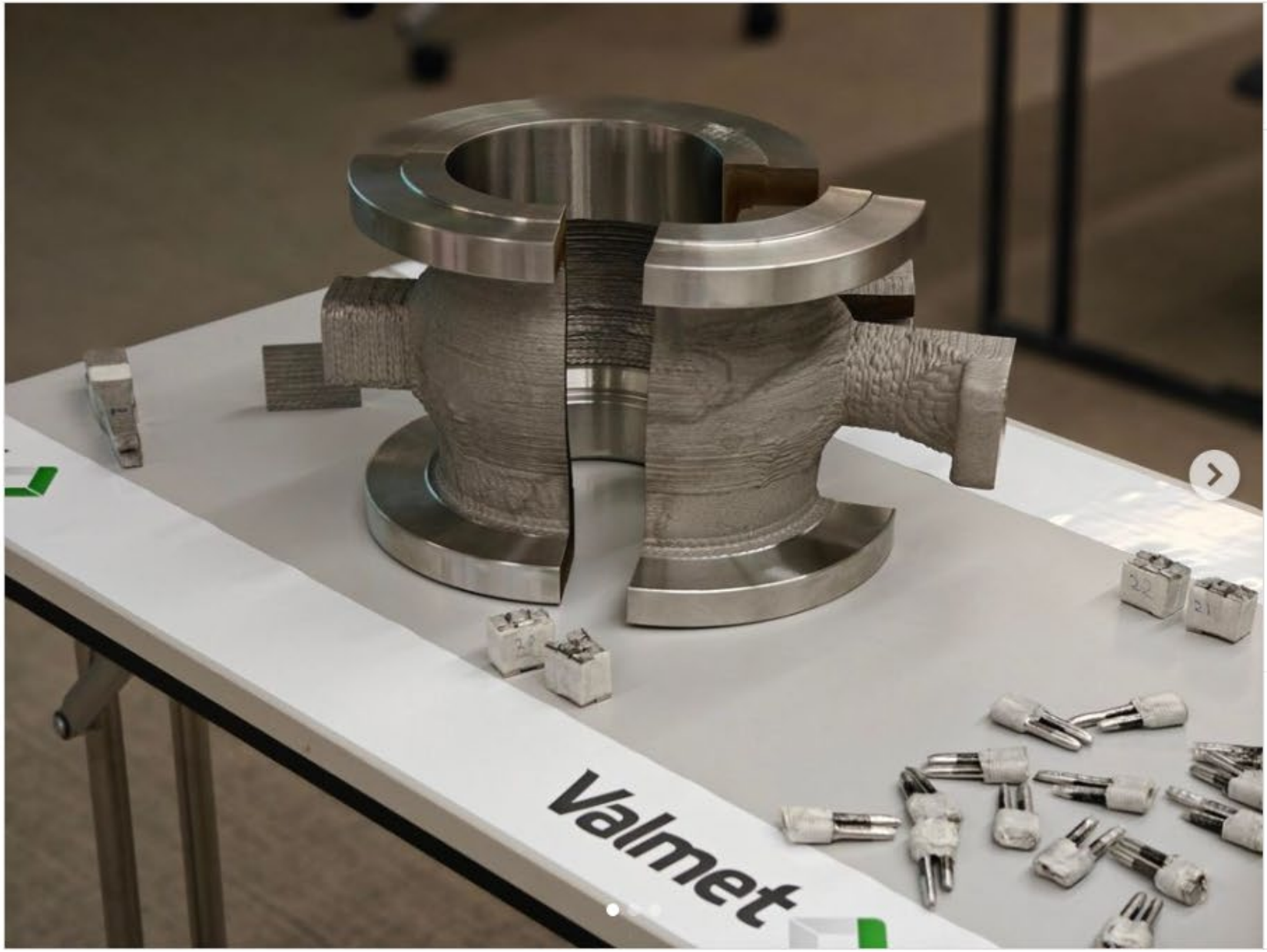
Valmet





A!

