Tritone
Industrial Additive Manufacturing

Leveraging MoldJet Technology For Industrial Applications

AM Tech Conference, Dec. 24, Tel-Aviv

Ohad Dolev

Tritone fundamentals

Founded in Israel (2017) and developed Systems & Materials for the **MoldJet** process

Sinter-based **metal & ceramic** AM

Industrial compatibility: throughput, repeatability, safety, operability, low-labor

Unique Inkjet-based **forming process**

Innovation in Materials; Slurry-based ‘paste’ feedstock
No powder

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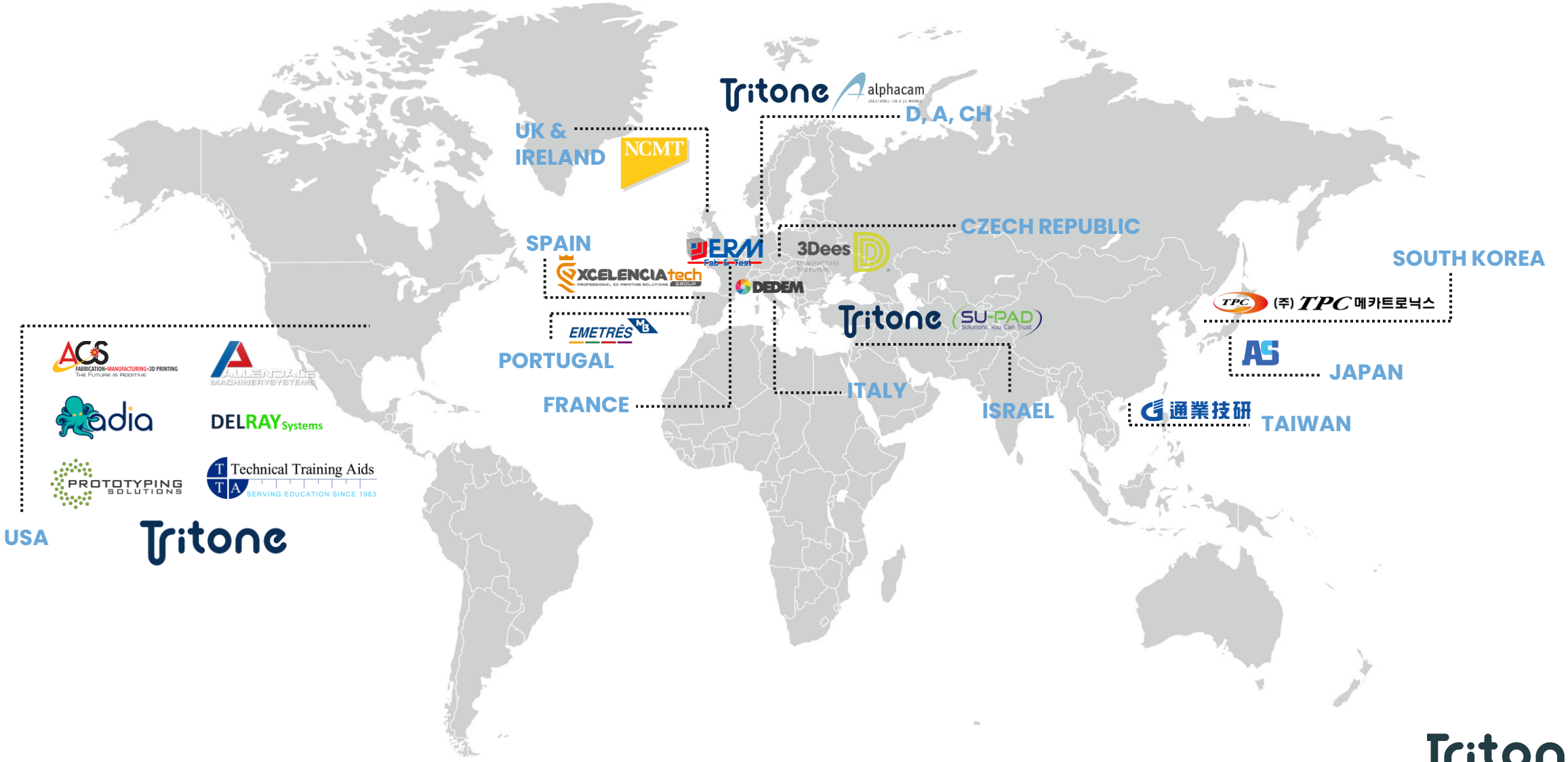
Global presence



