



# The Challenges in identifying suitable parts for Additive Manufacturing

Omer Blaier | 13.03.23

CASTOR





## Elad Schiller

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BSC & MBA (TAU)



**Founded:** Nov 17'

**Employees:** 26

**Funding From:**

- Asahi Kasei
- Xerox
- Evonik
- Etc.

**Advisory board:**

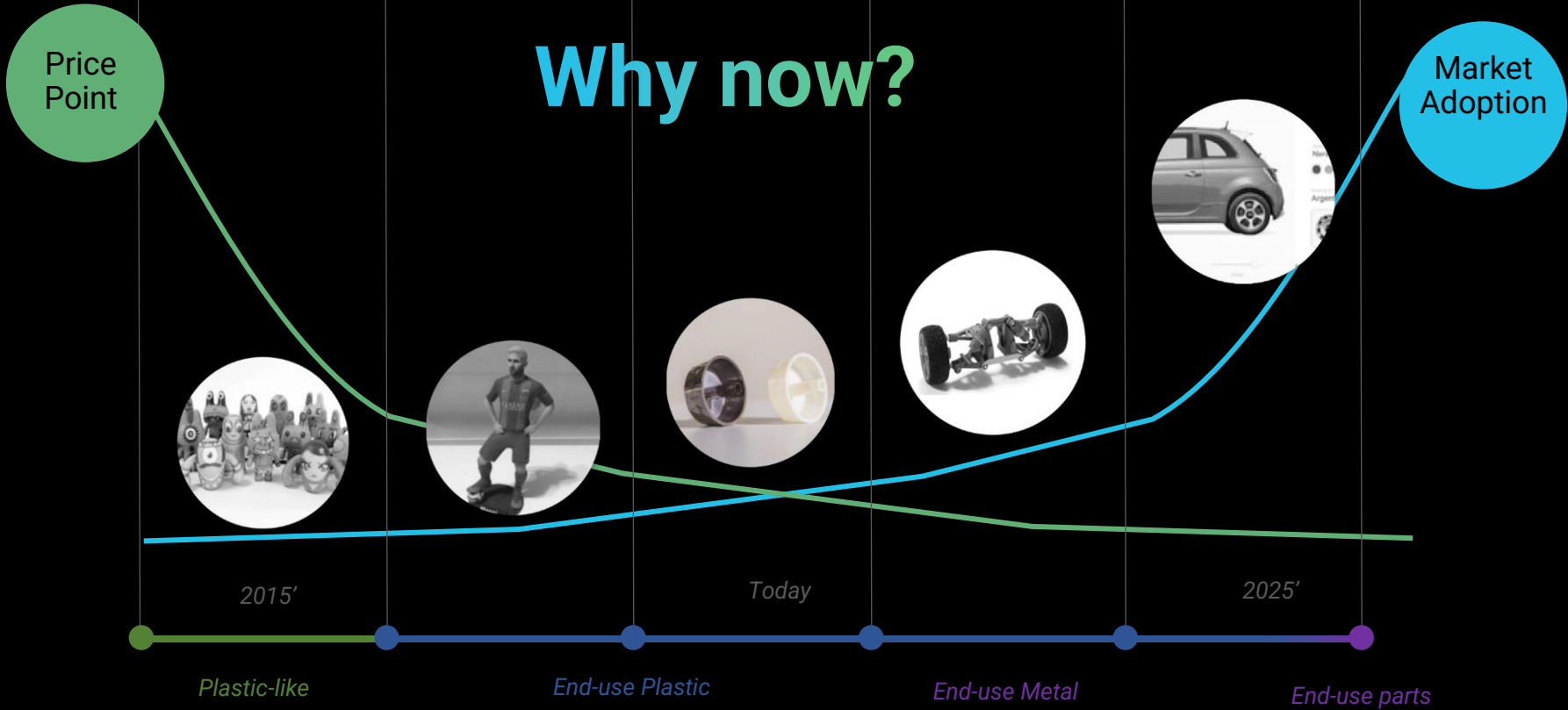
- Avinoam Nowogrodski  
(Smart-team)



- Boris Belocon  
(Stratasys)



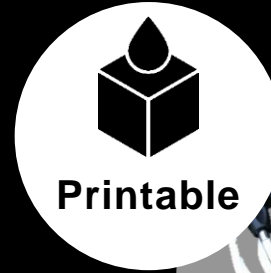
# Why now?



