

Wärtsilä Oyj, Juho Raukola

Innovation Manager (Additive Manufacturing)

Wärtsilän Vaasan tehtaalla oli herännyt kiinnostus 3D-tulostusta kohtaan, mutta kenenkään työnkuvaan tämä ei varsinaisesti kuulunut eikä avoimia paikkoja tähän ollut. Satuun rekrymessuilla Wärtsilän pisteelle yliopistokurssin tulostushypestä voimaantuneena kyselemaan diplomityöpaikkoja, ja CV:n lähettämisen jälkeen 2 viikon päästä matkustin ensimmäistä kertaani Vaasaan kirjoittamaan työsopimusta. Valmistumisen jälkeen minusta tuli firman ensimmäinen "Additive manufacturing engineer" ja tätä nykyä vedän 12 henkilön moniosaava ja -kulttuurista tulostustiimiä.

Ydinosaaminen:

3D-tulostus, innovaatiokehitys ideasta 3D-tulostetuksi tuotteeksi sekä sokealla itseluottamuksella positiivisen muutoksen aikaansaanti

Elämäntehtäväni niin töissä kuin vapaa-ajallakin on olla generalisti-spesialisti; ymmärtää kaikesta jotain mutta ei jostain kaikkea, ja yhdistää eri alojen ihmisiä toimimalla tulkkina maailmojen välissä.

Tekemällä oppii asioita, joita et tiennyt tarvitsevasi.

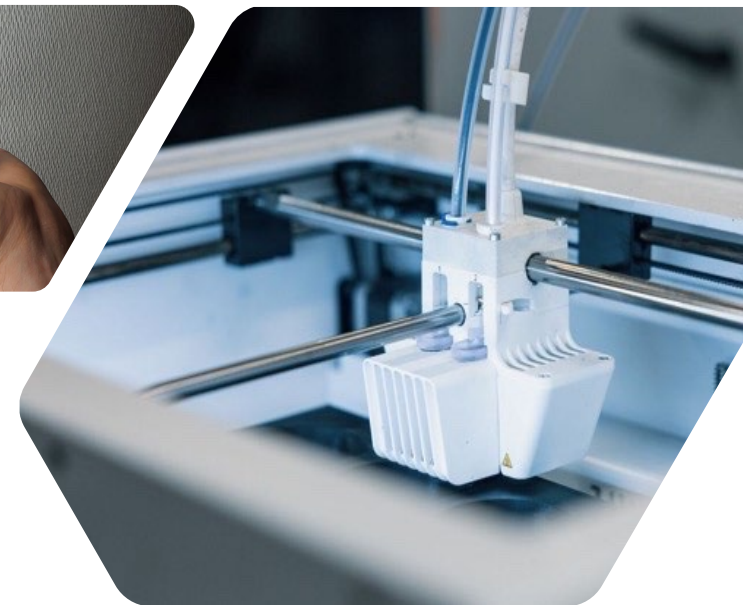


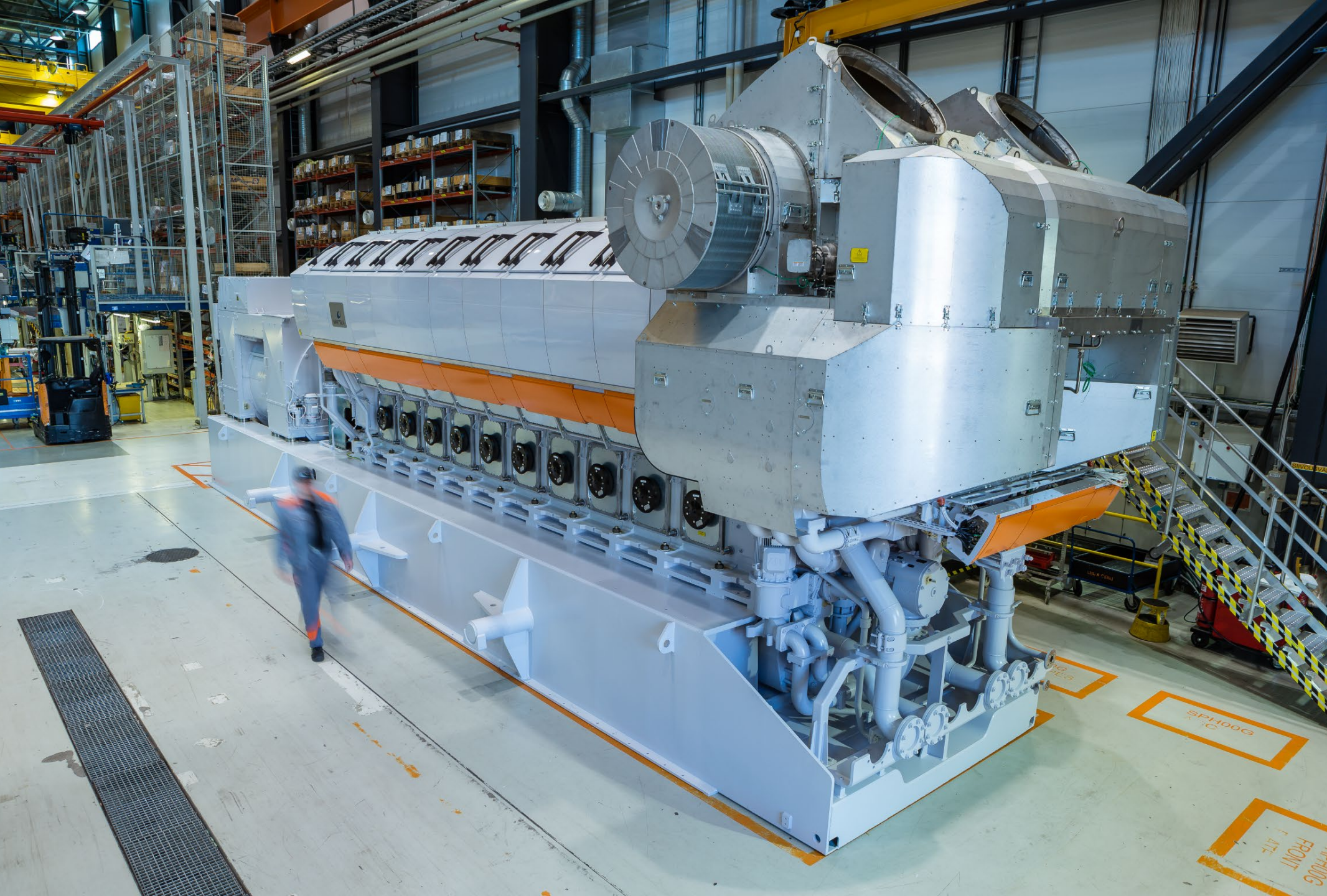
3D-tulostus ja komposiitit raskaassa konepajateollisuudessa - miksi ja miten?