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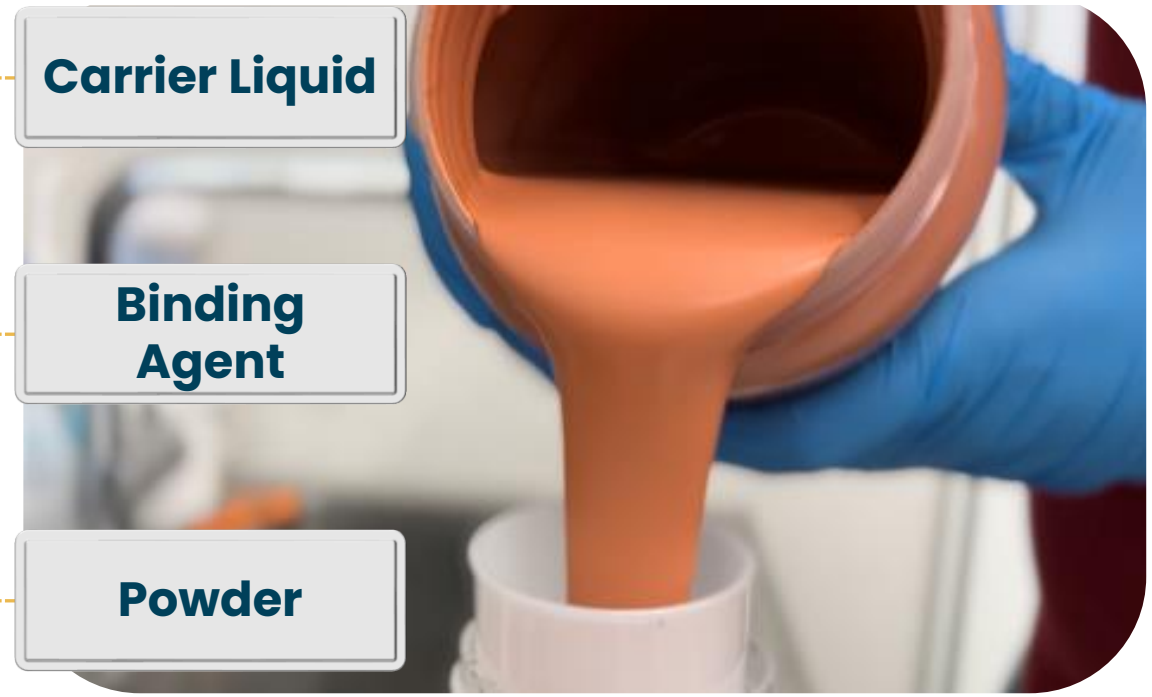
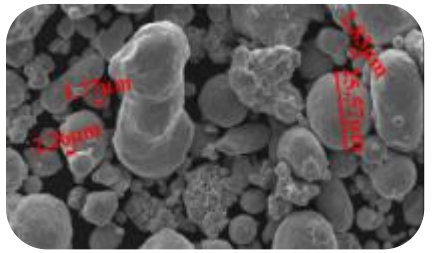
MoldJet Video