Valmet - Suorakerrostus



valmetglobal • Seuraa

valmetglobal 104 vk

For the first time in valve manufacturing history, we've 3D printed and machined a 6-inch pressure-intense valve body using WAAM (Wire Arc Additive Manufacturing) technology! 🌟

This innovation brings exciting benefits: 🟢 Improved quality and durability 🟢 Shorter lead times 🟢 Increased energy efficiency!

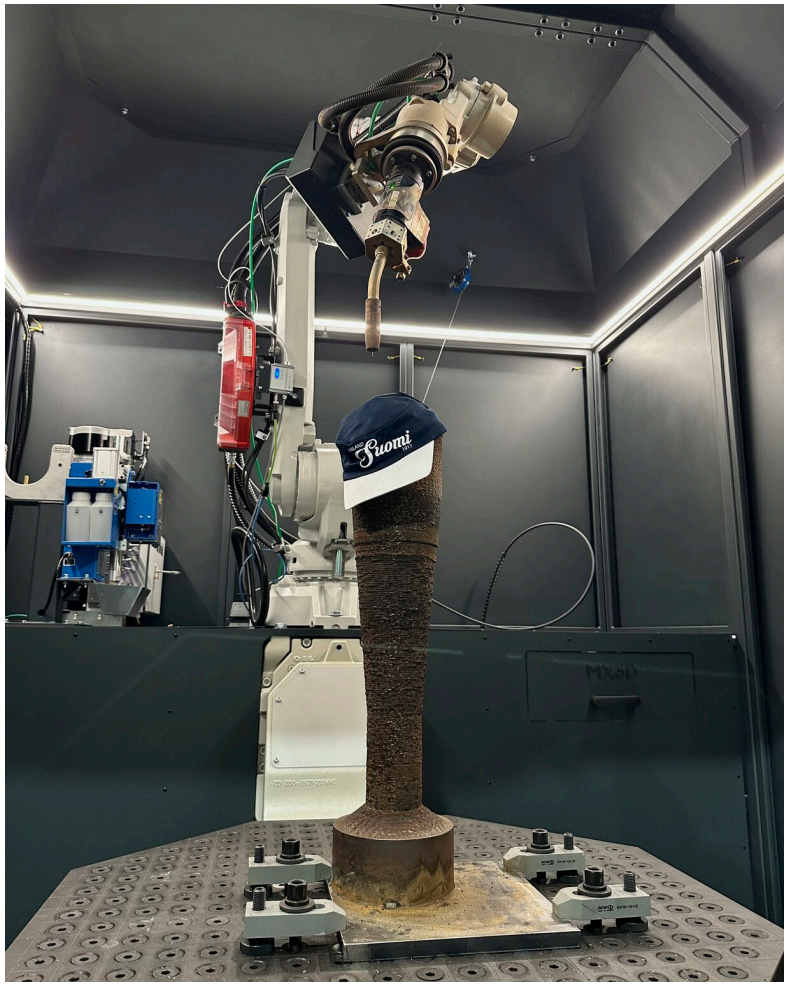
Our trainee, Roope Kiljunen, completed his diploma thesis on WAAM for valve

193 6

11. lokakuuta 2024

Kirjaudu sisään, jos haluat tykätä tai kommentoida

Tridiam





Tridiam

3D-tulostus puolustusteollisuudessa

Patria Drones (Nordic Drones)



Kuva: Eetu Holstein



3D Formtech

Main reasons for interest in AM

- Manufacturing without separate tools
- Almost without geometric restrictions
- Changing the shape of the parts to be manufactured
- Custom and optimization is fast, according to the need of use
- Small batch production, Mass customization
- Faster and easier generation of manufacturing data
- Simplifying the supply chain - speed
- Manufacturing not in industrial environments
- Cost-effective production
- Reducing waste

UNCLASSIFIED REL TO PUBLIC

Patria



2018

F/A-18 Hornet
General Electric F404-suihkumoottorin osa
Inconel 625
2:ssa koneessa…

