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Future Boatbuilding by Parexo, RISE and UPM

Live event

8.6.2021

www.parexocrafts.com

Future Boatbuilding – Topics and Participants

The Challenge: Old school moulds

- Parexo

Biocomposite material

- UPM

Large scale 3D printing, new mould

- RISE

Future boatbuilding technologies, new Gauge

- Parexo

Parexo Inc.

- Mikael Valtonen, CEO
- Kim-Niklas Antin, CTO, D.Sc.
- Sampo Karpo, CMO, as moderator

UPM Biocomposites

- Ralf Ponicki, Director, UPM Formi
- Eve Saarikoski, Application Manager, D.Sc.

Research Institutes of Sweden, RISE

- Emil Johansson, Forskare, Additiv Tillverkning
- Lenny Tönnäng, Laborationsingenjör, Additiv tillverkning

The Challenge: Old school moulds

Parexo

Mikael Valtonen

About Parexo

- Parexo Inc. is a marine industry company redefining boating and marine logistics.
- Parexo is launching completely new sustainable high-performance watercrafts.
- Company climate-neutral vision is to get rid of fossil based raw materials and energy.

The Challenge

Boat moulds are extremely expensive!

- Unlike automotive industry, volumes in marine industry are much lower
- Mould cost per boat is significantly higher!
- High mould cost makes new boat model launching slower

Time-to-market is too slow

- New boat models have to be on the market fast
- New agile methods and processes are definitely needed
- Modern concept development requires feedback quickly for improving next model

Reuse of old school mould is difficult

- Return on investment (ROI) should be fundamentally better

Drivers for new mould technology

- New moulds significantly more cost-effective
- New models faster to market
- 100% recyclable, moulds can be gridded down and recycled for new molds
- Competitive advantage for pioneers

Proof Points for new mould technology

Drivers for new mould technology

- New moulds significantly more cost-effective
- New boat models faster to market

- 100% recyclable, moulds
- Competitive advantage for pioneers

Small scale mould
Case Gauge

- Cost savings about **-10%**
- Time savings about **-10%**

- Yes, 100% recyclable
- Yes, competitive advantage for Parexo

Large scale mould
Case ”Large”

- Cost savings target **-50%**
- Time savings target **-50%**

- Yes, 100% recyclable
- Yes, competitive advantage for Parexo

Sustainable Value Chain

Disrupting Old School Methodologies

UPM Biocomposites

- Biocomposite material

Disruptive new mould technology

- Large scale 3D printing

Parexo Inc.

- New moulds more cost-effective

UPM Formi 3D | UPM BIOFORE BEYOND FOSSILS

RISE Research Institutes of Sweden

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Biocomposite material

UPM

Ralf Ponicki

Eve Saarikoski


UPM
UPM Formi
Sustainability meets performance
UPMBIOFORE-BEYOND FOSSILS

UPM in brief

SALES 2020
EUR 8.6 BILLION

Wood based raw-materials

Low carbon energy

BUSINESS AREAS:

- UPM BIOREFINING
- UPM ENERGY
- UPM RAFLATAC
- UPM SPECIALTY PAPERS
- UPM COMMUNICATION PAPERS
- UPM PLYWOOD
- NEW BUSINESSES

51 production plants

18,000 employees in 46 countries

RENEWABLE AND RECYCLABLE PRODUCS FOR:

- PACKAGING
- LABELLING
- TRANSPORTATION
- ELECTRIFICATION
- CONSTRUCTION
- COMMUNICATION
- TISSUE AND HYGIENE PRODUCTS
- MANUFACTURING
- BIOPLASTICS
- BIOMEDICALS

13,400 customers

200 million end-users globally

Future beyond fossils is a key driver for us


UPM
UPM Biocomposites
Leading the way to a more sustainable future
UPMBIOFORE-BEYOND FOSSILS

UPM Biocomposites

- Implements UPM Biofore strategy:
  Creating innovation driven, high-performing bio based alternatives to non-renewable materials
- One of the leading natural fibre composite manufacturers in Europe
- Corporate start-up – part of UPM Kymmene Oyj
- Great patent portfolio on material and production technology