**The HW is almost there...the application is missing**

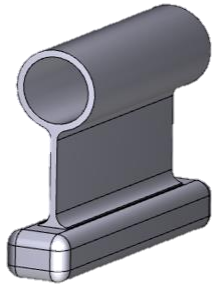
# Why it's challenging?

**Technical and  
Economical  
Analysis is  
Needed**



# Technical and economical aspects

## Geometry



## Materials



## Costs



vs.



# Wall Thickness

Filaments

- **Nozzle**

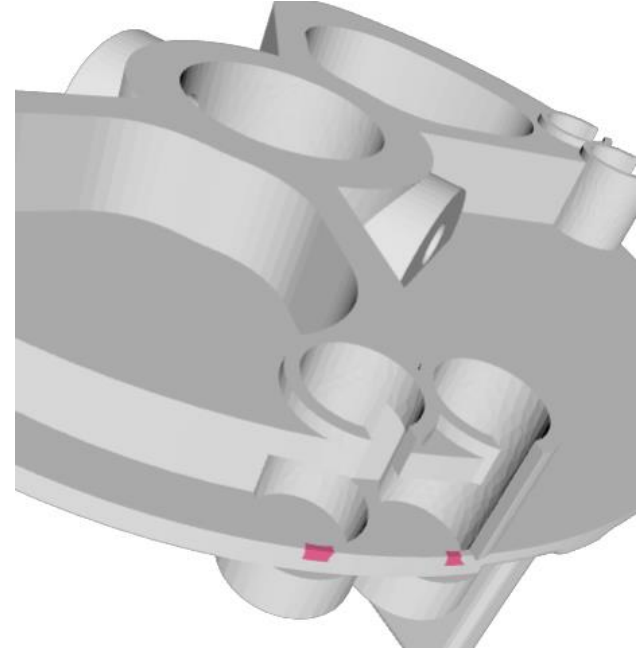
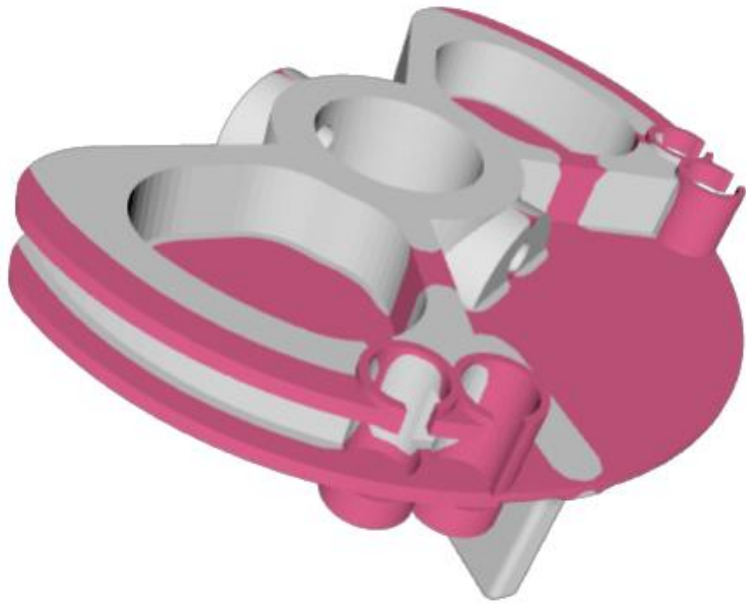
Powder

