MELTIO

Applications Catalog

Application Overview

Near Net Shapes
Replacement of casting and forging near net shapes for prototyping, pilot runs, and low volumes to avoid upfront investment and minimum order quantities.

Lightweighting
Typical for the aerospace and aviation industries, where weight savings have a significant impact on part cost and overall system efficiency.

Cooling
Incorporation of conformal cooling channels for increased performance, typically used in the aerospace industry, heat exchangers, molds and dies.

Repairs, Spares, and Obsolete Parts
Commonly used in mold repairs or heavy industries such as marine, rail way, mining, and defense where parts are required for machinery in remote areas.

Business Case

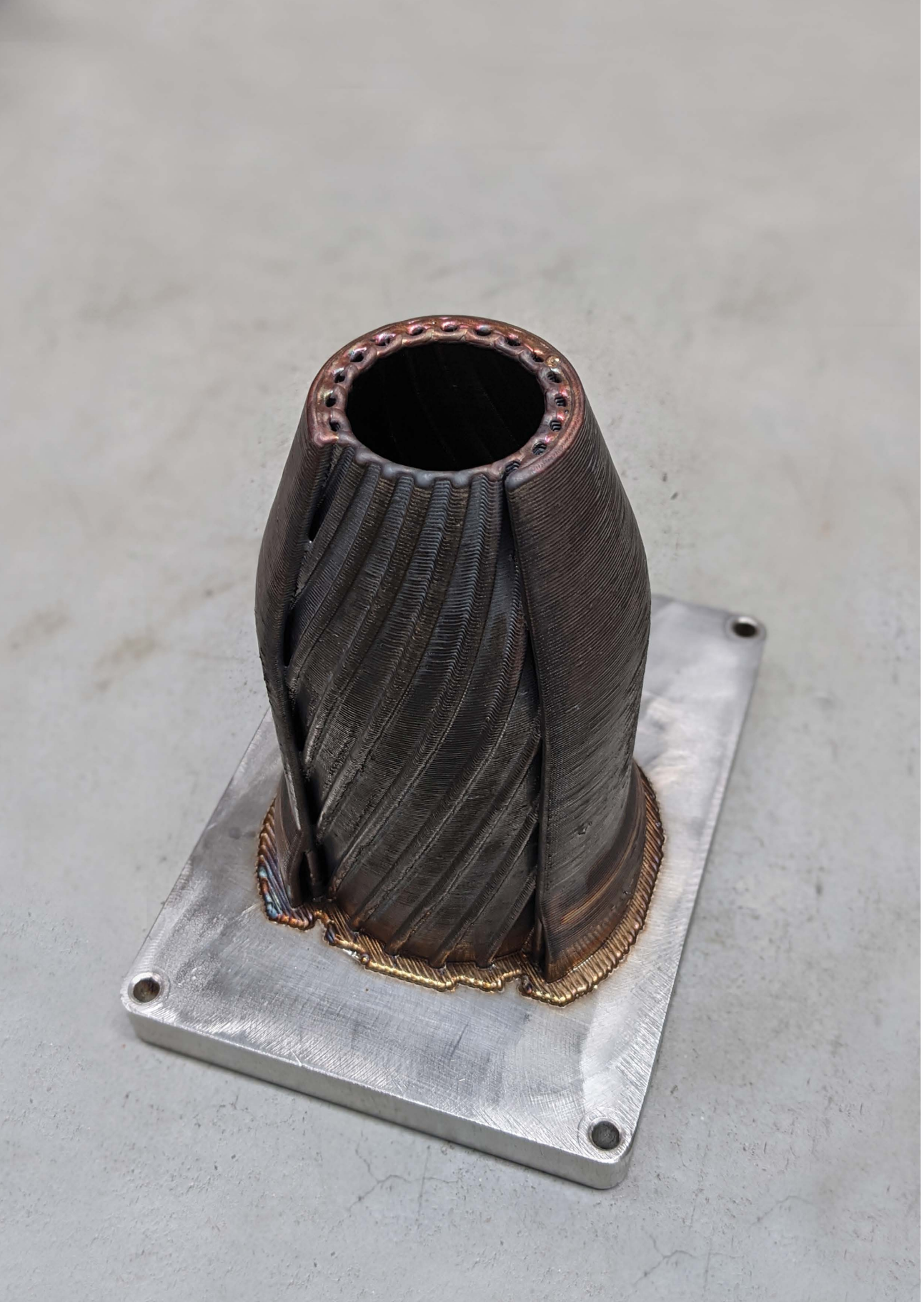
The cost analysis represents an estimation for the total print cost and print time when using a Meltio metal 3D printing system in-house. It excludes costs such as machine amortization, operator labor rates and post-processing.