Juho Raukola

Innovation manager (Additive manufacturing)

12.10.2023





slido



Mikä on alanne tavoite?

ⓘ Start presenting to display the poll results on this slide.

slido



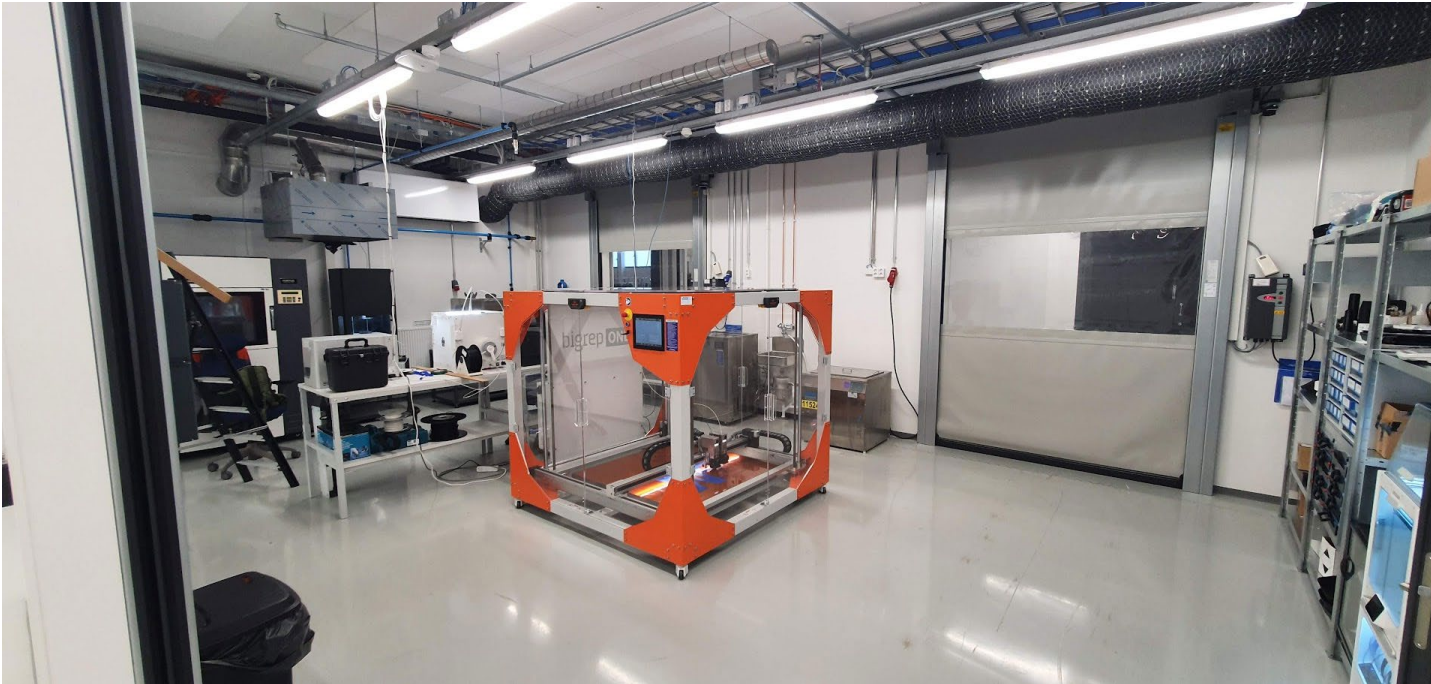
Mikä teitä rajoittaa tavoitteen saavuttamisessa?

ⓘ Start presenting to display the poll results on this slide.