- **Laser**
- **Wiper**

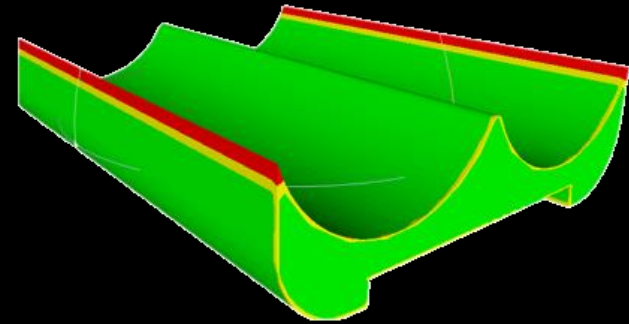
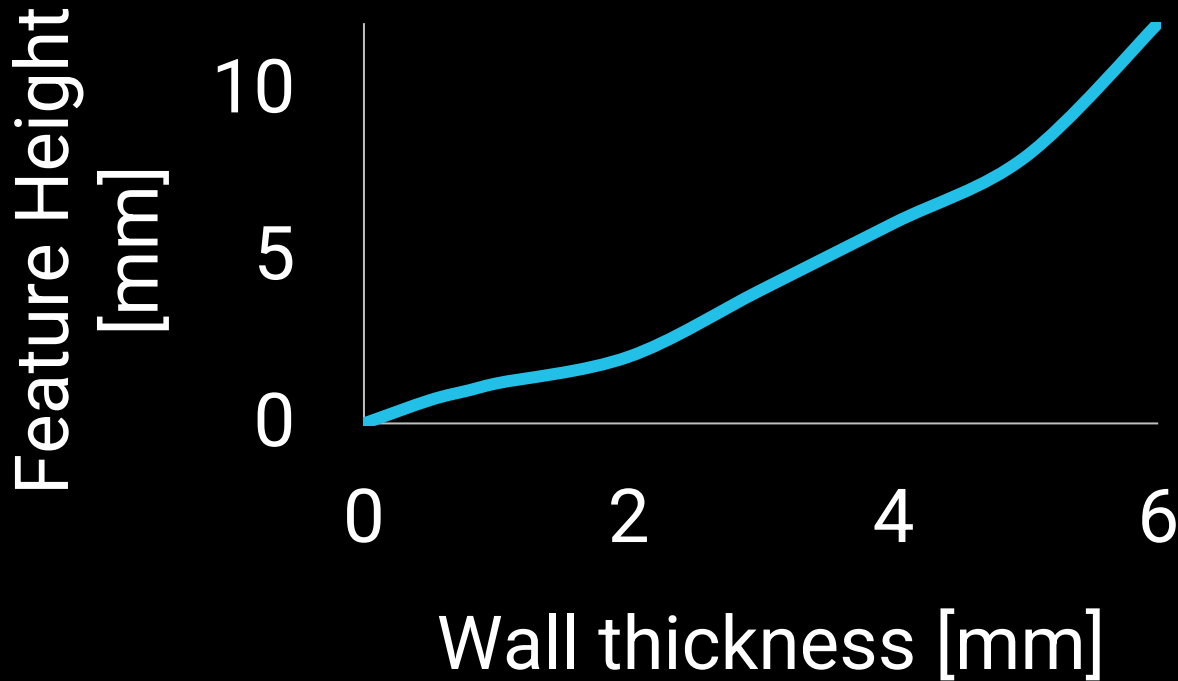
Jetting

- **Drop size**
- **Polymerization**
- **Wiper**

# How do you check minimum wall thickness?



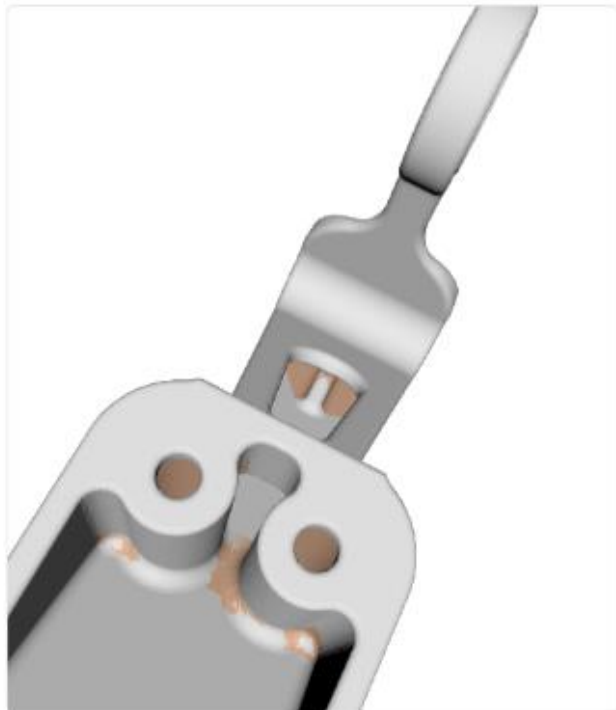
# It's the "Aspect-ratio" that counts





# Can it be machined after printing?

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- Tolerance No manufacturing tolerances were...  
[Read more](#)
- CAD file intact
- Material properties supported
- Milling metal supports Supports can be removed using CNC milling machine
- Milling surfaces Some of the part's surfaces are not accessib...  
[Read more](#)