The gas installation source has a big impact on the variable cost of a part, using a standalone bottle is much easier but the gas is more expensive, about 8,7€/m3. A proper liquified gas installation is more expensive and the cost per m3 can be as low as 2,4€/m3.

Cost Scenario 1: 50L Gas Bottle*

Cost Scenario 2: Liquified Gas Installation

The 50L bottles hold the gas at around 200bars.It's 10.000 L *



Combustion Chamber

Aerospace

This is the combustion chamber for a rocket engine with liquid cooling channels. Fresh fuel is flown past the combustion chamber to cool it down before it enters the engine to avoid overheating the chamber walls. This is a complex geometry that would never be made in a single-step process traditionally.

Size: 110,5 x 110,5 x 170 mm
Weight: 4,88 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 0,8 mm

Business Case

Drivers:

Complex Geometry

Difficult to Machine

Additional Design Freedom

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 50,55	€ 50, 55
Gas	€ 114,84	€ 31,42
Electricity	€ 15,13	€ 15,13

Print Time: 27 h 30’

Print Cost: € 180,51
(50L Gas Bottle)

Print Cost: € 97,09
(Liquified Gas)

Mining Drill Bit

Oil & Gas

It is attached to underground drills for drilling anchor points or exploratory holes in the mining and oil, and gas industry. The component wears out quickly during operations in remote sites. There is a very small area of the part which wears out, teeth, and surface.

Size: 96,5 x 96,44 x 91,3 mm
Weight: 3 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Lead Time | Cost | Difficult to Machine

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 31, 41	€ 31, 41
Gas	€ 41,76	€ 11,42
Electricity	€ 5,5	€ 5,5

Print Time: 10 h 5’

Print Cost: € 78,67
(50L Gas Bottle)

Print Cost: € 48,33
(Liquified Gas)

Post-processing: CNC Machining

Post-processing: CNC Machining

Glass Mold Core

Manufacturing

Half of a mold for the glass bottle manufacturing industry. Has a fairly complicated geometry made with a difficult material to machine to ensure longer lifetimes. This part would normally be cast, therefore long lead-times and high upfro nt investment. Meltio's LMD process offers unparalleled flexibility and impact to the company's bottom line in terms of part cost and lead time.

Size: 158,5 x 79,31 x 144,3 mm
Weight: 6 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Lead Time

Small Batch Production

Make it in Longer Lasting Materials

Difficult to Machine

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 62,82	€ 62,82
Gas	€ 78,30	€ 21,42
Electricity	€ 16,5	€ 16,5

Print Time: 24h

Print Cost: € 176,24
(50L Gas Bottle)

Print Cost: € 103,44
(Liquified Gas)

Piston Prototype

Automotive

Converts heat energy into linear motion inside automotive engines. Traditionally made by casting in large lot sizes, requires precision machining. Meltio enables rapid manufacturing of single quantity prototypes with minimum material waste and increased design freedom.

Size: 52 x 29 ø mm
Weight: 756 g
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Prototyping | Cost | Lead Time | Challenging to Cast Material | Difficult to Machine

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 7,92	€ 7,92
Gas	€ 9,14	€ 2,5
Electricity	€ 1,93	€ 1,93

Print Time: 3 h 30’

Print Cost: € 18,98
(50L Gas Bottle)

Print Cost: € 12,34
(Liquified Gas)

Post-processing: CNC Machining

Post-processing: CNC Machining

Gas Turbine Fan Blade

Oil & Gas

Converts the expanding gas into rotational force inside a turbine to generate electricity. It is a very complex geometry made out of a very difficult to machine material. Additive manufacturing affords greater geometry freedom which can increase process efficiency, whilst streamlining the supply chain by removing the mold-making and casting process; within a single gas turbine many different blade geometries are found further compounding the business case for Meltio Metal 3D Printing process.