Komposiitit & minä



In-house 3D printing in Wärtsilä



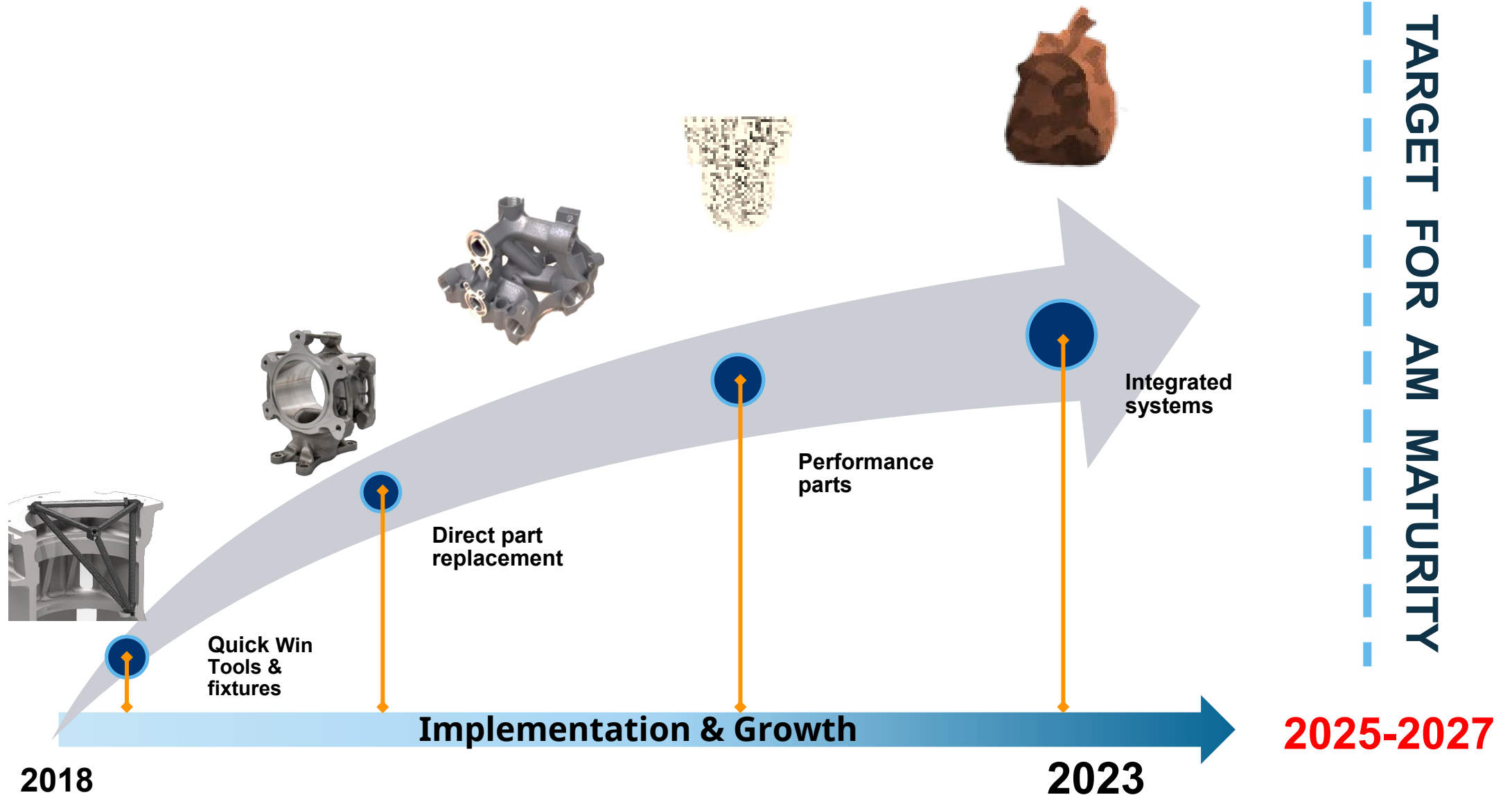
SandBox Vaasa



SandBox Trieste

Additive Manufacturing journey in Wärtsilä

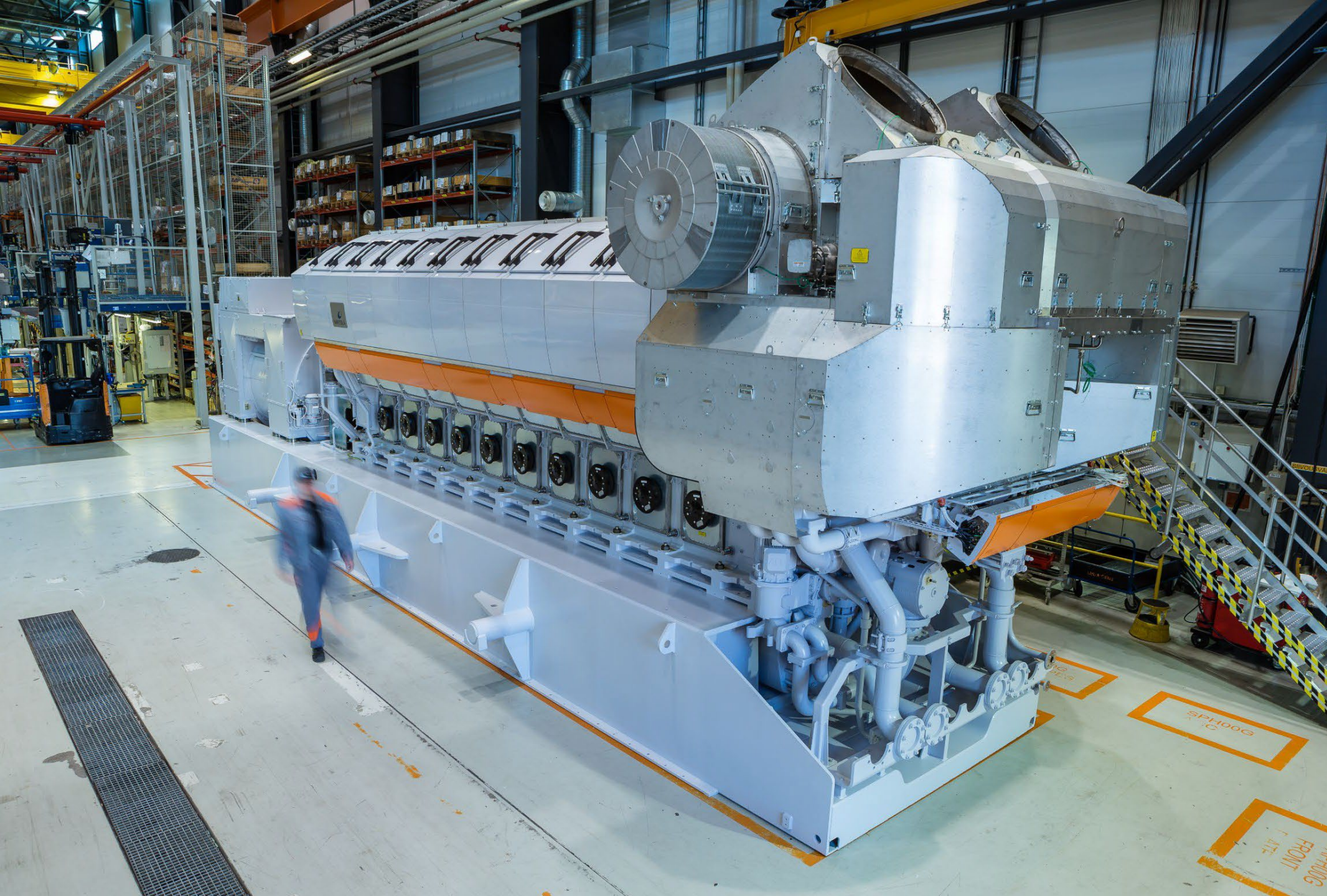
Main interest areas and capabilities



HINTA



ARVO



HINTA



ARVO

Brains \times Iron = Constant

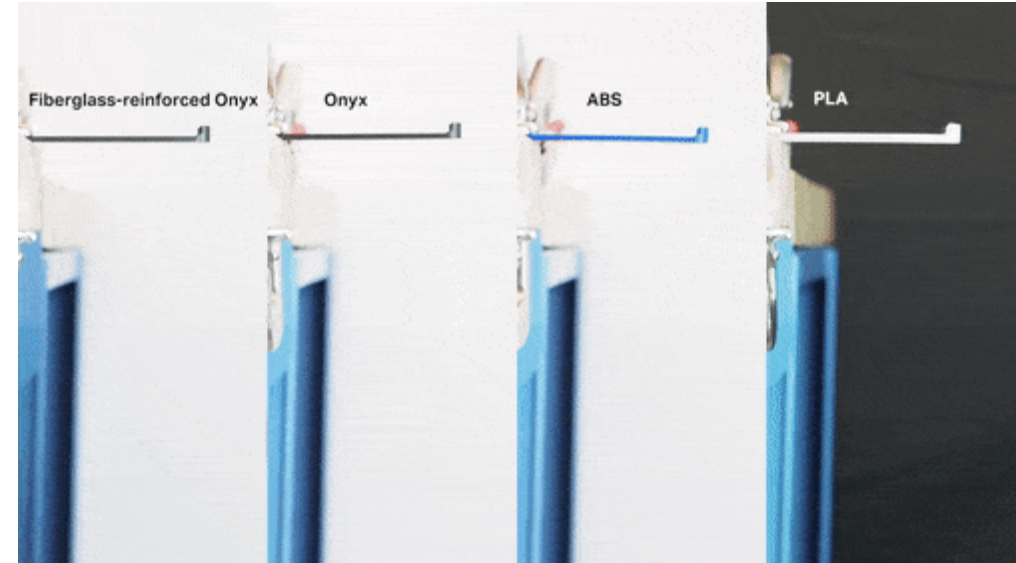
Composites Materials

Carbon Fibre

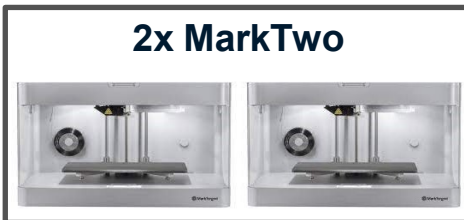
Fibreglass

HSHT Fibreglass

Kevlar



2x MarkTwo



1x Markforged X7



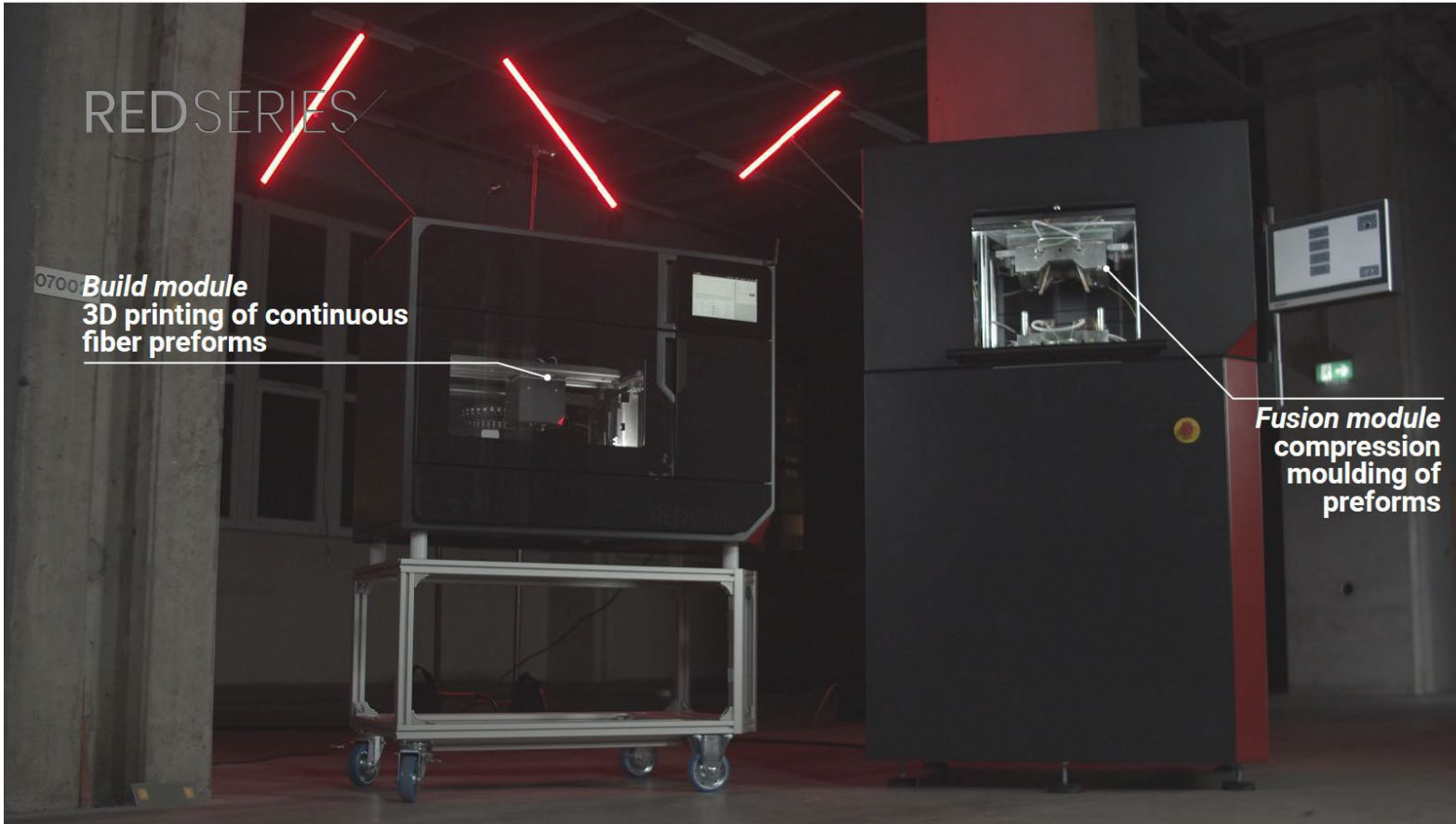
W26 Driving Unit Lifting Tool

- **As it was: Lifted weight 230 kg**
 - Must withstand 920 kg (4xWLL)
 - 9 kg of mass
 - Not easy to handle

- **Direct & Indirect Benefits:**
 - ✓ 80% Lighter
 - ✓ Removable parts & easy shipment
