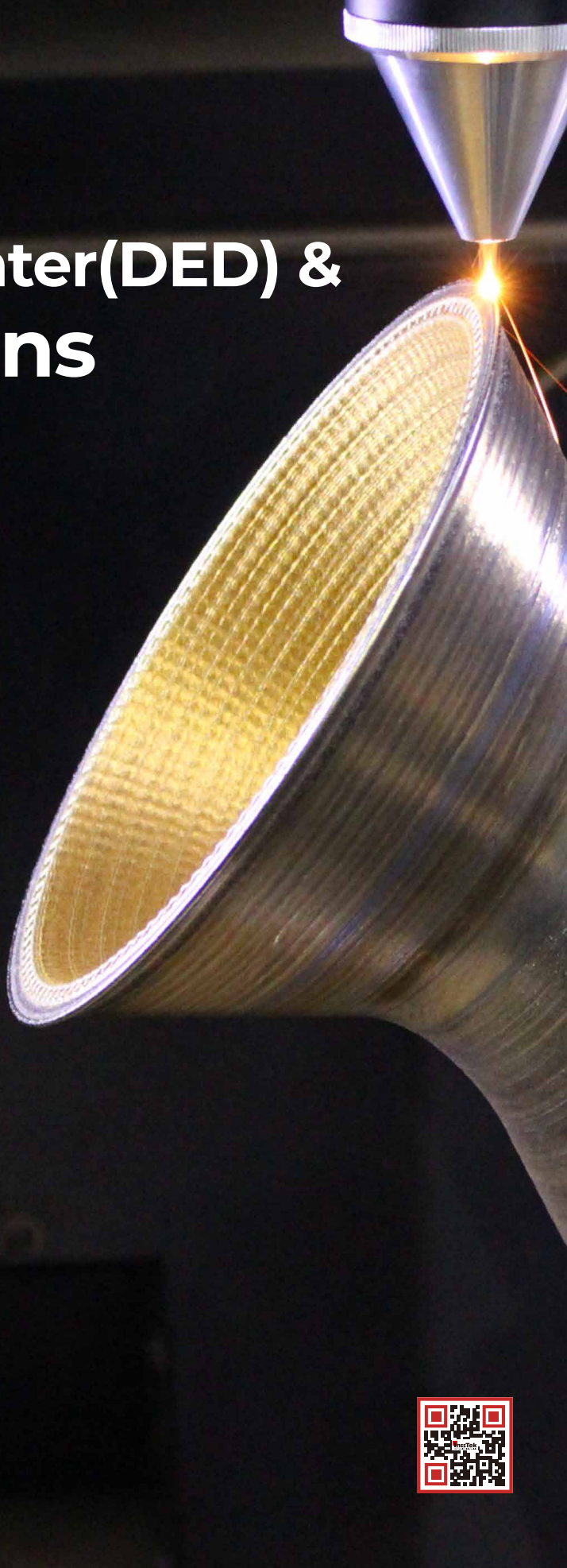
Metal 3D Printer(DED) & Applications



System Introduction

- Key technology
- Main system

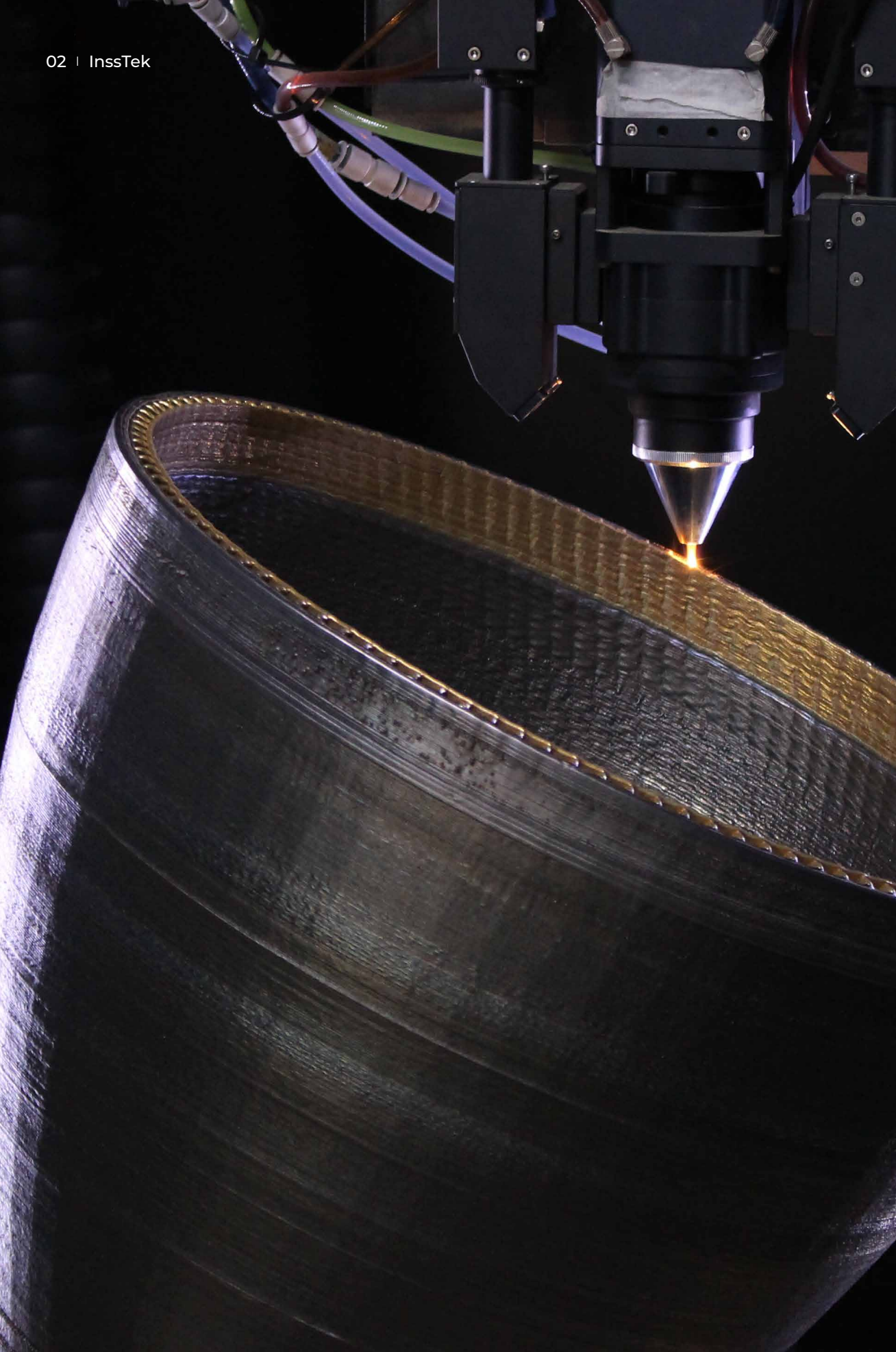
Applications

- Aerospace
- Automobile
- Heavy Industry
- Customer request
- Medical Coating
- Other Applications

InssTek

Content

InssTek



Aerospace

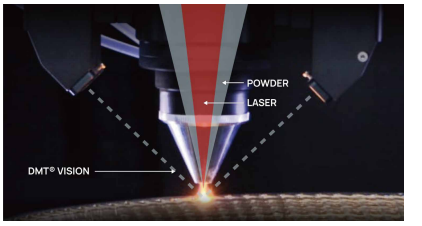
Multi-Material Rocket Nozzle (2022)

DMT® Technology

The most precise DED technology

DMT® (Direct Metal Tooling)

DMT the area of metal DED (Direct Energy Deposition) technology, was developed using InssTek's own technology. DMT technology can analyze and control the height of the melt pool in real-time with a vision camera(s).