Size: 35 x 75 x 135 mm
Weight: 1,11 kg
System: Meltio M450

Material: Inconel 718
Gas: Argon
Layer Height: 1 mm

Business Case

Drivers:

Difficult to Machine Material

Supply Chain

Complex Geometry

Cost Scenarios:

	1. 50L Gas Bottle	2. Liquified Gas
Material	€ 62,72	€ 62,72
Gas	€ 12,40	€ 3,39
Electricity	€ 1,74	€ 1,74

Print Time: 3 h 10’

Print Cost: € 76,85
(50L Gas Bottle)

Print Cost: € 67,85
(Liquified Gas)

Watch Bezels

Jewlery

Holds watch mechanics and electronics, mass manufactured with highly sophisticated design and surface requirements. Difficult and very expensive to machine material for a high volume product, leading to cost savings due to the huge amount of lost material because of its low net weight geometry. Subtractive manufacturing cannot leverage high material removal rates due to the small feature size, further complicating the business case for traditional manufacturing.

Size: 53,37 x 44,59 x 10,85 mm
Weight: 155,93 g / 29,22 g per part
System: Meltio M450

Material: Titanium 64
Gas: Argon
Layer Height: 0,8 mm

Business Case

Drivers:

Cost Savings

Reduce Scrap

Difficult to Machine Material

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 11,79	€ 11,79
Gas	€ 59,16	€ 16,18
Electricity	€ 3,12	€ 3,12

Print Time: 5 h 40’
56’ per part

Print Cost: € 74,06
€ 12,34 per part
(50L Gas Bottle)

Print Cost: € 31,09
€ 5,18 per part
(Liquified Gas)

Post-processing: CNC Machining

Spline Shaft

Mining

Industrial component for torque transmission in heavy equipment. A low volume component which is hollow and difficult to machine, due to its geometry and material. Production time and cost in traditional manufacturing are 10x higher. The machining of the near-net-shape component can be done quickly and cheaply as only certain critical areas need machining.

Size: 132 x 132 x 193 mm
Weight: 6,6 kg
System: Meltio M450

Material: Stainless Steel 308
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Lead Time | Cost | Low Volume | Difficult to Machine | Geometry

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 69,52	€ 69,52
Gas	€ 78,32	€ 21,42
Electricity	€ 16,5	€ 16,5

Print Time: 30 h

Print Cost GB: € 164,32
(50L Gas Bottle)

Print Cost LG: € 107,44
(Liquified Gas)

Knee Implant

Medical

Medical component traditionally made from machining a billet of titanium which is a wasteful, time consuming and expensive process (tool wear). Also typically printed with SLM which reduces the post-processing but maintains a high component cost, Meltio enables low component cost by quickly producing a near net shape which can be machined in a cost-effective manner.

Size: 99 x 77 x 51 mm
Weight: 410 g
System: Meltio M450

Material: Titanium 64
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Cost S avings

Low Batch Production

Difficult to Machine Material

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 31	€ 31
Gas	€ 22,45	€ 6,14
Electricity	€ 1,18	€ 1,18

Print Time: 2 h

Print Cost: € 54,62
(50L Gas Bottle)

Print Cost: € 38,32
(Liquified Gas)

Post-processing: CNC Machining

Post-processing: Polishing

Airfoil Cooling Blade

Energy

Cooling blade found on the hub of a multi-megawatt power plant generator. Forces air into the generator’s housing to remove waste heat. Replaces complex welded assembly with large potential for manufacturing errors, allows for a better-optimized blade geometry and weight reduction, which increases generator efficiency.