 - ✓ Reduced production and shipment lead time
 - ✓ Faster & safer lifting



New technologies for serial



5 years production hypothesis, cost of production **all included** (Machine, material, mold, overhead, labour)

	Part 1	Part 2	Part 3-4 set of six	Complete set 2022
1 pc per year	692.79€	675.27€	1464,24€	2,832,3€
50 pc per year	98.32€	80.80€	472,8€	651,42€
200 pc per year	89.22€	71.70€	463,8€	624,72€

2024 because of increased efficiency cost drop by 19%





30 kg



2 kg

LIGHTER (95%)
CHEAPER (90%)



LINER CLAMPS

- **Weight critical due to flight freight mass limit**
 - Less mass, more equipment on the same pallet
- **65% of weight saving achieved by 3D printing (continuous carbon fiber)**



COST SAVINGS

LEAD TIME SAVING

MASS SAVING



ITEM	QTY	PART NUMBER	DESCRIPTION	SUPPLIER
8	1	ISO 4762 - M12 x 40	Hexagon Socket Head Cap Screw	
7	1	ISO 4762 - M12 x 70	Hexagon Socket Head Cap Screw	
6	1	1001876	Bottom clamp	
5	1	1001875	Outside clamp cover	
4	1	DIN6311 25 M12	Push plate	Wiberger
3	1	DIN6306 M12x60	Lock screw	Wiberger
2	1	1001872	Inside anvil	
1	1	1001871	Clamp body	

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1	1	1001871	Clamp body	

Material		Surface treatment		Parts must be marked with the drawing number.	
This drawing is QuantiServ property and may not be copied or reproduced without written admission.		For unperforated tolerances applies to SWS 713-94		The part shall be free from burrs, sharp edges and any other defects.	
Drawn by: PSTX04		Date: 21.8.2019		Serial surface finish: Ra3,2	
Dwg. No. 1001874		Scale: 1 : 2		Sheet: 1 / 1	
Liner Clamp		Issue			