[Show Errors And Warnings Only](#)



# Mechanical properties

Filaments

**High Z adhesion**

Powder

**Low Z adhesion**

Jetting

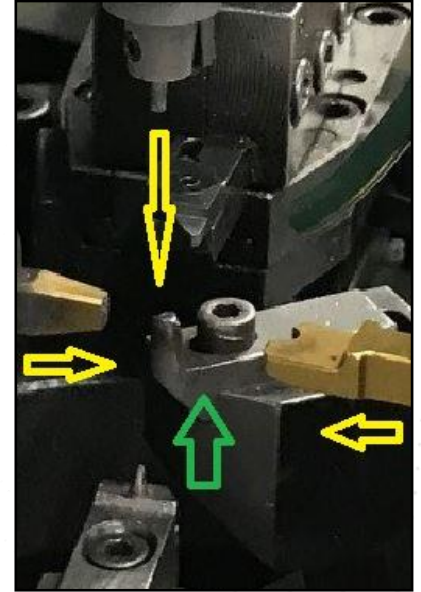
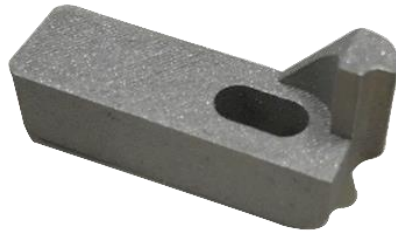
- **Binder- Low**
- **Polymer - high**

**STANLEY**

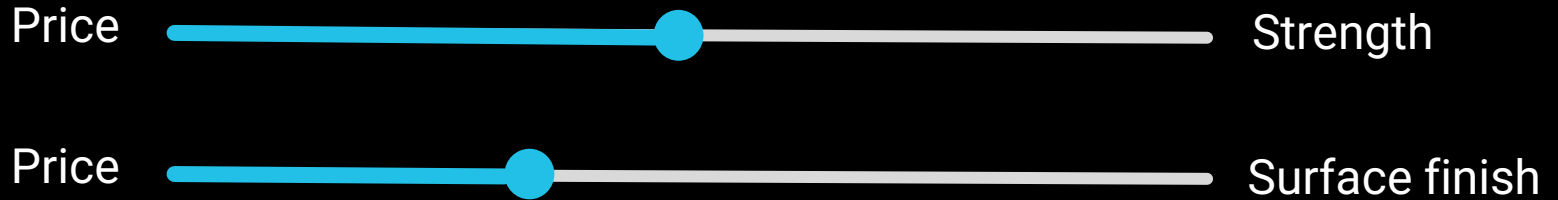
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Originally: **Tool Steel**

Printed: **Maraging Steel**



# Over engineering



**It's a manner of compromises**

# FEA – Fight the Z adhesion

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**CASTOR**

Displacements & Stresses

38 Real warp ?

Max. displ.  $|u|_{\max} = 0.2294$  mm Toggle ball ?

Max. Von Mises  $\sigma_{\max} = 14$  MPa Toggle ball ?