Size: 200 x 152 x 55 mm
Weight: 516 g
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 0,5 mm

Business Case

Drivers:

Lead Time
Replaces Complex Assembly
Low Volume
Single Step Process
Lightweight
Optimized Geometry

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 5,4	€ 5,4
Gas	€ 15,01	€ 4,11
Electricity	€ 2,11	€ 2,11

Print Time: 3 h 50’

Print Cost GB: € 22,52
(50L Gas Bottle)

Print Cost LG: € 11,62
(Liquified Gas)

Aircraft Engine Mount

Aerospace - CiTD

"*Engine Mounts are high-performance structures that must withstand extreme loads and fatigue requirements. CiTD is developing new additive manufactured engine mounts for the new generation of electric A/C with high performances and reduced mass. Meltio's technology makes it happen on time, cost and quality. It has been developed under H2020 AMABLE program.*"

Marta García - CiTD Engineering & AM Director

Size: 95,6 x 95,6 x 215,75 mm
Weight: 502 g
System: Meltio M450

Material: Titanium 64
Gas: Argon
Layer Height: 1,2 mm

Business Case

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 37,8	€ 37,8
Gas	€ 40,02	€ 10,95
Electricity	€ 2,11	€ 2,11

Print Time: 3 h 50'

Print Cost GB: € 79,93
(50L Gas Bottle)

Print Cost LG: € 50,86
(Liquified Gas)

Post-processing: CNC Machining

Injection Mold Half

Manufacturing

Tool for high pressure injection molding of plastic components. Very difficult to machine geometry due to poor tool access to occluded areas requiring the use of small tools which have low material removal rates. Due to high mass and density not suitable for powder metal printing while fine features limits the effectiveness of WAAM. Meltio produces the part at a low cost with minimum post-processing requirements.

Size: 140 x 140 x 297 mm
Weight: 15 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Difficult to Machine

Lead time

Complex Geometry

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 157,05	€ 157,05
Gas	€ 182,7	€ 49,98
Electricity	€ 38,5	€ 38,5

Print Time: 70 h

Print Cost: € 378,25
(50L Gas Bottle)

Print Cost: € 245,53
(Liquified Gas)

Concrete Bagging Nozzle

Mining

Wear part used for fillings bags with cement. Production quantity too low to justify casting, very complex geometry to machine due to hard material requirements, high aspect ratio holes (hollow) and irregular surface which require the use of milling, rather than turning, using long tools with low removal material rates further increasing the cost of the component. Meltio delivers a 10x cost reduction for this low-volume application.

Size: 99 x 116 x 258 mm
Weight: 1,78 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Lead Time | Complex Geometry | Low Volume | Difficult to Machine | Cost