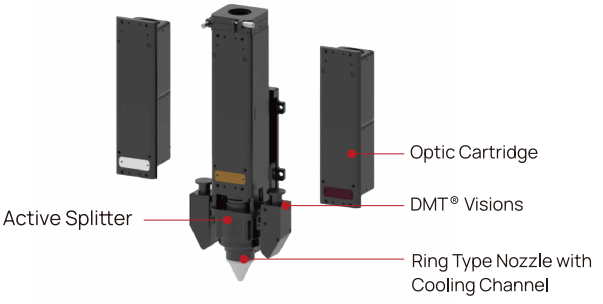
AM-Module

Compact optic and size-changeable beam

The AM-Module allows for flexible beam control. By replacing the optic cartridge (LFM-1) or using the automatic zoom system (LFM-2), beam sizes can be adjusted up to three times larger, enabling a wide range of applications.

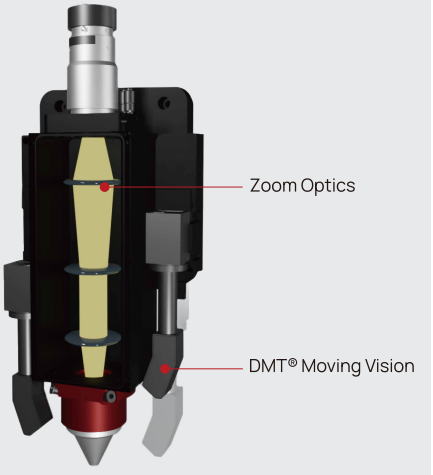
LFM-1

Users can select from four different optic cartridges and replace them easily for optimized processing.



NEW LFM-2

Users can adjust beam sizes without interrupting printing and reposition the vision camera to minimize interference with the workpiece.