UPM Biocomposites

REPLACING FOSSILS WITH RENEWABLES

Forest

Wood-based fibers

+

Polymer

=

UPM Formi
Replacing fossils

UPM Formi
Product lines

UPM Formi Pro
- enhancing sound performance, reducing noise

UPM Formi EcoAce
- sustainable design based on almost 100% renewable resources

UPM Formi 3D
- outperforming traditional designing with wood like materials

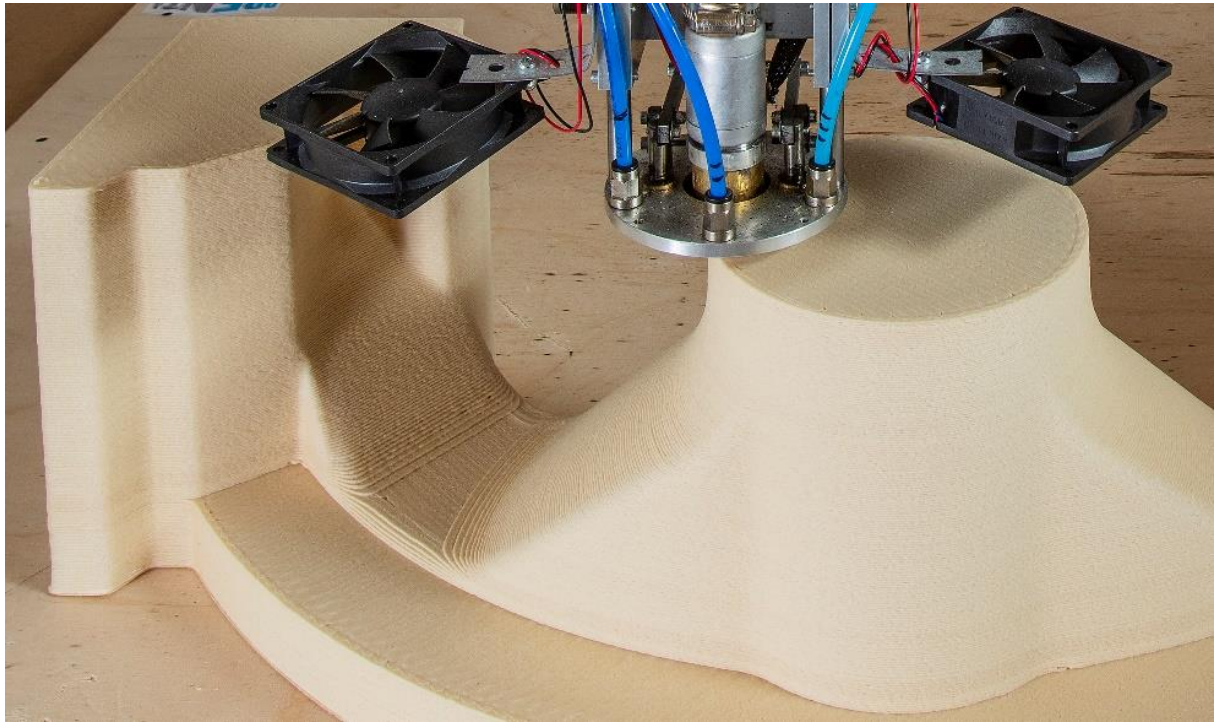

UPM
UPM Formi 3D
UPMBIOFORE-BEYOND FOSSILS

UPM Formi 3D

- UPM Formi 3D uses wood-based cellulose fibres for extra functionality
    - Easy to use “drop in” material
    - High-definition production
    - Wood like post processing properties
        - Easy to mill / sand

High performance 3D printing

Properties	
During printing	Self-supporting molten state properties enables high overhangs and printing in angle
	Shear thinning melt flow enables clean transitions
	Fast cooling enables faster layer time
	Low shrinkage, high dimensional stability enables printing in angle and even to cold plywood surface



Wood like post treatment properties

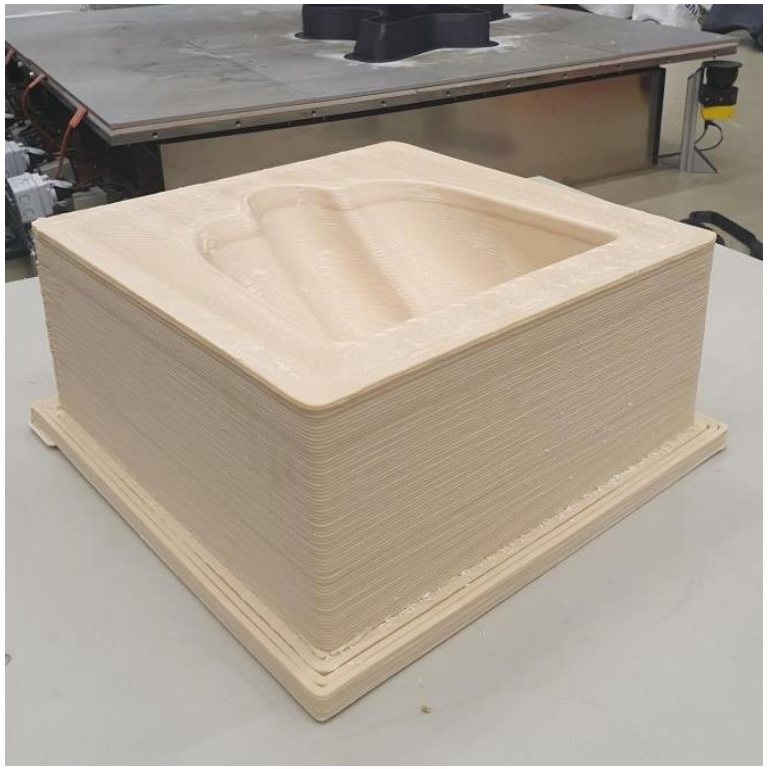
Prints made from UPM Formi 3D can be milled and saded without losing shape, in addition it has exellent surface post treatment properties unlike PP based materials e.g. PP+50GF.