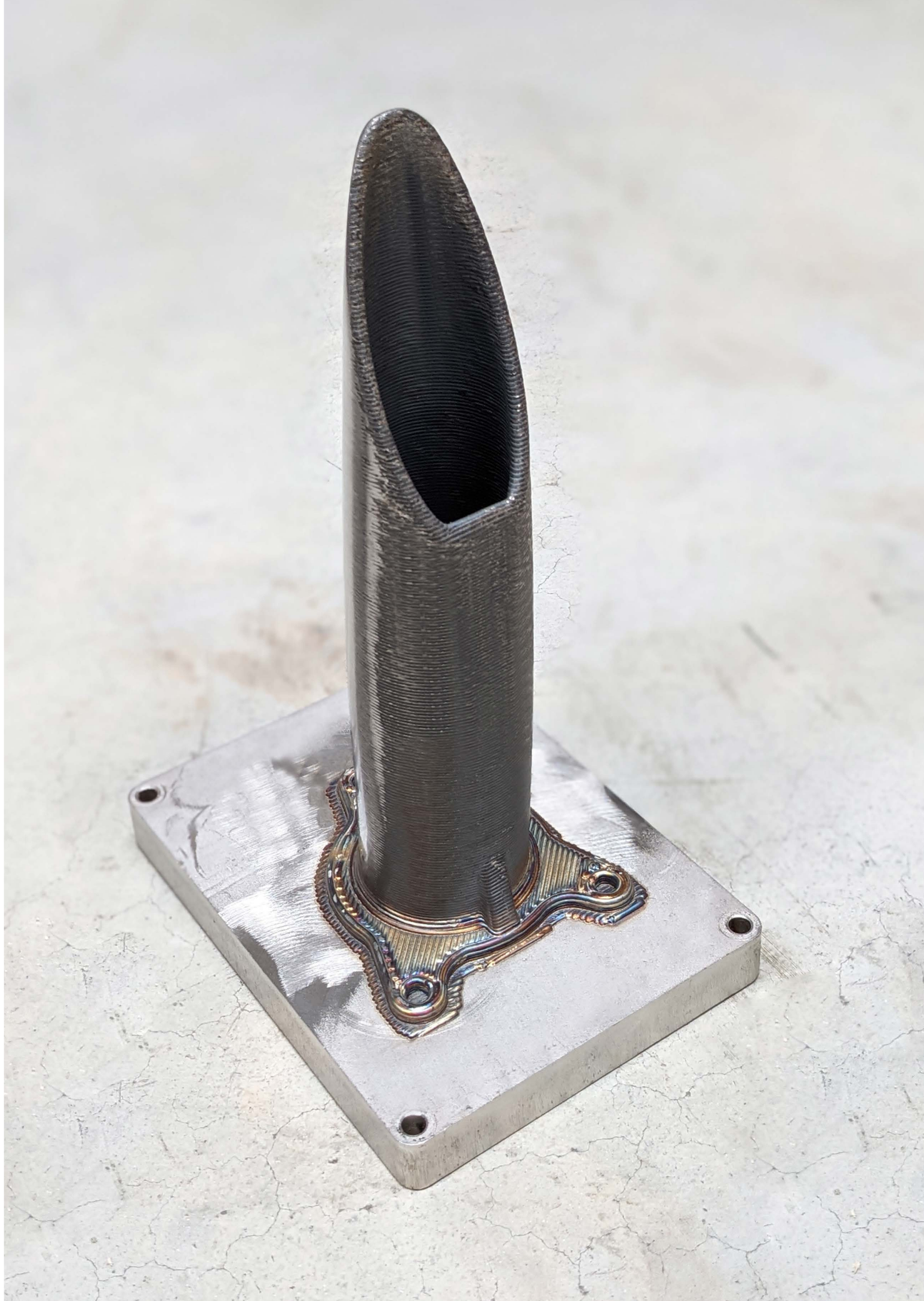
Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 18,67	€ 18,67
Gas	€ 32,63	€ 8,93
Electricity	€ 3,44	€ 3,44

Print Time: 6 h 15’

Print Cost: € 54,73
(50L Gas Bottle)

Print Cost: € 31,03
(Liquified Gas)



Prototype Bearing Block

Mining

Component that holds bearing in place as part of a concrete manufacturing plant. This is a wear component that is required for the production plant to operate. Digital manufacturing enables the optimization of stock and a cost-effective production of replacement parts. A heavy and bulky geometry like this one would not be cost-effective for powder metal 3D printing while machining would require warehousing of stock billets of the correct size and would lead to significant material waste.

Size: 143 x 143 x 75 mm
Weight: 6,5 kg
System: Meltio M450

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 1,2 mm

Business Case

Drivers:

Lead Time | Supply Chain | Low Volume | Spare Parts | Cost | Difficult to Machine

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 68,06	€ 68,06
Gas	€ 90,01	€ 24,62
Electricity	€ 13,55	€ 13,55

Print Time: 24 h 38’

Print Cost: € 171,61
(50L Gas Bottle)

Print Cost: € 106,23
(Liquified Gas)

Turbo Impeller

Automotive

Converts exhaust gas pressure into rotary motion in turbo machinery. Traditionally made by casting in large lot sizes, requires precision machining. Meltio enables rapid manufacturing of single quantity prototypes with minimum material waste and increased design freedom.

Size: 140,3 x 140,3 x 47,7 mm
Weight: 1,85 kg
System: Meltio Engine Robot Integration

Material: Stainless Steel 316L
Gas: Argon
Layer Height: 0,6 - 1,2 mm

Business Case

Drivers:

Prototyping | Lead Time | Challenging to Cast Material | Five Axis | Cost | Difficult to Machine

Cost Scenarios:

	50L Gas Bottle	Liquified Gas
Material	€ 19,37	€ 19,37
Gas	€ 21,19	€ 5,8
Electricity	€ 3,19	€ 3,19

Print Time: 5 h 48’

Print Cost: € 43,75
(50L Gas Bottle)

Print Cost: € 28,36
(Liquified Gas)

MELTIO

meltio3d.com
info@meltio3d.com