Technical Data

Type	SDM800	SDM1200	SDM1600	SDM2400
Beam Size (μm)	800	1200	1600	2400
Build Speed (cm^3/h)	5.8	16.4	27.4	66.6
Layer Height (μm)	250	450	600	900

IPCM-Multi

Multi material fabrication

Features

Hexa-powder feeding system (Max. 6 hoppers)

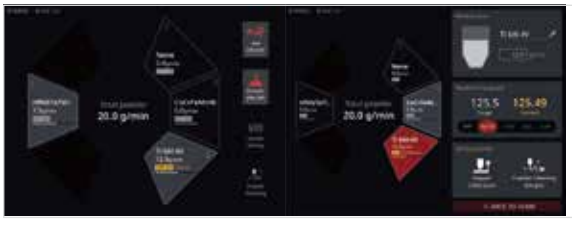
Real-time feedback control

Feeding rate range: 0.05~20.0g/min(based on Ti-6Al-4V)

User-configurable mixture proportions for alloys

Minimum quantity powder control

Convenient storage unit



Newly Developed Feeding System

It can supply powder stably and accurately with real-time feedback control

IPCM-Single

Suitable for mass production

Features

Single-powder feeding system(1 hopper)

Real-time feedback control

Feeding rate range: 0.5~10.0g/min(based on Ti-6Al-4V)

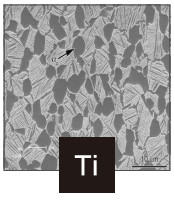
Continuous quality control function

Steady material supply

High-capacity hopper

Applicable Materials

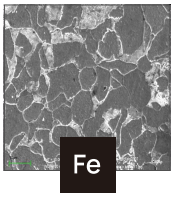
The figure below using IPCM shows just the metals already printed with our technology so far. We are continuously studying various alloys.



Titanium

CP Ti (Gd2)

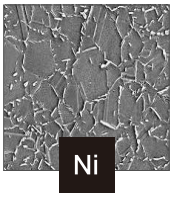
Ti6Al4V (Gd5)
Ti6Al4V (Gd23)