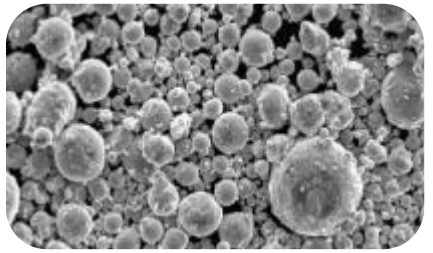
Slurry-based ‘Paste’ Feedstock

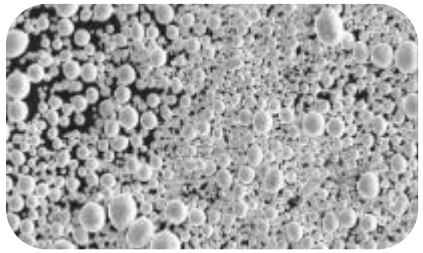
Medium

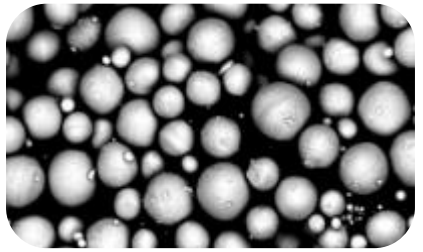
1. Carrier Liquid
2. Binding Agent
3. Powder











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MoldJet Materials – List and Status

Family	Type	Status
Stainless Steel	316L	Released
	17-4PH	Released
	15-5PH	Released
	420	Beta
Tool Steel	H13	Released
	M2	Released
Low Alloy Steel	4340	Released
	4140	Beta
Super Alloys	Inconel 718	Beta
Titanium	6-4	Released
Copper based	Pure Copper	Beta
Ceramic	Alumina	Beta

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Implication of ‘Paste’ Feedstock

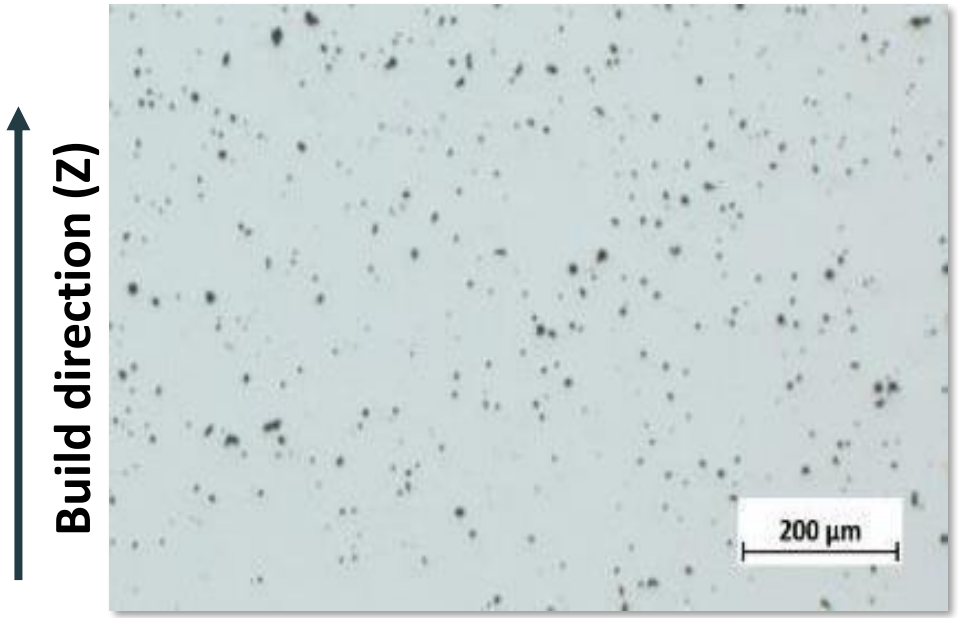
Powder Free process!

- ANY sinterable materials are applicable
- Proven Feasibility study:
  In713, Mo, Ta, NiTi, Au, Ag, SiC, ZrO_2, WC, Zirconium..

Uniform material distribution:

- Isotropic behavior
- Low Shrinkage

High ‘Green’ strength!



* Courtesy of Fraunhofer IFAM Branch Lab Dresden

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Luxury & Fashion

Images for illustration purposes only

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Luxury & Fashion

The Case Study:

- Manufacture of 2,000 metal pairs of luxury heels.
- Delicate & complex design
- Delivery in 5 months.