Several post processing possibilities validated	
Post processing	Milling sawing and sanding
	Gluing - e.g. Wood glue, Sikaflex
	Painting and Varnishing - Acrylic, Spray, Epoxy
	Waxing - e.g. Osmocolor
	Fire + UV resistance improvement -e.g. Finnester Hybrid Red

3D printed biocomposite moulds for vacuum infusion

UPM Formi 3D and LSAM technology provide a cost and resource efficient way of reducing environmental impact of the mould production

- Waste-free production with freedom of design
- Significant time and cost savings
- Use of UPM Formi 3D reduces CO2 emissions compared to fossil-based plastics
  - e.g.~75% reduction against PP50%GF
- Material reusability in 3D printing applications for a sustainable future



No compromises on mould performance!

UPM BIOFORE
BEYOND FOSSILS

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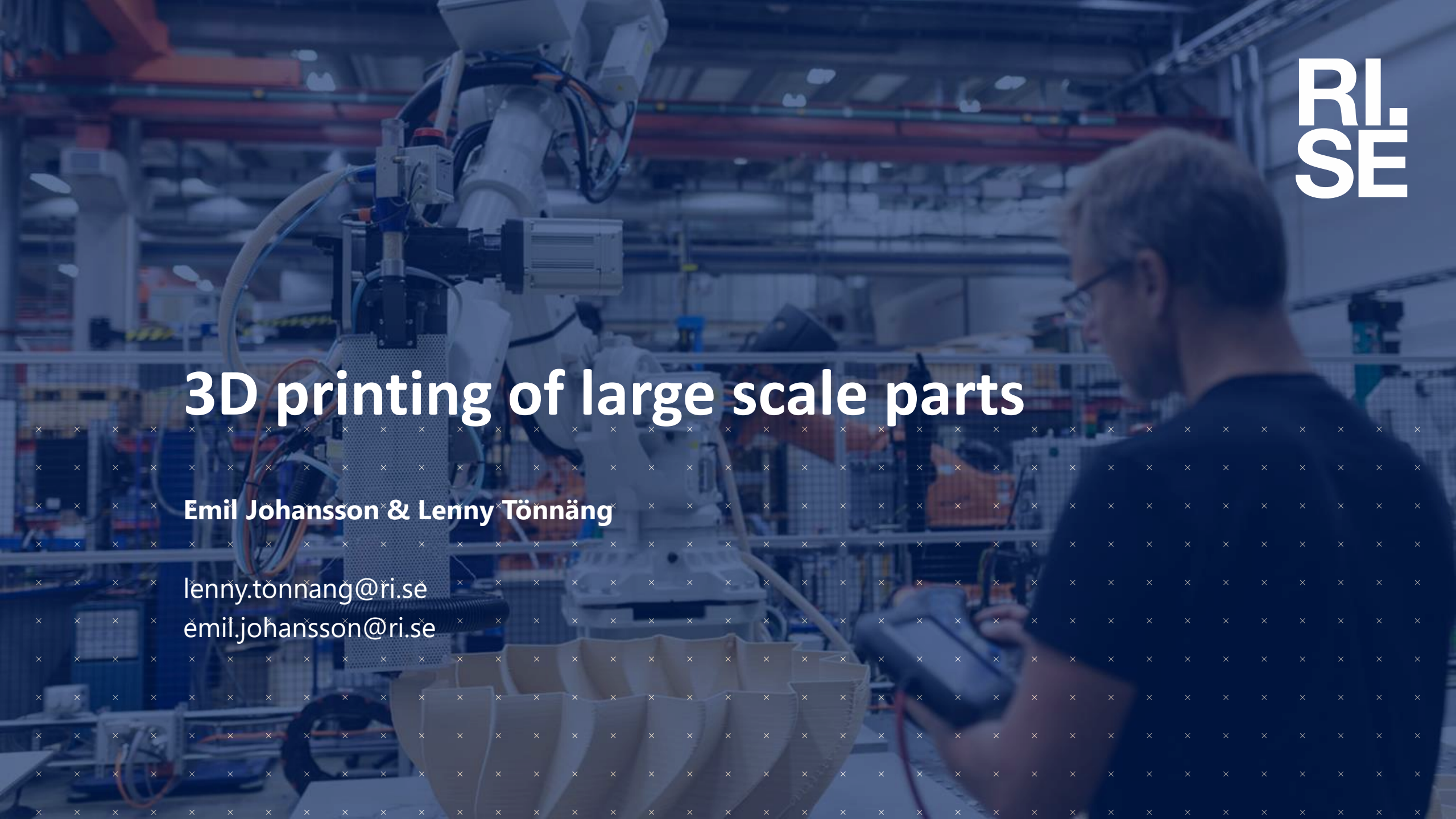
Large scale 3D printing New mould