Steel

P20
P21
H13

SS304L
SS316L
SS420J2
SDSS 2507

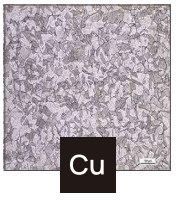


Nickel

Inconel 600
Inconel 625
Inconel 690
Inconel 713
Inconel 718

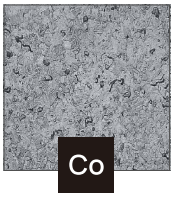
Hastelloy 22
Hastelloy 276

Nimonic75
Invar36



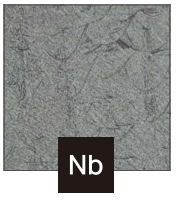
Copper

Cu-Sn
Al-bronze



Cobalt

CoCr
Stellite 6
Stellite 21
Stellite 25

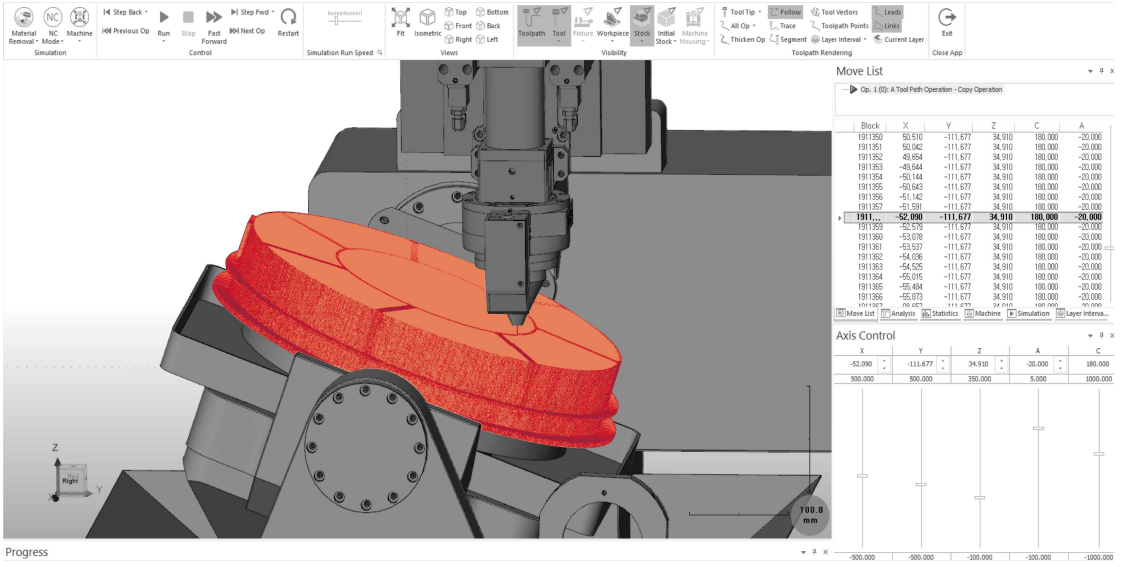


Niobium

C-103

Simultaneous 5 Axis AM CAM

Simultaneous 5-Axis AM CAM is one of the most important technologies of InssTek's DED Additive Manufacturing. Combining of InssTek's years of Know-how. Simultaneous 5-Axis AM CAM enables us to overcome the limitations of existing DED technology. We are breaking the limits of the additive manufacturing to make complex components.



Product Lineup

Please contact us for more information. In addition, you can customize each equipment through consultation (laser power, size, number of hoppers supplied with powder, etc).

MX-Fab
Industrial Application

Manufacturing various industrial components (Space, Energy, Heavy industry, ...)

MX-Lab
Alloy Research Application

Easy and simple alloy specimen fabrication (HEA, FGM, MMC, Bi-metal, ...)

MX-Med
Metal Porous Coating System

Fabrication of porous structures on surface (Medical, Semiconductor, ...)

* Providing system customization with optimized features for each industry and customer needs.

Order Made

Aerospace

Large Scale Robot 3D printing System

Application | Aerospace

Multi-Material Rocket Nozzle

InssTek applied multi-material DED technology to manufacture a full-scale rocket nozzle with a complex geometry, including a spiral-type cooling channel.

PART Information

- Size: Ø 420 mm × H 552 mm
- Weight: 80 kg
- Material: (Inner & Cooling Channels) Al-Bronze
  (Outer) Nimonic 75 & Inconel 718
- Operating Time: 190 hours

AM Process

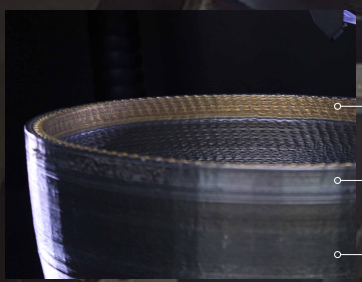
- Machine: MX-Fab with IPCM-Multi
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM2400 (DMT)

Customer KARI 한국항공우주연구원

Multi-Material & Recycle Powder

This nozzle case further highlights the use of recycled powder in additive manufacturing.

- Al-Bronze was applied to the cooling channels.
- Inconel 718 was used for the outer shell.
- Nimonic 75 was applied to the upper section.



*Nimonic 75

To verify sustainability, recycled Nimonic 75 powder from the lower section was reused in the upper part.

Analysis confirmed no difference in chemical composition or mechanical properties between the recycled and pure sections, proving the reliability of recycled powder for aerospace applications.

FGM Rocket Nozzle

Functionally Graded Material (FGM) technology has been used to manufacture actual-size rocket nozzle.

PART Information

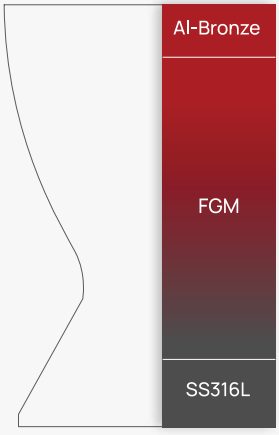
- Size: Ø 420 mm × H 552 mm
- Weight: 10 kg
- Material: (Top) Al-Bronze
  (Bottom) SS316L
- Operating Time: 40 hours

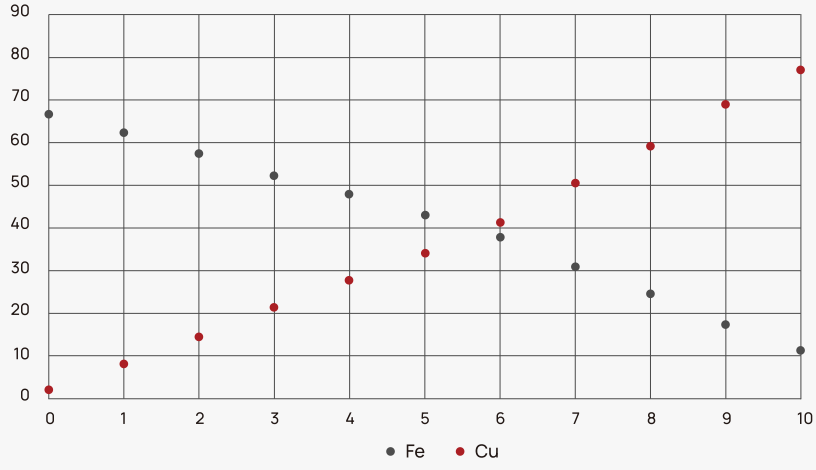
AM Process

- Machine: MX-Fab with IPCM-Multi
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM2400 (DMT)

Customer KARI 항공우주연구원

Gradual Composition of Two Materials





KARI 3ton Rocket Nozzle

Multi material additive technology has been used to manufacture a 3-ton combustion nozzle with different inner and outer material parts that are used for propulsion verification.