AM MAIN JOURNAL GAGE TOOL

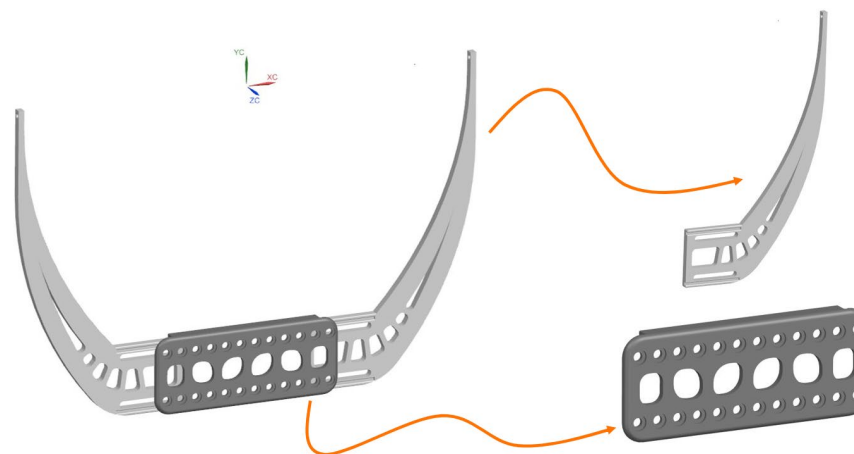
- Used for measuring main journal diameters at customer sites
- Light-weight
- Easy to configure for different diameters



💰 COST SAVINGS

🔄 RAPID DEVELOPMENT

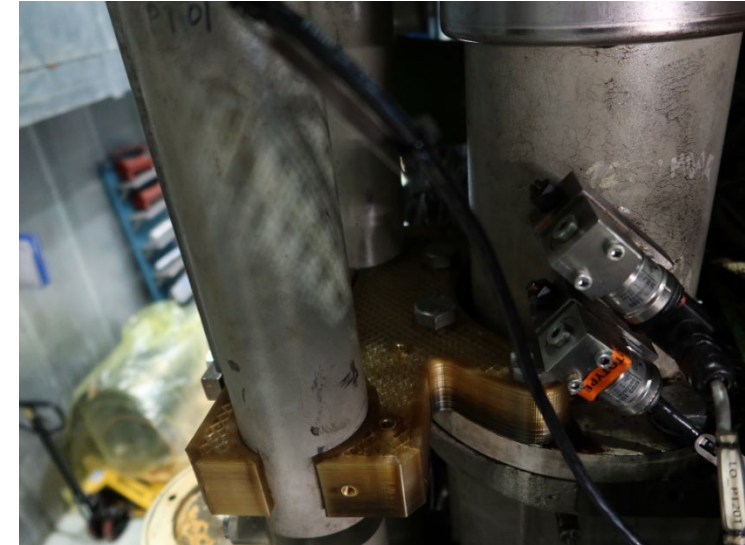
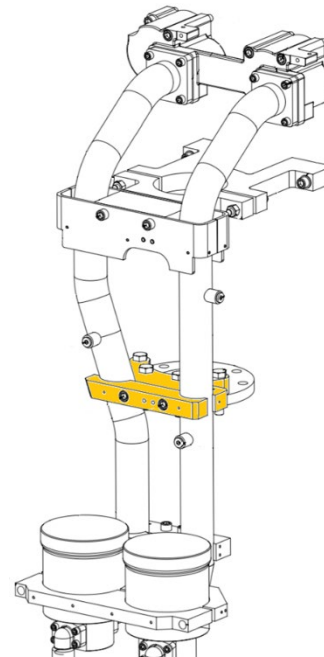
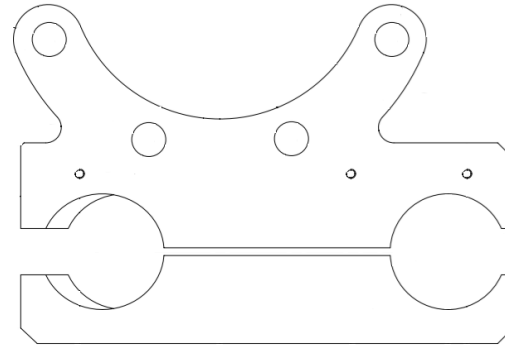
🔗 MASS SAVING