Patria, Lentoposti

miniFactory - Rheinmetall

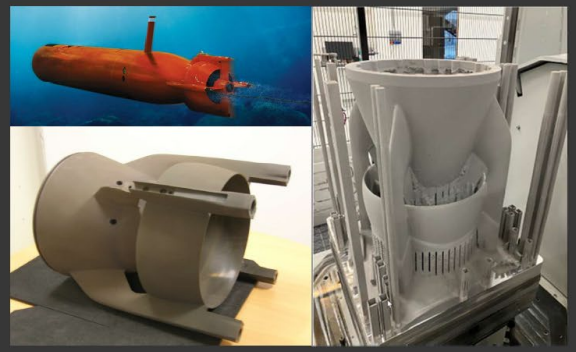


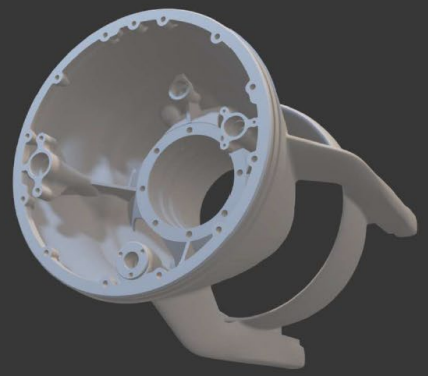
Challenger 3



ULTEM 9085

AUV62 Hull – Tail section

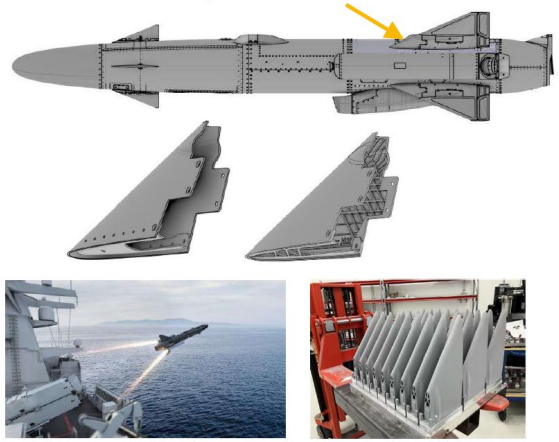




- Aluminum (AlSi10Mg → CP1)
- ≈ 50% Weight reduction with AM
- Shorter lead time
- Fewer components
- Smarter design; new capabilities

SAAB BAE SYSTEMS

RBS15 Mk3, Front Cover Skin



SAAB



Values

-33% Cost

-60% Lead Time

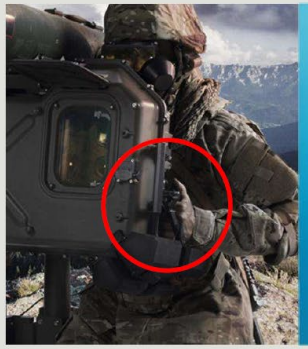
-30% Weight

17→1 Parts

- Improved supply chain
- Scalable production supply
- Improved quality

BAE SYSTEMS

Handle for RBS70 & Hinge for Gripen Fighter







SAAB

Industry Collaboration, M Meet-up 2026, Håkan Stake (Saab) & Mattias Hägglund (BAE Systems)

BAE SYSTEMS

Carl-Gustaf venturi: Nov 2014 live fire

Titanium, EBM, 72 h build time





SAAB

BAE SYSTEMS

About us

What is 3D Print Army?

A community from Ukraine is working to help the army protect Ukraine. We do not sell anything, and all costs are covered by donors and volunteers.

1,254,325
Printed plastic (kg)

4,908
3D printers

Orders queue
4,243

2,376
Active makers

28,704
Required plastic (kg)

drukarmy.org.ua/en/how-it-works



Starlink connectors

With 3D Print Army, you can help solve the problem of vulnerable connectors. For just $10, you can use 850 grams of plastic to print 77 sets of protective caps. This could potentially save at least $10 450, ensuring a reliable connection at the forefront and saving money for further combat use.