PART Information

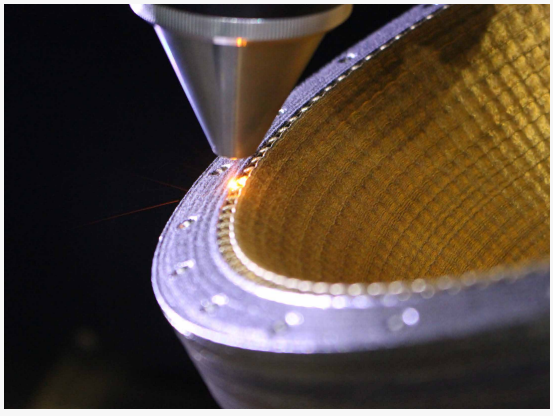
- Size: Ø 280 mm × H 257 mm
- Weight: 20 kg
- Material: (Inner) Al-Bronze
  (Outer) Inconel 625
- Operating Time: 300 hours

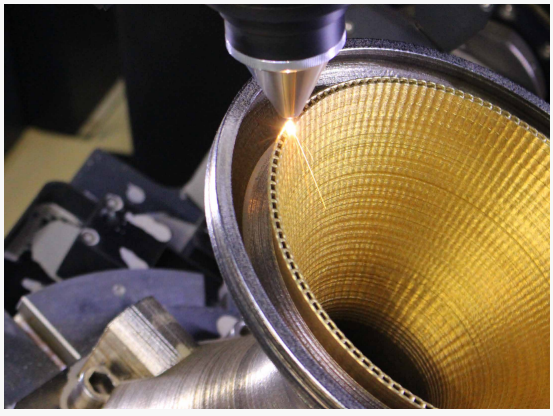
AM Process

- Machine: MX-Fab with IPCM-Multi
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM800 (DMT)

Customer KARI 한국항공우주연구원

Multi-Material 3D Printing





C-103 3ton Rocket Nozzle Extension

InssTek's additive manufacturing technology can make the rocket nozzles using high-melting-point materials such as C103 (Nb-based Alloy).

PART Information

- Size: Ø max 432 mm, min 270 mm
  H 169 mm
- Material: C103 (Nb Alloy)
- Operating Time: 64 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM800 (DMT)

Customer KARI 한국항공우주연구원

Fuel Tank for Satellite System

Spherical fuel tank mounted on the satellite was successfully completed using InssTek's optimized DED technology.

PART Information

- Size: Ø 230 mm × H 280 mm
- Weight: 10 kg
- Material: Ti-6Al-4V
- Operating Time: 60 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM2400 (DMT)

Customer KARI 한국항공우주연구원

Compressor Blade (Repair)

InssTek's optimized DED technology was applied to repair damaged parts of blades.

PART Information

- Size: 600 × 200 × 25 mm
- Material: (Base) Titanium
  (Powder) Ti-6Al-4V
- Operating Time: 4 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM800 (DMT)

Customer KARI 한국항공우주연구원

Jet Engine Air Seal (Repair)

InssTek's optimized DED technology was utilized for the repair of jet engine air seal.

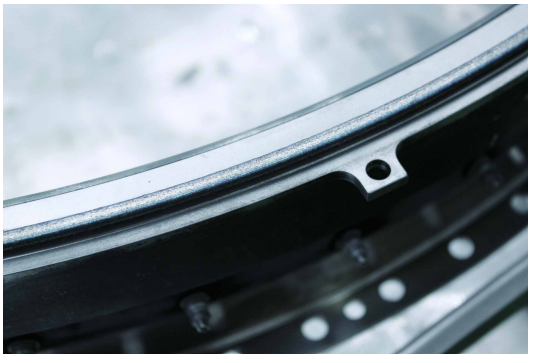
PART Information

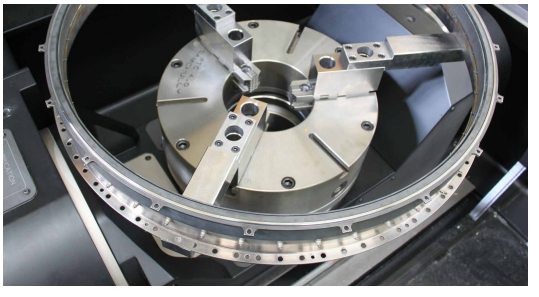
- Size: Ø 180 mm × H 65 mm
- Material: (Base) Titanium
  (Powder) Titanium
- Operating Time: 2 hours

Customer Hanwha Aerospace

Jet Engine Shroud Support (Repair)

InssTek's optimized DED technology was utilized for the repair of jet engine shroud support.