RISE

Emil Johansson

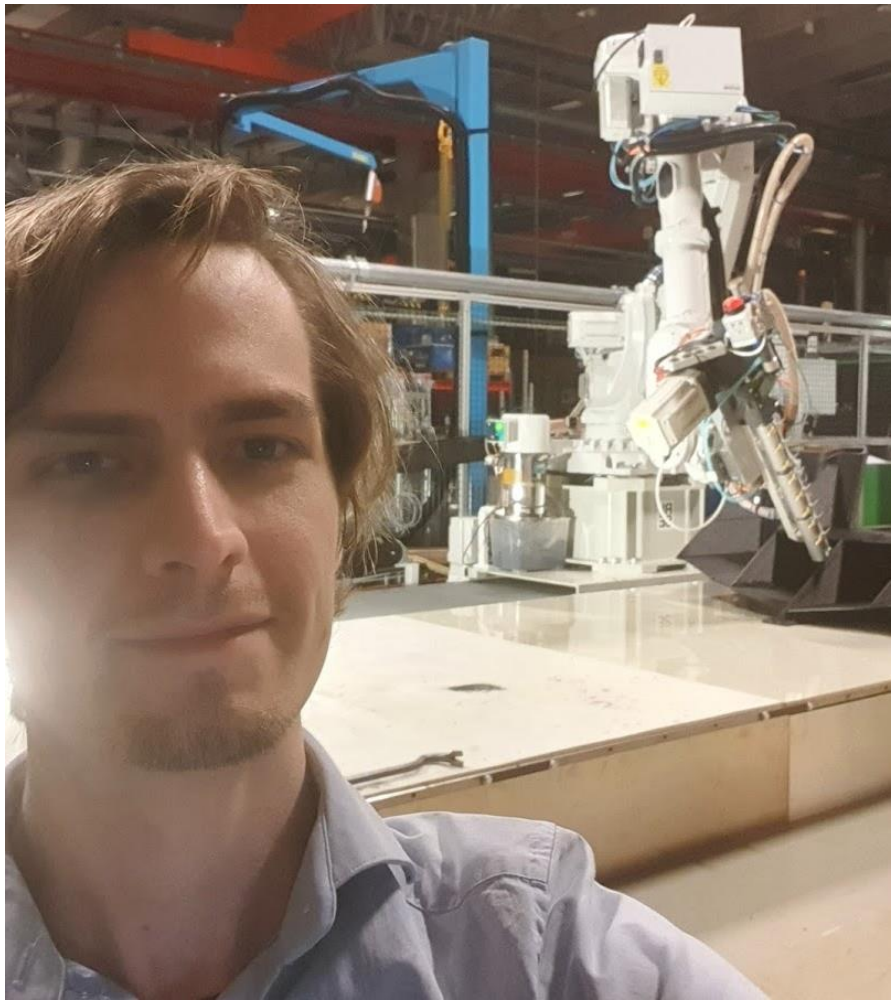
Lenny Tönnäng



3D printing of large scale parts

Emil Johansson & Lenny Tönnäng

lenny.tonnang@ri.se
emil.johansson@ri.se



Emil Johansson

Lenny Tönnäng