The Ukrainian-made "Sting" and 'Salut' interceptor drone, as well as a new Ukrainian-made interceptor drone whose name has not yet been announced are seen on March 31, 2026 in Kharkiv, Ukraine. (Photo by Nikoletta Stoyanova via Getty Images)



https://militarnyi.com/

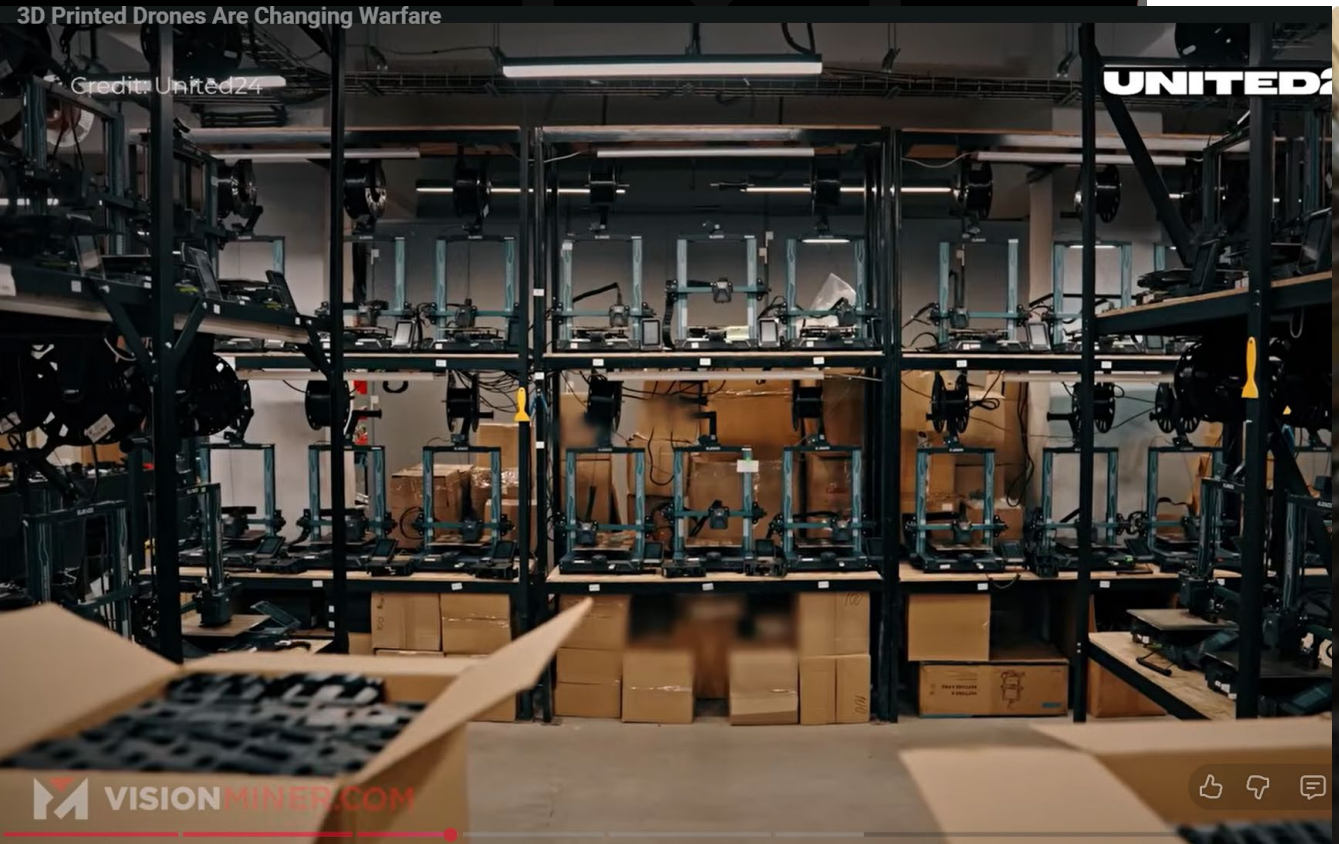
WILD HORNETS

WHO WE ARE WHAT WE DO OUR PARTNERS UA EN

Verified data show our drones have neutralized 1738 enemy assets valued at $1,69 billion. Specifically:

SHAHEDS AND GERBERAS	6724	TANKS	151	VEHICLES	613
AIR DEFENSE SYSTEMS	4	OTHER DRONES	1966	ARMORED VEHICLES	220
INFANTRY	818	ARTILLERY / MLRS	122		