PART Information

- Size: Ø 600 mm × H 100 mm
- Material: (Base & Powder) Inconel 718
- Operating Time: 6 hours

AM Process

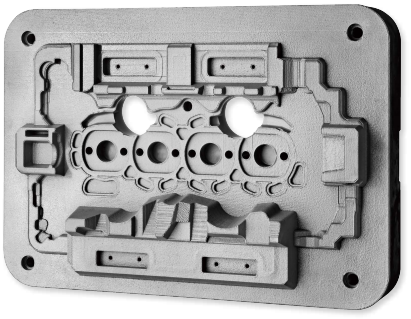
- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM800/1200 (DMT)

Customer 대한민국공군 REPUBLIC OF KOREA AIR FORCE

Application | Automobile

Multi-Material Mold

InssTek's optimized DED technology has been applied to the production of anti-corrosion cladding molds for automobile engine cylinder head.



PART Information

- Size: 470 × 320 × 120 mm
- Material: (Base) H13 tool steel
  (Powder) Hastelloy C22
- Operating Time: 70 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

Customer HYUNDAI MOBIS

Remodeling Headlamp Mold

InssTek's optimized DED technology was used to produce molds with new designs.

PART Information

- Size: 750 × 450 × 550 mm
- Material: (Base & Powder) P21 tool steel
- Operating Time: 2 hours

AM Process

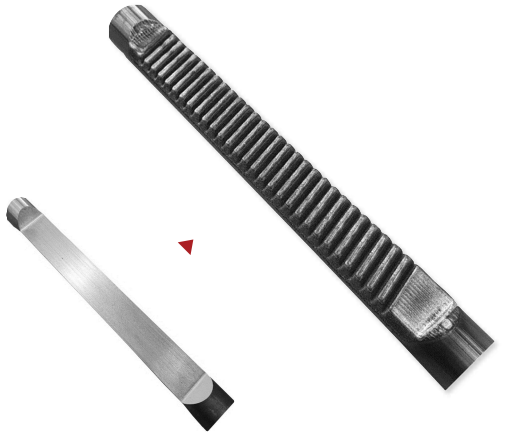
- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

Advantage

- Reduced lead time: from 4 weeks to 1 day
- Material cost savings of up to 80%

Rack Bar & Pinion Shaft

InssTek's optimized DED technology has been used to improve the performance of various automobile parts.



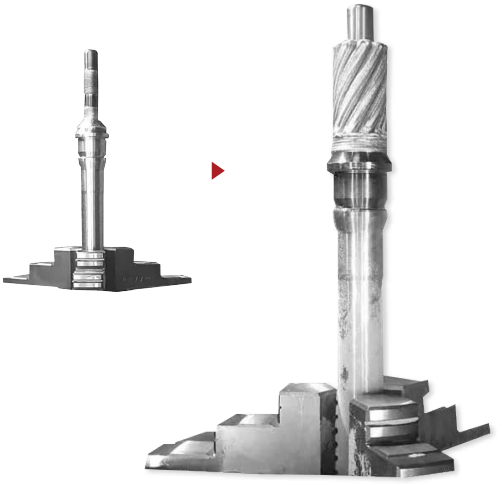
Rack Bar

- Size: Ø 28 mm × L 690 mm
- Material: (Base) SNCM439
  (Powder) H13
- Operating Time: 2.5 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

Customer HYUNDAI MOBIS



Pinion Shaft

- Size: Ø 30 mm × L 260 mm
- Material: (Base) SNCM439
  (Powder) H13
- Operating Time: 3 hours

AM Process

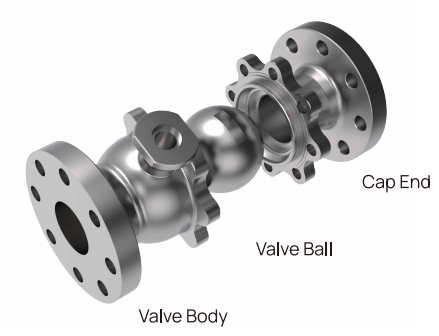
- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

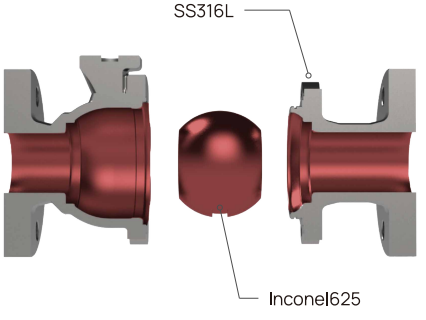
Customer HYUNDAI MOBIS

Application | Heavy Industry

Multi-Material Valve

InssTek's multi material additive manufacturing technology was used to manufacture special values for ships that improve corrosion resistance.