Images for illustration purposes only

04/24 **Purchase & Outsourcing**

08/24 **Install &Commissioning**

09/24 **Production Start**

10/24 **24/7 Production**

from purchase to production in 5-months

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Luxury & Fashion

MoldJet Success factors:

1. Precious metals compatibility!
2. Excellent feature resolution
3. Superior material properties!
4. Any shape, No support!
5. Paste deposition as required per part

Aerospace & Defense

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Aerospace & Defense

The Case Study:

- The Product: topology-optimized heatsink
- Qualifying Moldjet Technology for A&D line of products
- Certifying AMT as a Tier 2 manufacturer
- Multiple configurations & high production rate

12/23 **Benchmark**

02/24 **Tier 2 Qualification & Outsourcing**

06/24 **Production**

10/24 **Quote**

11/24 **Purchase**

02/25 **Commissioning**

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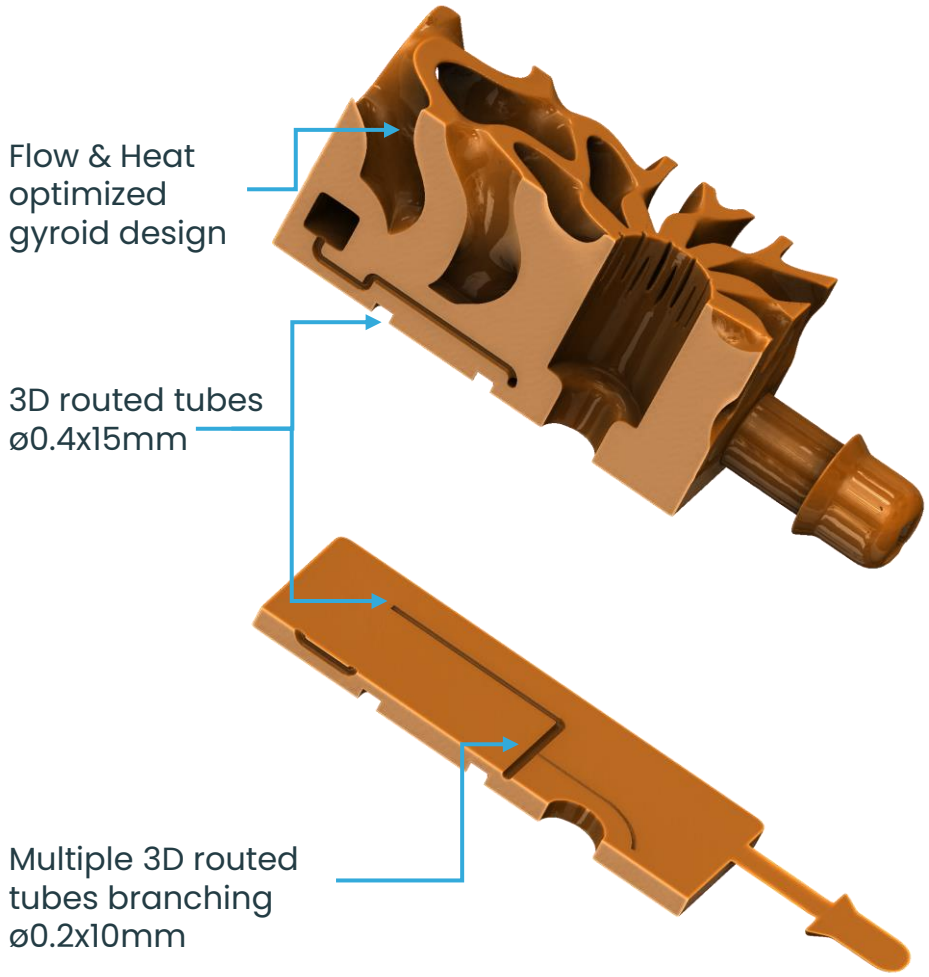
Aerospace & Defense

MoldJet Success factors:

- OPEN TUBES! → Small ø, Long 3D route
- Thin walls, high pressure
- Excellent Thermal conductivity
- No photopolymers → No Carbon leftovers
- High green strength → high yield!