100 droonia päivässä





3D-tulostetut aseet

3D-tulostetut aseet FGC-9



Kuva: Kalle Suomi / Yle

3D-tulostetut aseet - Tampere



Kuva: Tulli

1 rulla 1kg
1 ase 1kg muovia
1 tulostin = 1 kg päivässä

3D-tulostetut aseet





(twitter.com/Jake_Hanrahan)

Äänenvaimentimet



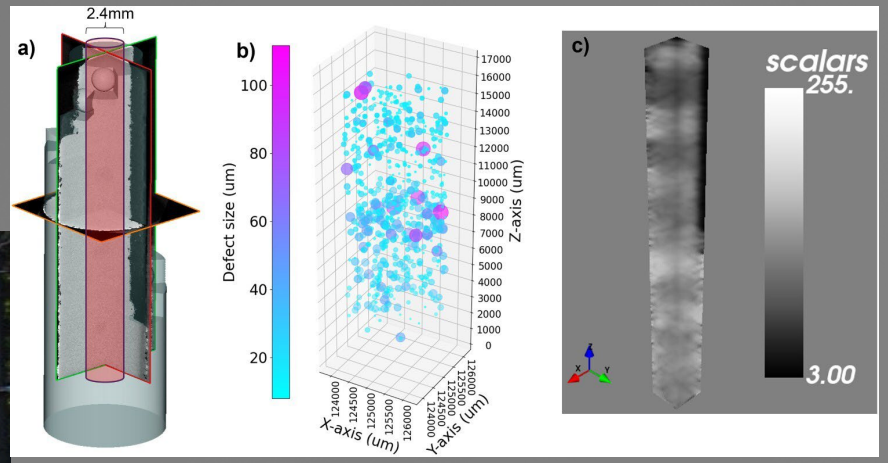


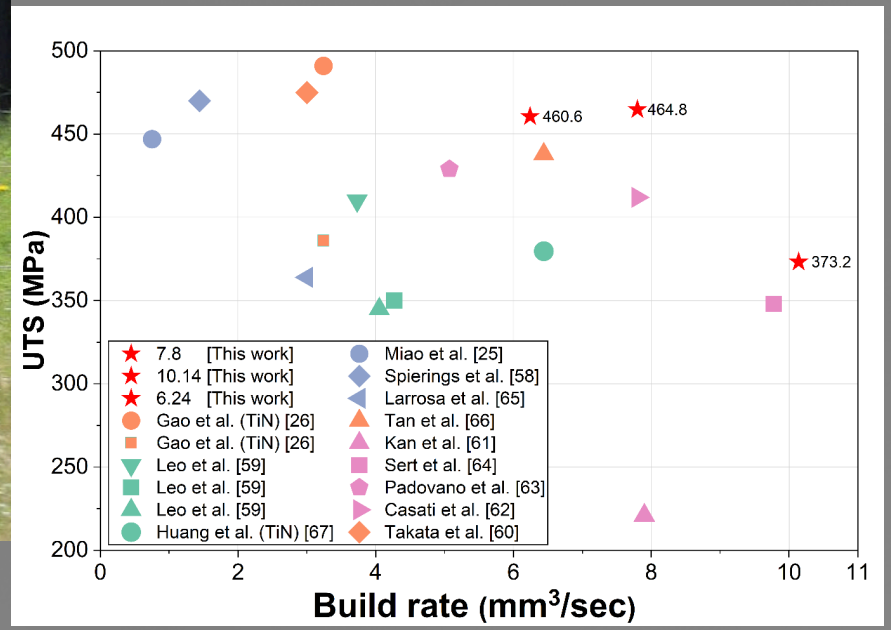
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Tulevaisuus