PART Information

- Size: Ø 210 mm × L 282 mm
- Weight: 8 kg
- Material: (Inner) Inconel 625
  (Outer) SS316L
- Operating Time: 120 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

Certification DNV·GL product certification (AOM)

Multi-Material Bearing

InssTek's multi-material additive manufacturing technology has been used to manufacture special bearings for heavy industry that improve lubrication.

PART Information

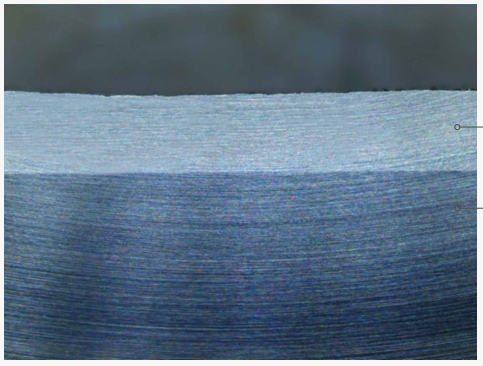
- Size: (Width) Top 420 mm, Bottom 382 mm
  (Inner Diameter) 110 mm
  (Thickness) 1.5 mm
- Material: (Base) Carbon Steel
  (Powder) White Metal
- Operating Time: 30 minutes

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM2400 (DMT)

Customer VOITH

Section of Multi-Material Bearing



White metal lamination for metal bearing fabrication.

Application | Customer request

MIIT Disc

InssTek's optimized additive manufacturing technology was used to manufacture special shape parts designed by customers.

PART Information

- Size: Ø 1000 mm
- Material: (Base) Carbon Steel
  (Powder) SS316L
- Operating Time: 20 hours

AM Process

- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200

Customer KORAIL KOREA RAILROAD

KTX Train Part

InssTek's optimized additive manufacturing technology was used to manufacture special shape parts designed by customers. In addition, DfAM (Design for Additive Manufacturing) technology was applied to the design of the part.

PART Information

- Size: Ø 400 mm
- Material: (Base) Carbon Steel
  (Powder) SS316L
- Operating Time: 4 hours

AM Process

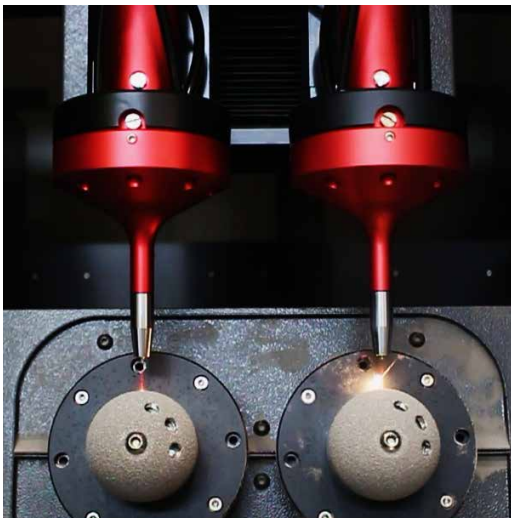
- Machine: MX-Fab with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: LFM-1 with SDM1200 (DMT)

Customer KORAIL KOREA RAILROAD

Application | Medical Coating

Metal Porous Coating

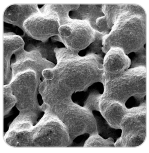
InssTek's MPC technology enables the coating of pure titanium onto various metallic substrates.
For artificial joints, hip systems are typically produced with Ti-6Al-4V and knee systems with CoCr alloys.
Using MPC, InssTek has successfully developed titanium porous layers on both Ti-6Al-4V and CoCr implants, achieving strong bonding and enhanced surface properties.



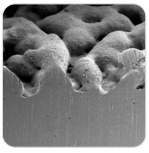
MX-Med Dual Module Coating

Advantages

- Superior performance with strong bonding
- Consistent and reproducible results
- High productivity for large-scale applications
- Customizable porous patterns (porosity, shape, etc.)
- Applicable to multi-material systems



Top



Cross section

Surface

FDA Approved

Clinical trial

These artificial joints have been tested and approved by our partners for their quality and reliability.
One of these joints was successfully implanted in a hip replacement surgery, demonstrating its clinical applicability.

Since 2021, the joints have been under clinical testing, with over 400 surgeries performed to date.
After more than a year of follow-up, patient outcomes have been favorable, and surgeons have expressed high satisfaction with the quality.