Download VTK

Layers & Legend

Clipping plane

Back to part analysis

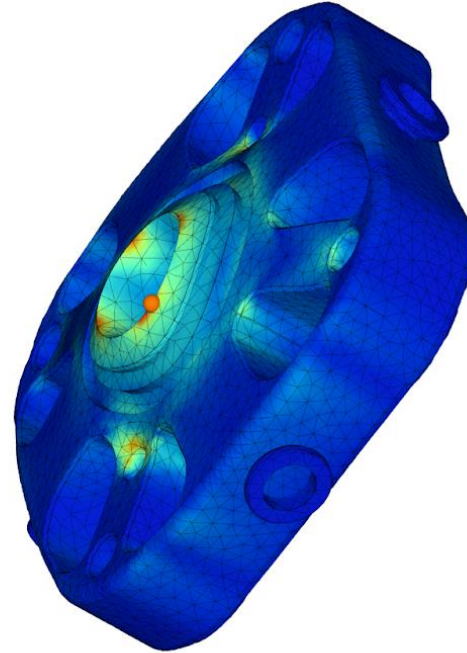


Main locator

1. Problem

2. Mesh

3. Results



# Cost estimation

Filaments

$$X=V*T$$

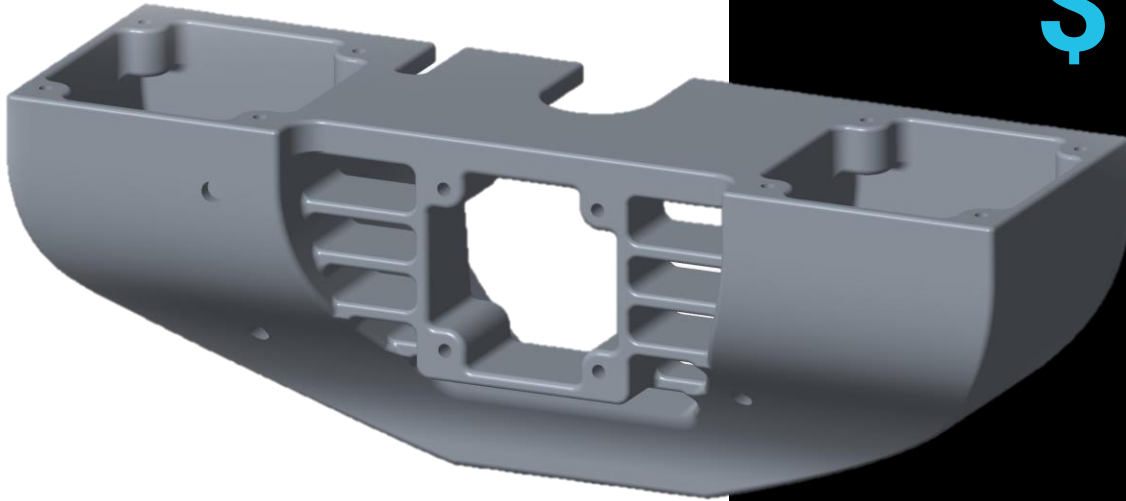
Powder

**Laser speed**

Jetting

**Drop range**

Industrial machinery  
part

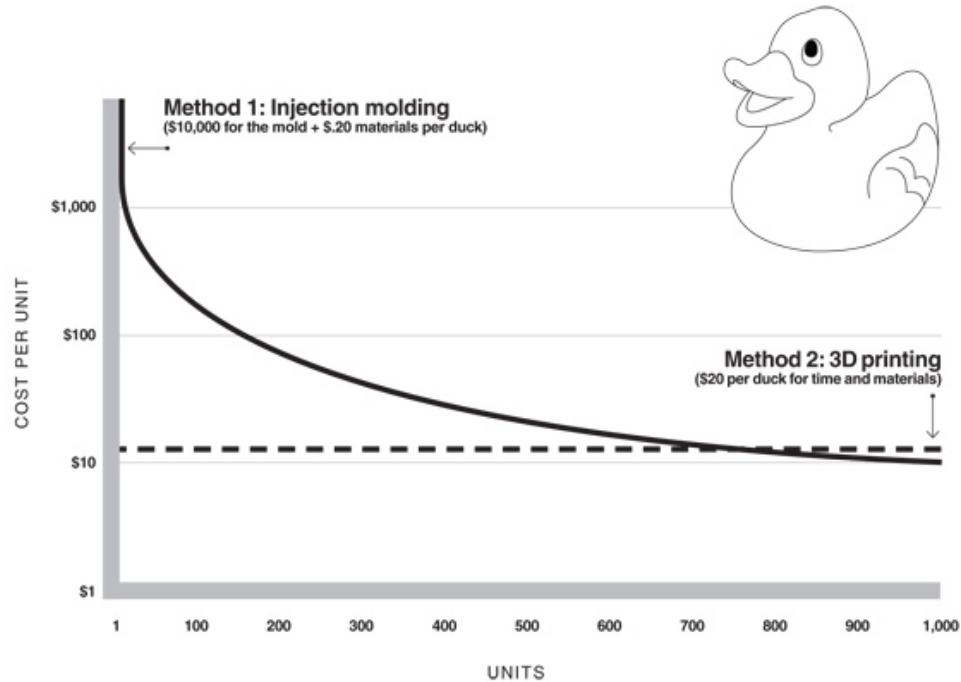


Total cost saving  
Using 3D printing:

**\$120K**



# It's all about the Break-Even



Source: 3D HUBS



# Similar geometries have similar price



# What about the Supply Chain benefits?



Result

Printable with changes

Cost estimation ⓘ

\$165 | Total Cost \$178

Lead time ⓘ

5 days | for first shipment

Recommended printer ⓘ

Jet Fusion 4200

Recommended material ⓘ

HP 3D HR PA 12



Material Analysis    Geometry Analysis    Cost Analysis    Lead time Analysis    Stress Analysis

Material	HP 3D HR PA 12		Nylon 101
ⓘ Total part cost [\$]	178.34	\$	218.34
> ⓘ Upfront [\$]	4	\$	204
> ⓘ Production [\$]	165		1
> ⓘ Inventory [\$]	9.34	\$	13.34

Switch to financial breakeven view

# When can we have the first part in hand? CASTOR



Result  
Printable

Cost estimation ⓘ  
Production \$33 | Total Cost \$34

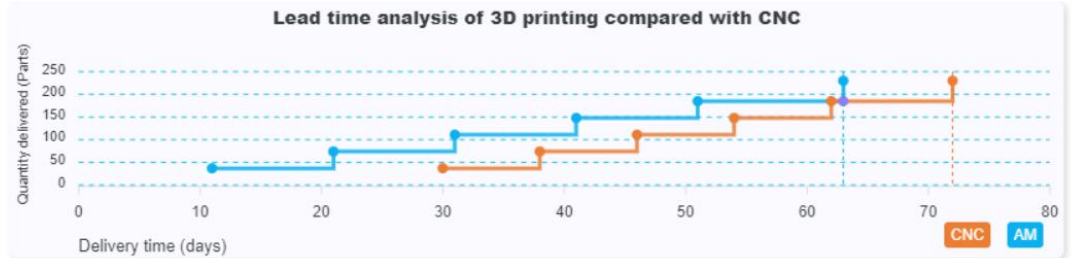
Lead time ⓘ  
11 days | for first shipment

Recommended printer ⓘ  
Epsilon W50

Recommended material ⓘ  
PLA (BCN3D)



Material Analysis | Geometry Analysis | Cost Analysis | **Lead time Analysis** | Stress Analysis



37 out of 230 parts will be delivered in 11 days when using AM  
37 out of 230 parts will be delivered in 30 days when using CNC

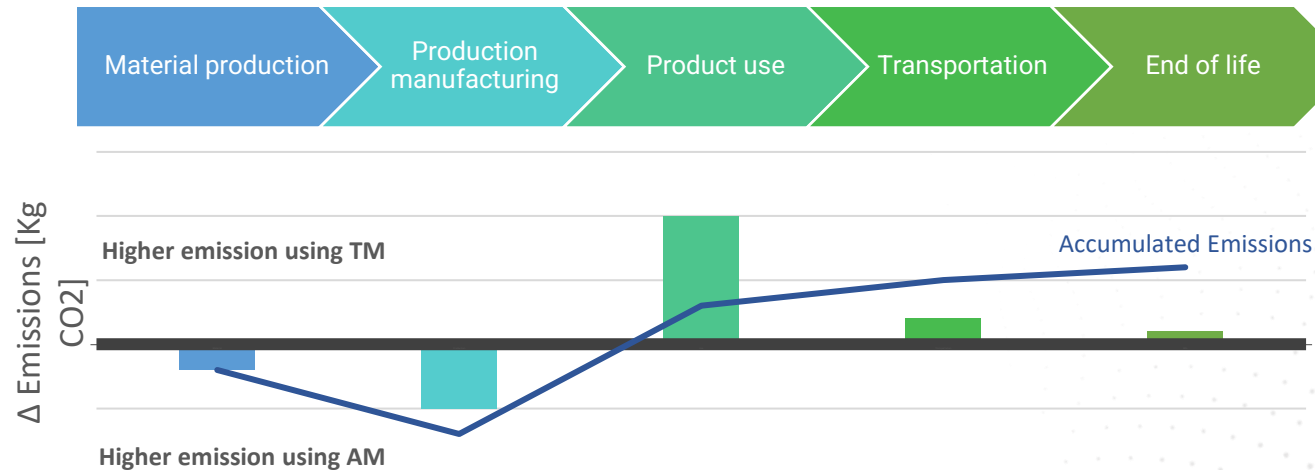
This is assuming a production run of 230 parts [Change quantity](#)