Flickr: Cheetah Run
Author Mark Dumont



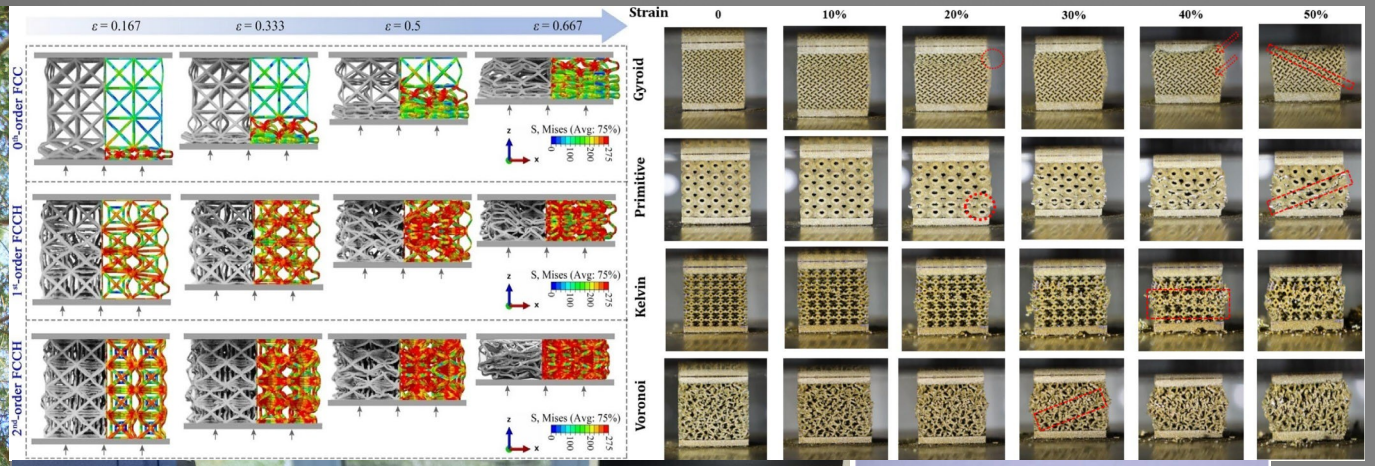


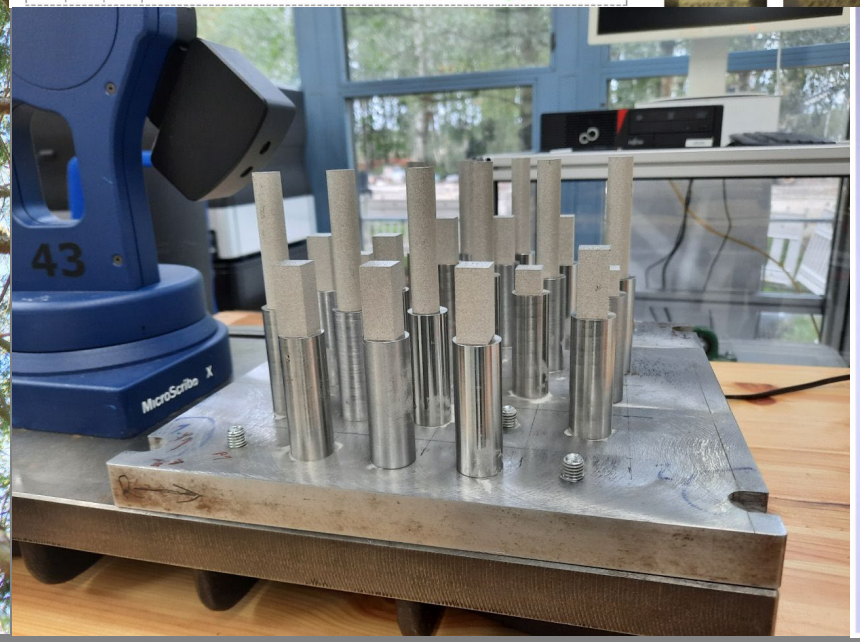


Akmal, J., Minet-Lallemand, K., Kuva, J., Syvänen, T., Ylander, P., Puttonen, T., ... & Salmi, M. (2025). AI-based defect detection and self-healing in metal additive manufacturing. *Virtual and Physical Prototyping*, *20*(1), e2500671.

Md Sadique Ali, Björkstrand Roy, S. Siddharth Kumar, Tuomas Puttonen, Yang Shengzhao, Mika Salmi. High-Productivity laser powder bed fusion of AlSi10Mg enabled through TiN Addition. In review.