Medical Implant

- Machine: MX-Med with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: Porous Coating Module

Customer Lincotek SmithNephew Orentec

Hip System

- Material: (Base) Ti-6Al-4V
  (Coating) CP Ti
- Operating Time: 30 minutes

Knee System

- Material: (Base) CoCrMo;
  (Coating) CP Ti
- Operating Time: 30 minutes

Ankle System

- Material: (Base) CoCrMo
  (Coating) CP Ti
- Operating Time: 30 minutes

Semiconductor Coating

InssTek's multi material application coating technology has been used to improve the performance and control surface roughness of special parts.

PART Information

- Size: Ø 345 mm × Thickness 20 mm
- Material: (Base) Steel 6
  (Powder) CP Ti
- Operating Time: 2 hours 23 minutes

AM Process

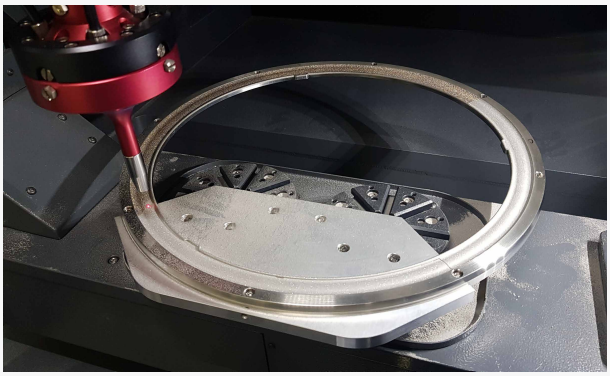
- Machine: MX-Med with IPCM-Single
- Software: MiXO-Pro, MX-OS
- Printing Head: Porous Coating Module
- Key Theh: Porous Coating

Customer SAMSUNG

Metal Porous Coating process

Before coating

After coating



[MX-Med] Multi material coating process

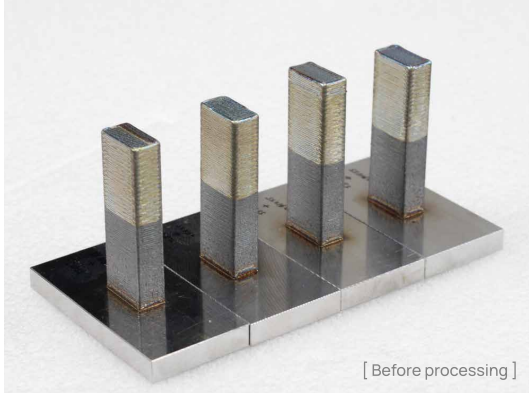
Comparison of the surface condition before and after coating demonstrates the effectiveness of the porous titanium layer in improving quality and adhesion.

Material Research

InssTek's core technology such as Hexa Powder Feeder, Optic Module, Meltpool Monitoring, and Material Designer are providing greater research conveniences in the development of innovative materials.

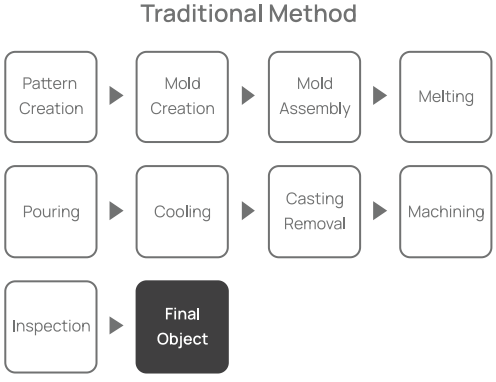
MX-Lab Material Research

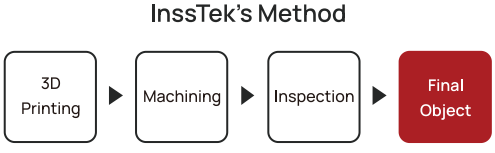
- Machine : MX-Lab
- Software: MiXO, Material Designer



Advanced Material Research

Traditional casting and machining methods involve multiple stages, from mold creation to final inspection. In contrast, InssTek's DED method streamlines the workflow to 3D Printing → Machining → Inspection → Final Object, significantly reducing development time.





* For more information, please read InssTek's [Material Research Report with MX-Lab]

Service Process

Approach to customer satisfaction

1. Powder test
- Powder analysis (SEM)
- Powder flowability test (ASTM B213 / ASTM B212)

2. Process Parameter Optimization
- Testing for single and multi-material applications
- Bimetallic interface analysis
- Specimen preparation and mechanical property testing

3. Design review and DfAM

4. AM Strategies
- Slicing
- Tool path generation
- Simulation

5. Manufacturing

6. Post-Processing
- Heat treatment
- Machining

7. Verification
- Non-destructive testing (NDE)
- Strength and durability evaluation

Contact Info

+82.42.935.9646
154 Sinseong-ro Yuseong-gu, Daejeon, Republic of Korea
sales@insstek.com


InssTek

InssTek

InssTek Inc.
+82.42.935.9646 | sales@insstek.com | www.insstek.com