3D printing today

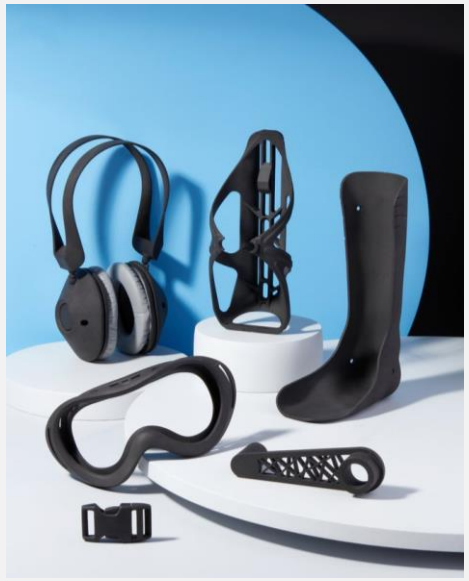


PHOTO CREDIT/FORMLABS

PHOTO CREDIT/SIEMENS ENERGY

3D printing tomorrow

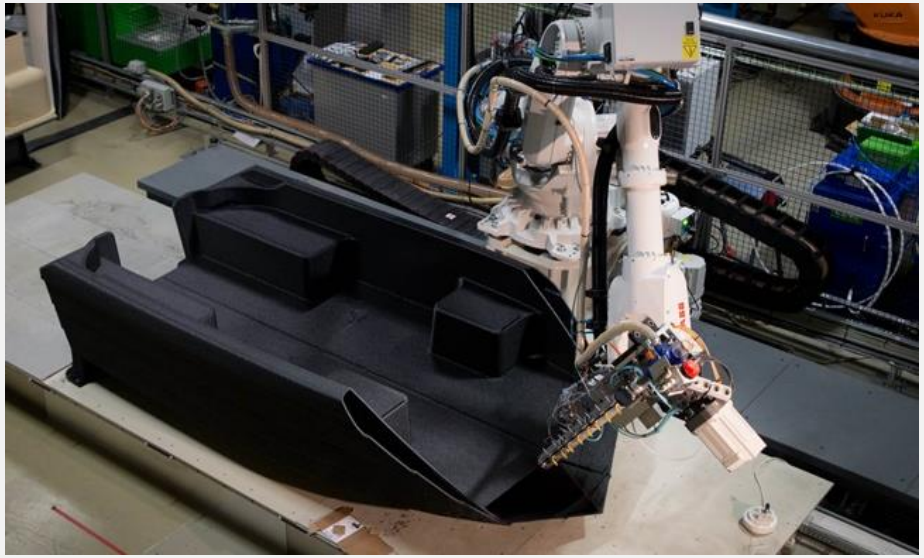
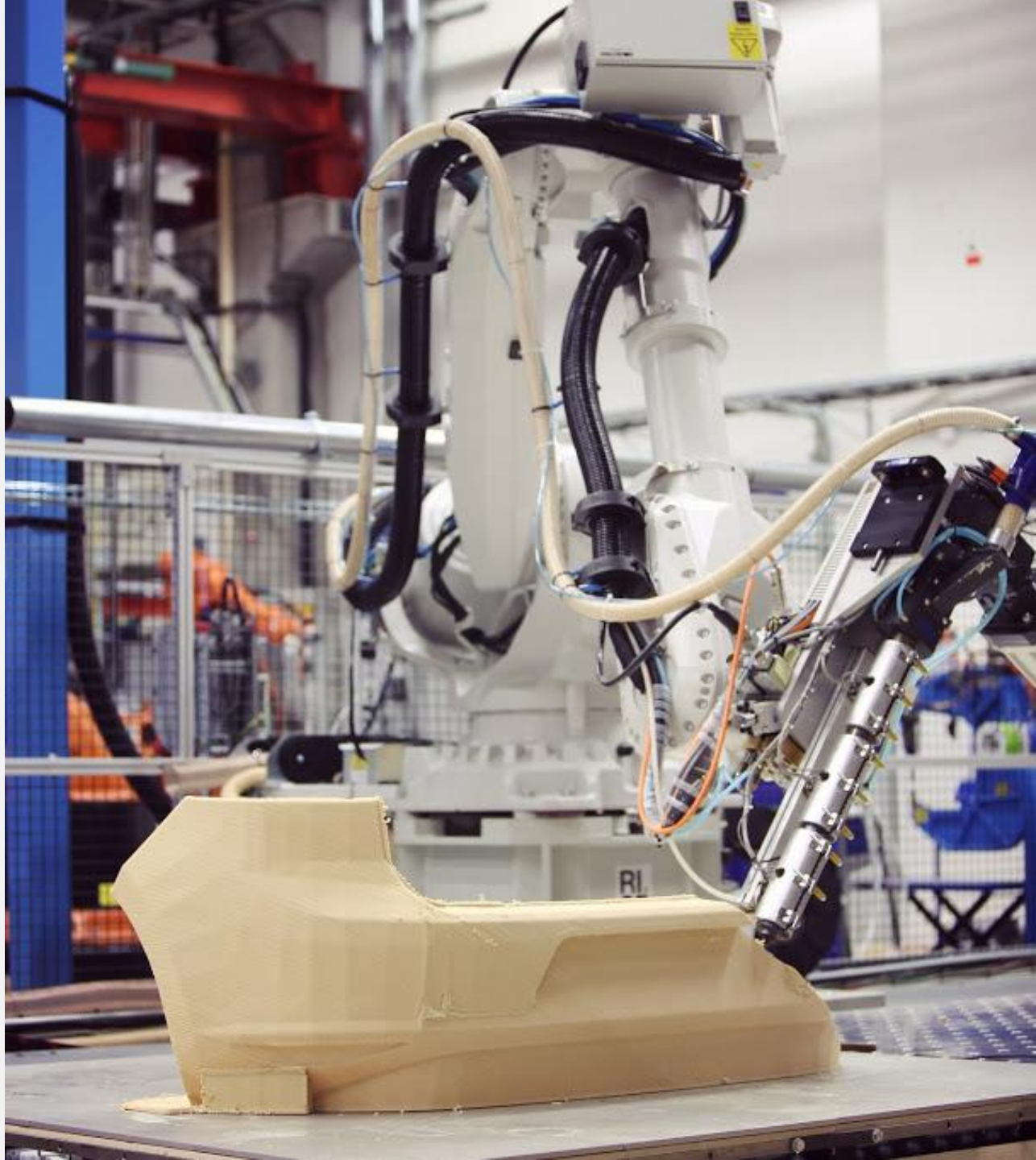