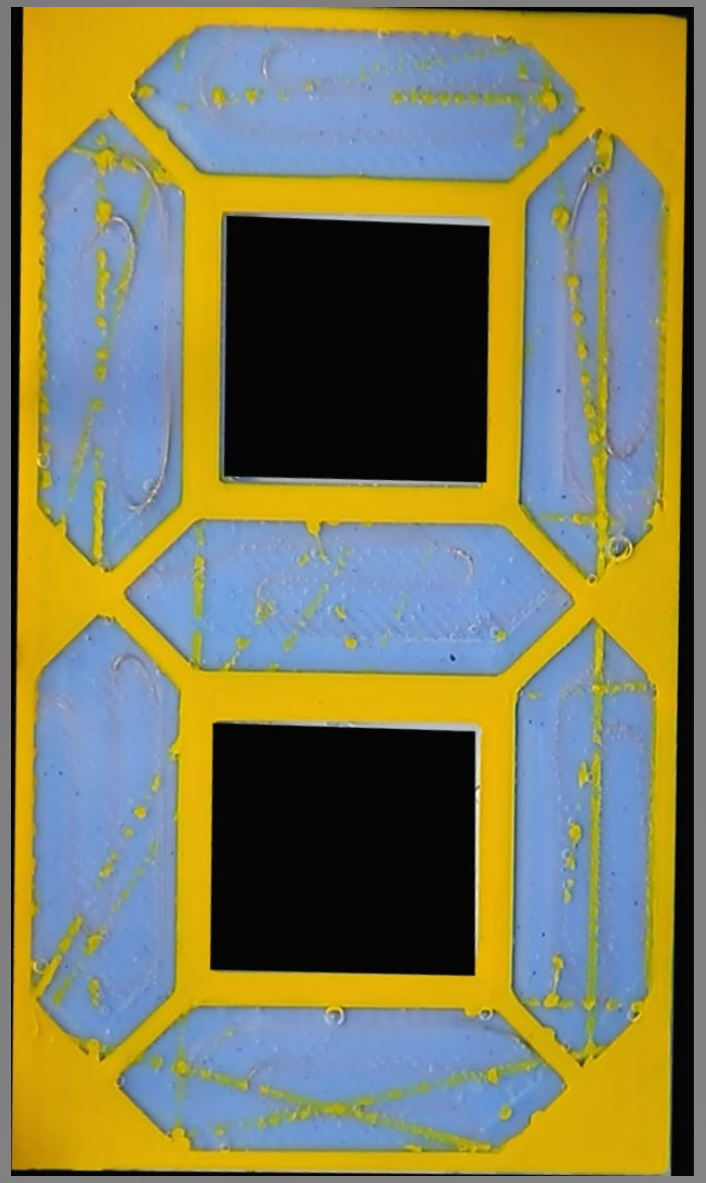


Kestilä, A., Vehkamäki, M., Nyman, L., Salmi, M., Lohilahti, J., Hatanpää, T., ... & Ritala, M. (2024). 3D-printed sensor electric circuits using atomic layer deposition. *Sensors and Actuators A: Physical*, *370*, 115260.

Björkstrand et al.

Gandhi, R., Salmi, M., Roy, B., Pagliari, L., & Concli, F. (2025). Mechanical performance, fatigue behaviour, and biointegration of additively manufactured architected lattices. Virtual and Physical Prototyping, 20(1), e2530733.





Kumar, S. S., Niyagama, W. W., Akmal, J. S., & Salmi, M. (2025). 4D printing of electro-activated thermochromic composites for dynamic 3D displays. *Materials & Design*, *251*, 113674.

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"Muscles of the Hand and Wrist" by Double--M is licensed under CC BY 2.0.

Kumar, S. S., Mousapour, M., Akmal, J. S., & Salmi, M. (2026). 4D-printed shape memory alloy–polymer hybrid composites with tunable bidirectional actuation. *Virtual and Physical Prototyping*, *21*(1), e2670936.



Kiitos
aalto.fi