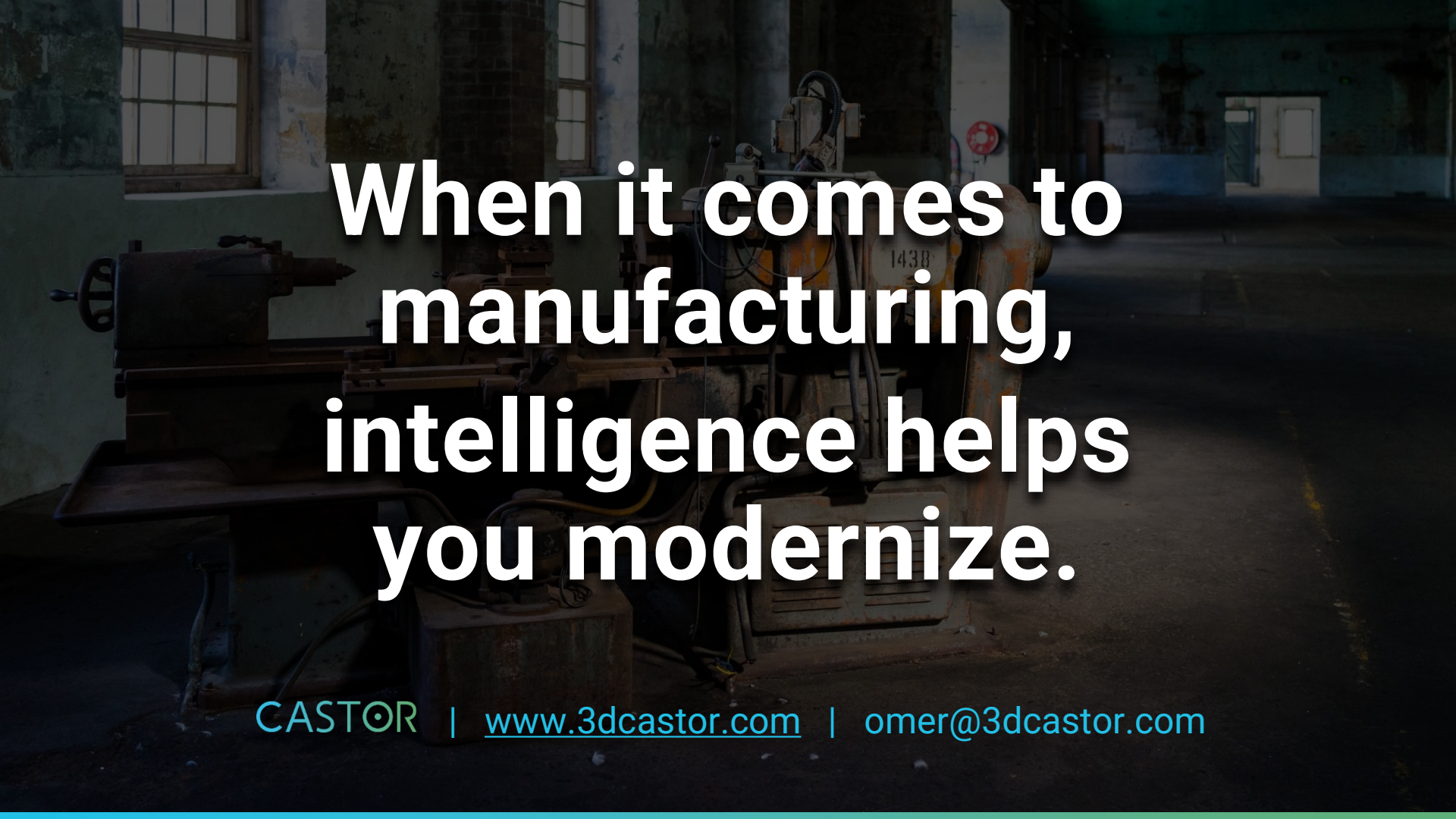
Lead time parameters [Edit](#)

Compare with another manufacturing method: CNC

# CO<sub>2</sub> Emissions | Life Cycle Analysis

Emissions “delta” during the product life cycle, based on:





**When it comes to  
manufacturing,  
intelligence helps  
you modernize.**

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