PHOTO CREDIT/EMIL JOHANSSON

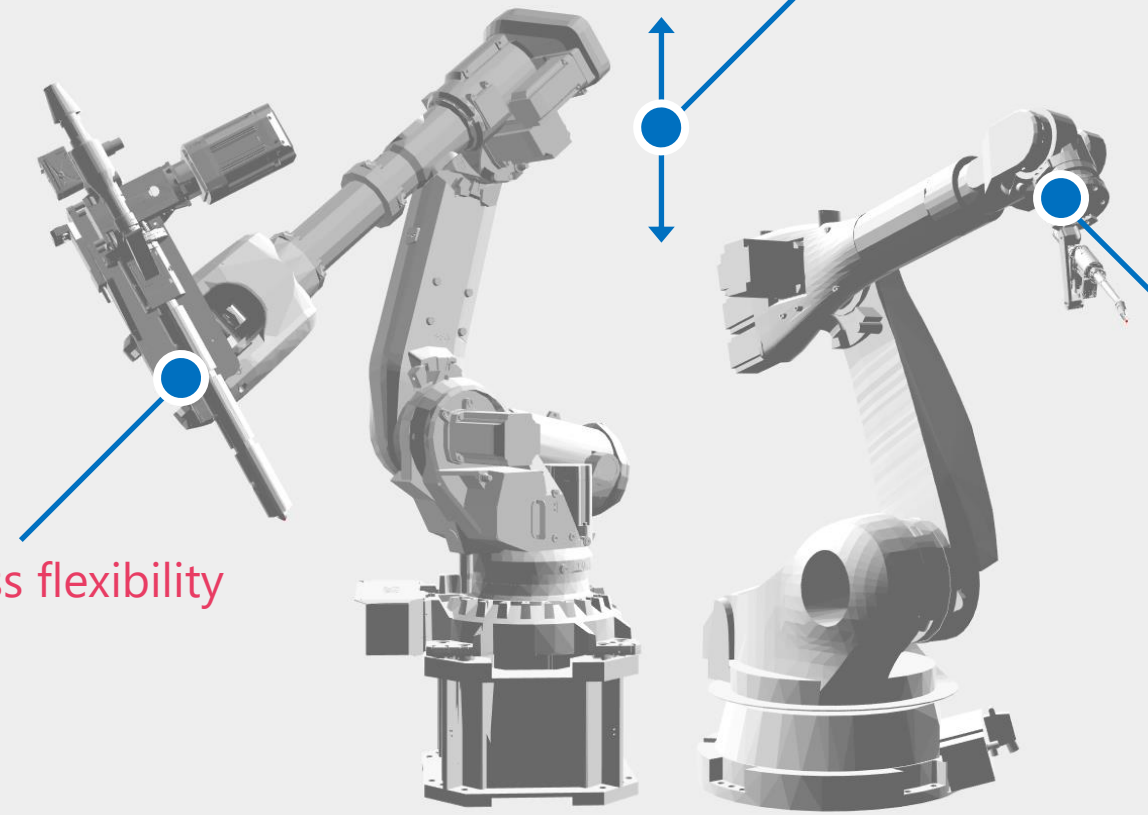
Meet the next manufacturing revolution:

the 3D printing industrial robot



Why robotic 3D printing?