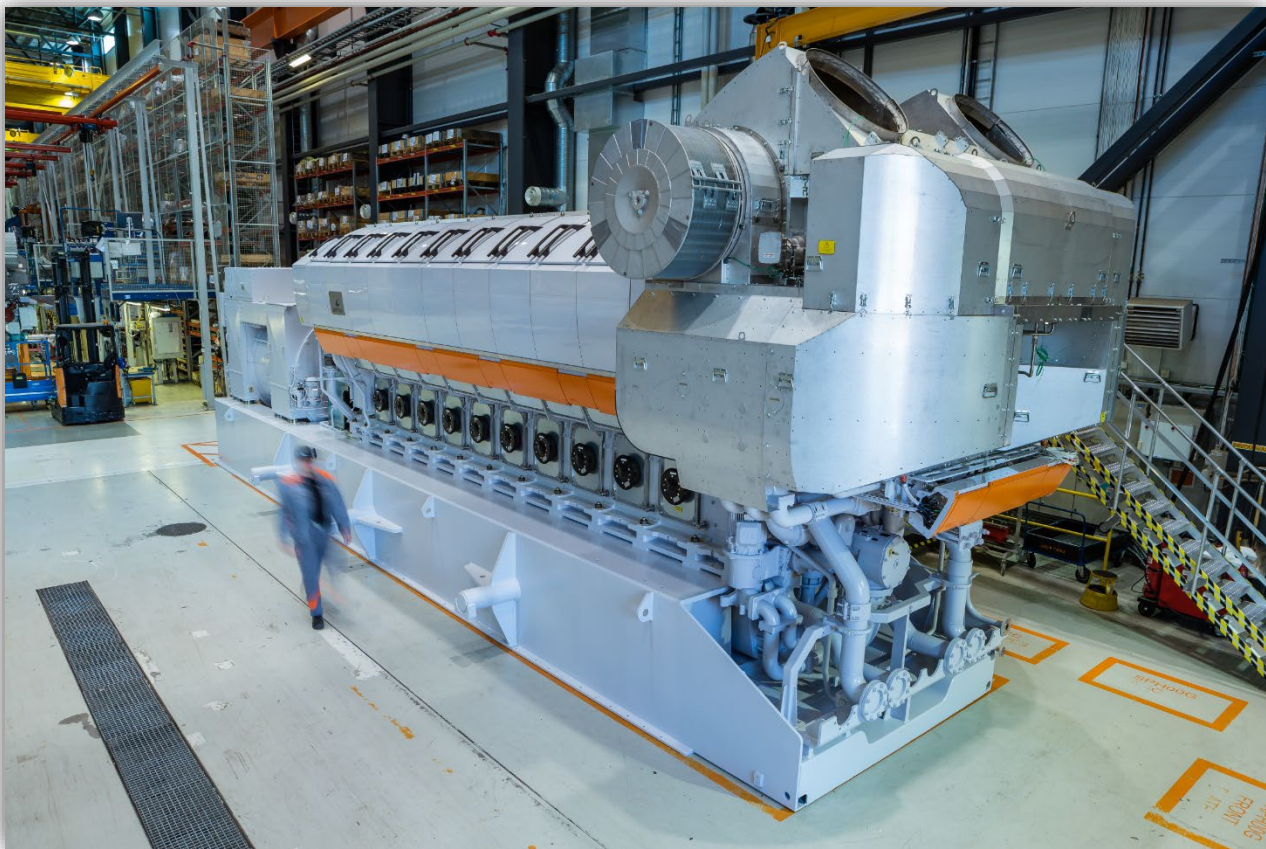


Gas pipe bracket

From CNC steel to 3D printed polymer

- Cost saving potential by 3D printing: 25-40%
- Original Mass: 12 kg
- 3D printed mass: 1.2 Kg



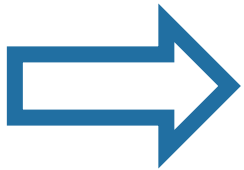
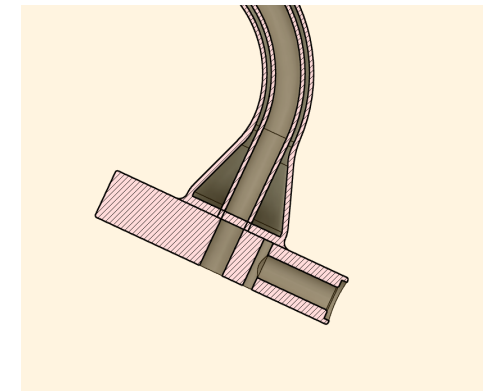


- Double-wall structure
- Pressure 8-30 bar
- Max. temp 100 °C
- Must connect A to B → dimensions can be changed
- Batch sizes 1pc, 10 pcs, 100 pcs

Problems to be solved:

Dimensional accuracy & weight (assembly)
Cost per part
Challenging fabrication of steel

700 mm



Reques for quotation sent to 5 Finnish companies

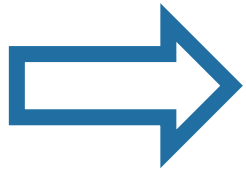
Company 1: did not reply

Company 2: Too small, no technology

Company 3: asked one question, after reply did not respond (too small diameter)

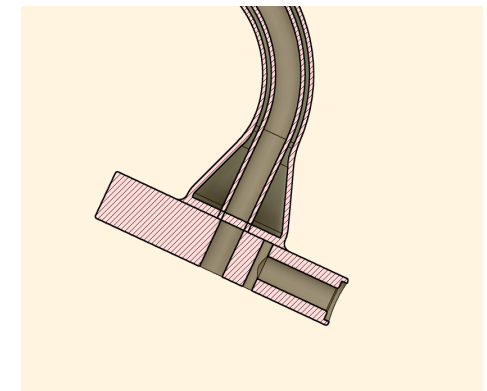
Company 4: Initial interest, challenges opening .step model, after phone call declined