02. Easy to scale and integrate

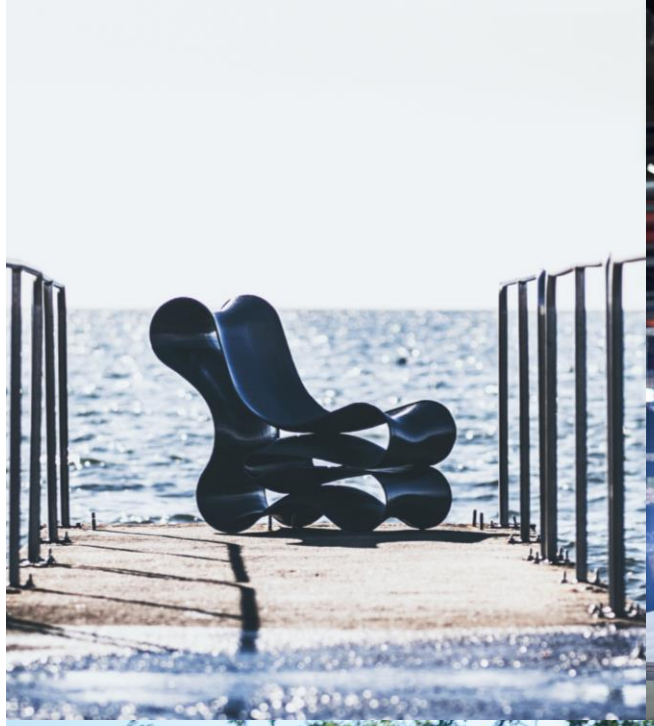


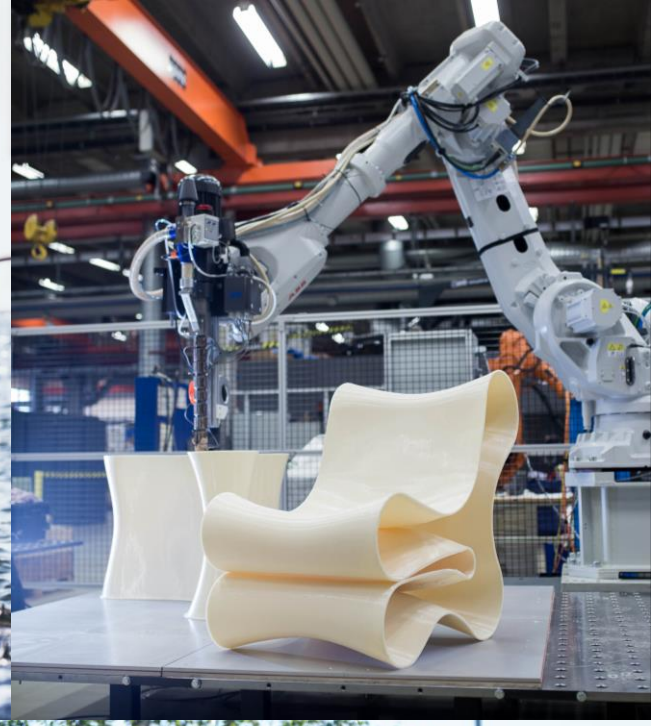
03. Availability & cost

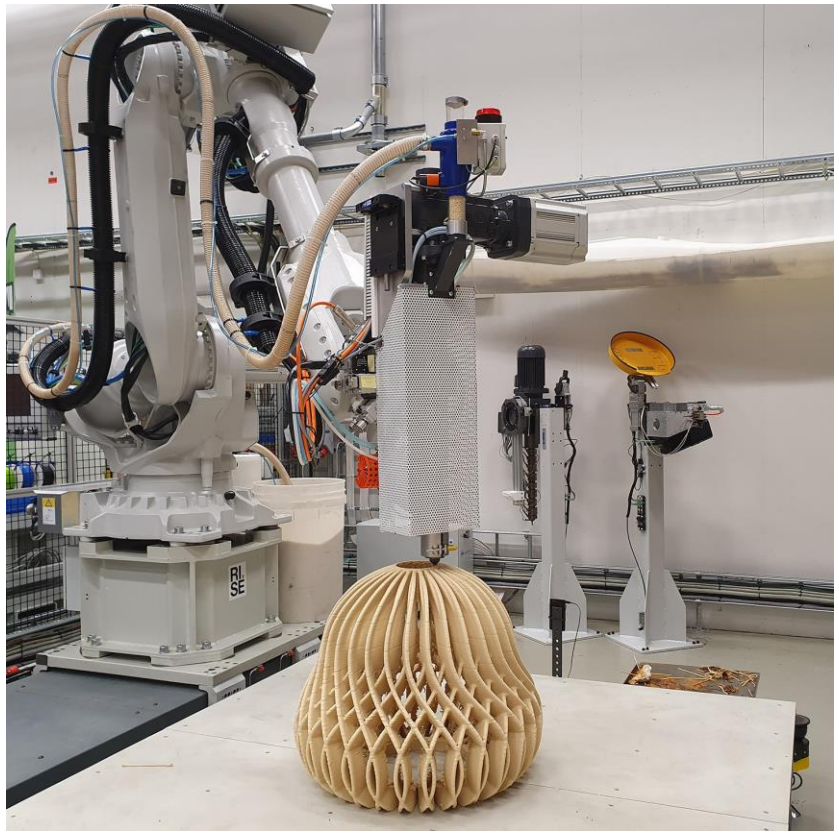
01. Material & process flexibility

3D printing and robotics at RISE

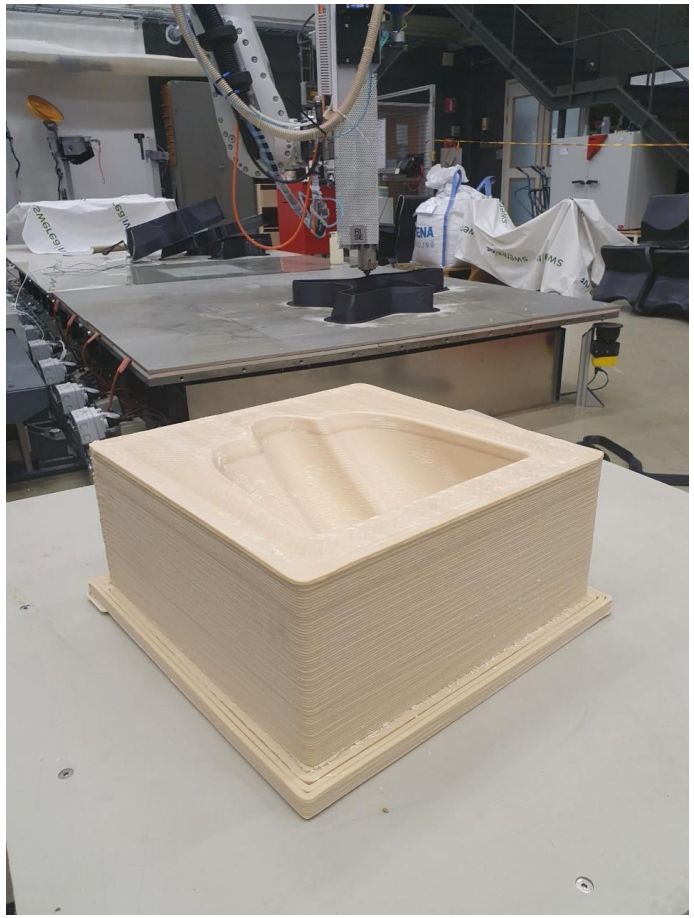
- Pioneers in large scale printing and world leaders in robotic AM.
- Physical test and demo environment since 2015.







"Lattice Lamp" is made of 3d-printed wood composite. Created by Charlotte von der Lancken and printed at RISE.



3D printed mould tool for composite manufacturing.

Manufactured at near-net-shape in UPM Formi and machined to final dimensions.

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Future boatbuilding technologies New Gauge

Parexo

Kim-Niklas Antin

Video

https://youtu.be/_It155OJdWU

Things we can start doing today 1/2

Cradle-to-gate life-cycle analysis

- Part of life-cycle the **manufacturer** can control
- Materials, processes, supply chain
- Example: Recyclable mould made from biocomposites using additive manufacturing

Things we can start doing today 2/2

Cradle-to-grave life-cycle analysis

- The **user** is in control for the most part
- Example 1: The carbon hull has **higher** CO2 footprint in manufacturing (cradle-to-gate) than glass fiber counterpart. However, reduced fuel consumption **offsets** this within 3 years.
- Example 2: The carbon hull is **more expensive** than its GFRP counterpart.
- However, reduced operating cost leads to a **break-even** after 3 years of moderate use.

Things we are doing in the future

- Traditional approach: Design for manufacturing and assembly

→ Cheap production

- Cradle-to-cradle solution: design for **disassembly** → The hull can be used again to remanufacture a “new” boat
  - The boat can return to the manufacturer (circular economy)
  - Cheaper in the long run for **everyone** and more sustainable for the environment
  - It doesn’t help if the product lasts forever, if the user no longer wants it → **Adaptation** e.g. to electric powertrain or use-case

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Q & A
Next Steps

For further information please contact:

- Mikael Valtonen, tel +358 40 711 9761 / mikael.valtonen@parexo.fi
- Emil Johansson, tel +46 70 780 61 54 / emil.johansson@ri.se
- Eve Saarikoski, tel. +358 40 835 2395 / eve.saarikoski@upm.com

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