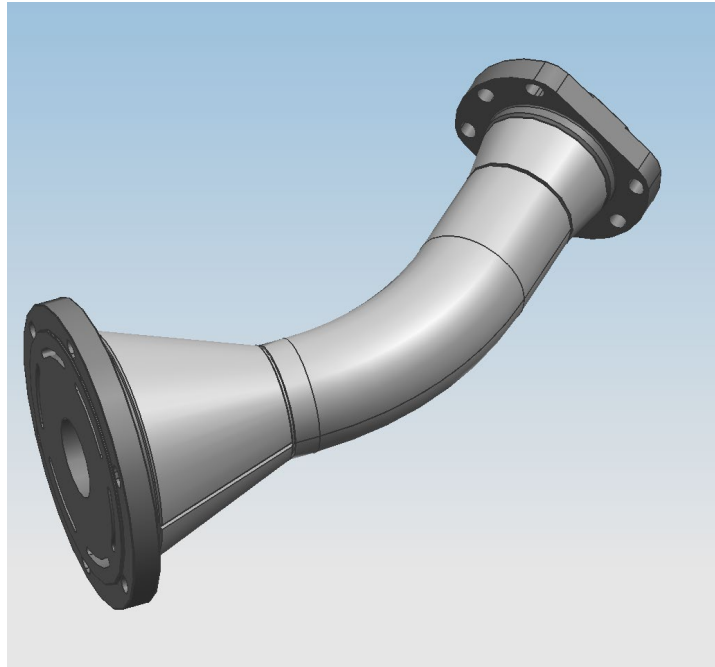
Company 5: "We could investigate, but probably all the problems will still remain."



Reques for quotation sent to 5 Finnish companies

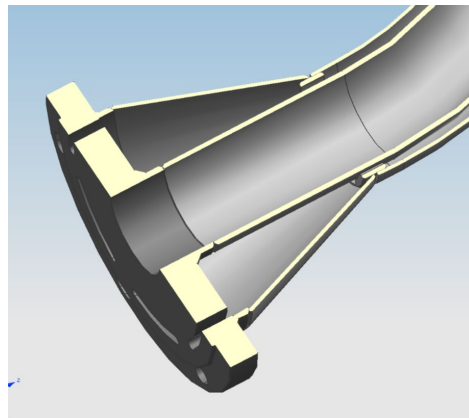
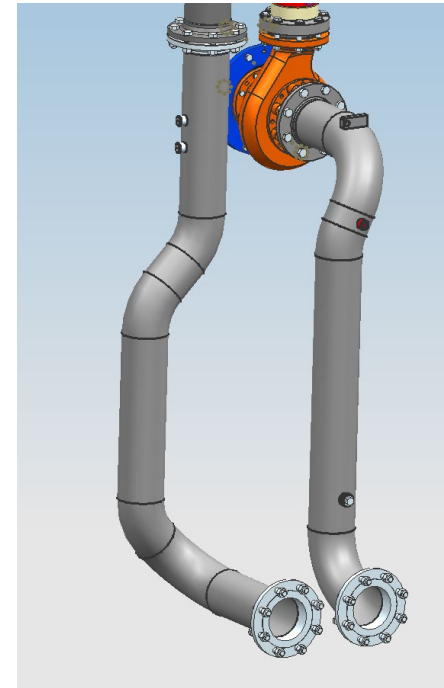
700 mm



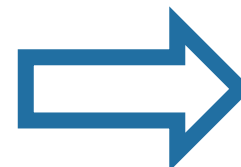


Potential for composite?

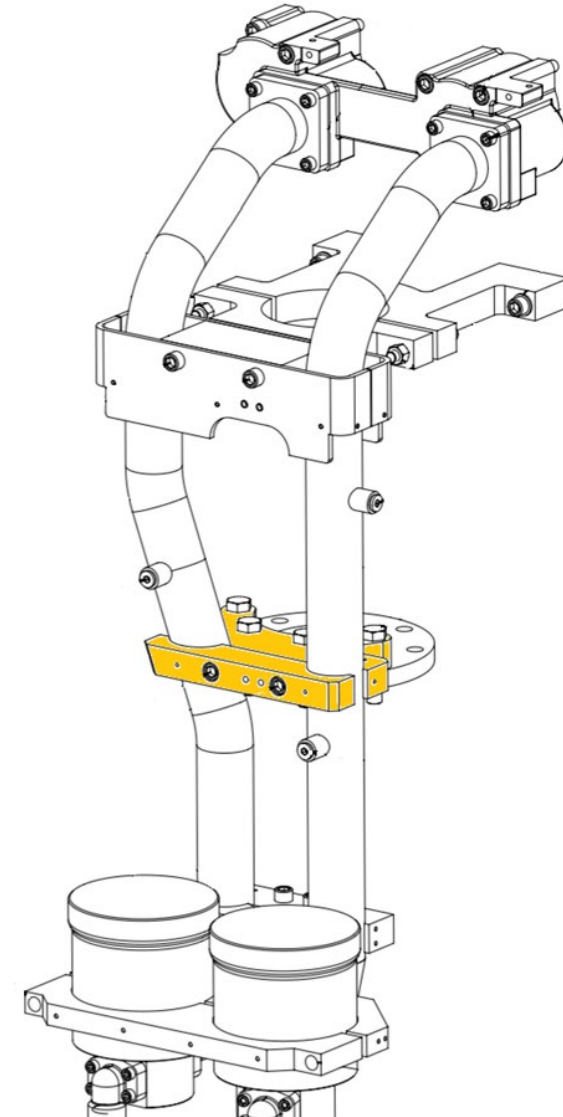
- Weight reduction
- Part consolidation
- Ease of assembly, shorter time to mount
- Corrosion resistance
- Damping properties, longer lifetime
- New fuels compatibility



Hundreds of different pipe types, business worth of millions of euros annually



Help us





THANK YOU