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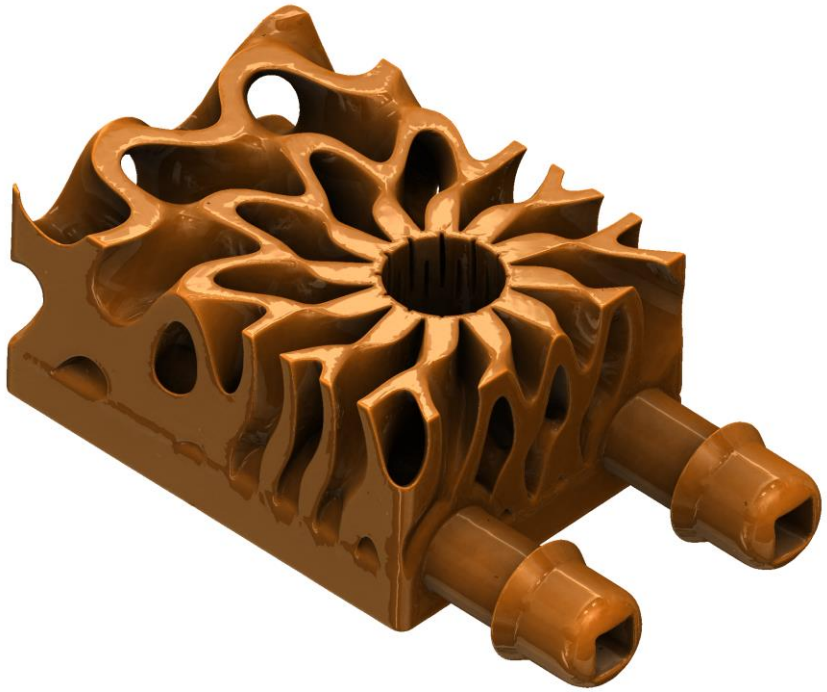
Aerospace & Defense

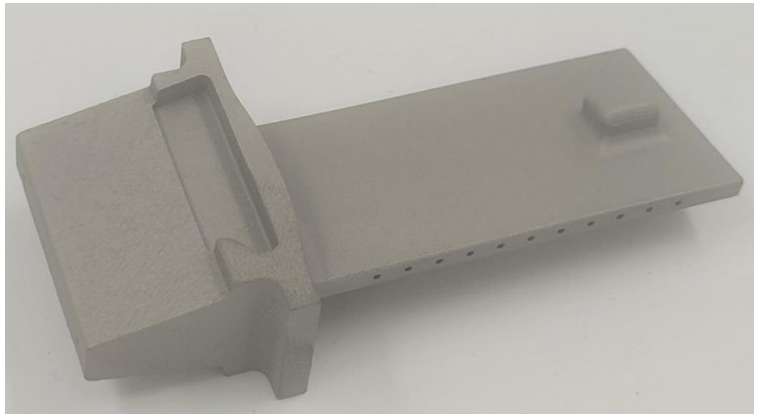
Moldjet Vs. Competitors:

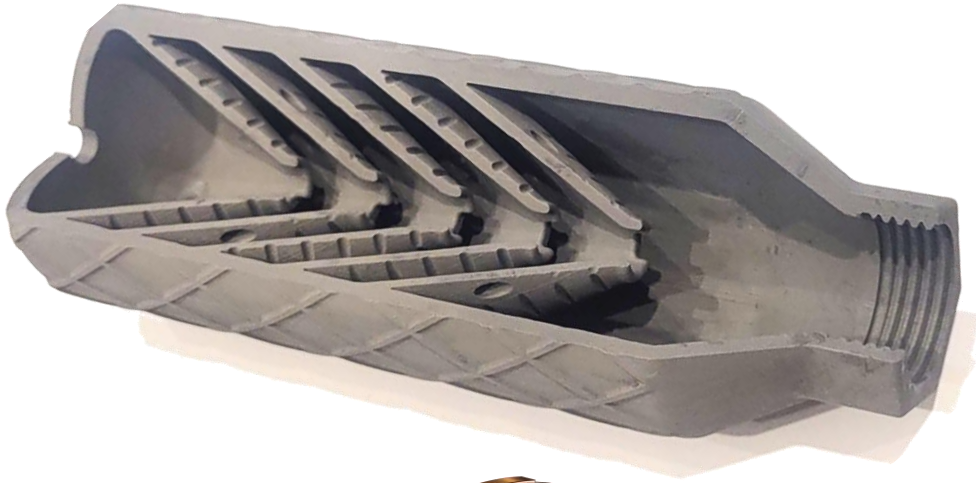
Won this competition against Binderjet and DLP technologies:

- Successfully handled the geometrical challenges
- Best productivity
- Best cost per part



Aerospace & Defense – Opportunities





MOLYBDENUM

17-4PH SS

Inconel 718

Copper

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Lightweight Mirrors

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Lightweight Mirrors

The Case Study:

- The Product: Lightweight Silicone-Carbide (SiC) Mirror
- Manufacturing of Lightweight SiC Mirrors by Moldjet Technology:
  - Fast steering Mirror
  - Laser Mirror
  - Low CTE Mirror
- High density SIC

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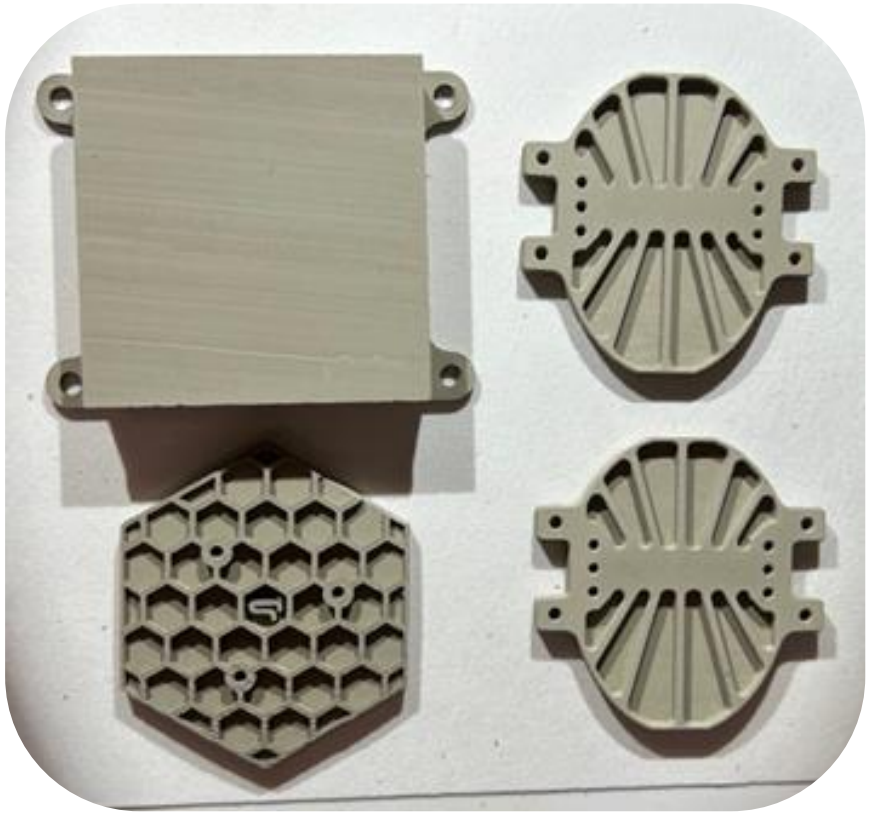
Lightweight Mirrors



SiC Green Parts

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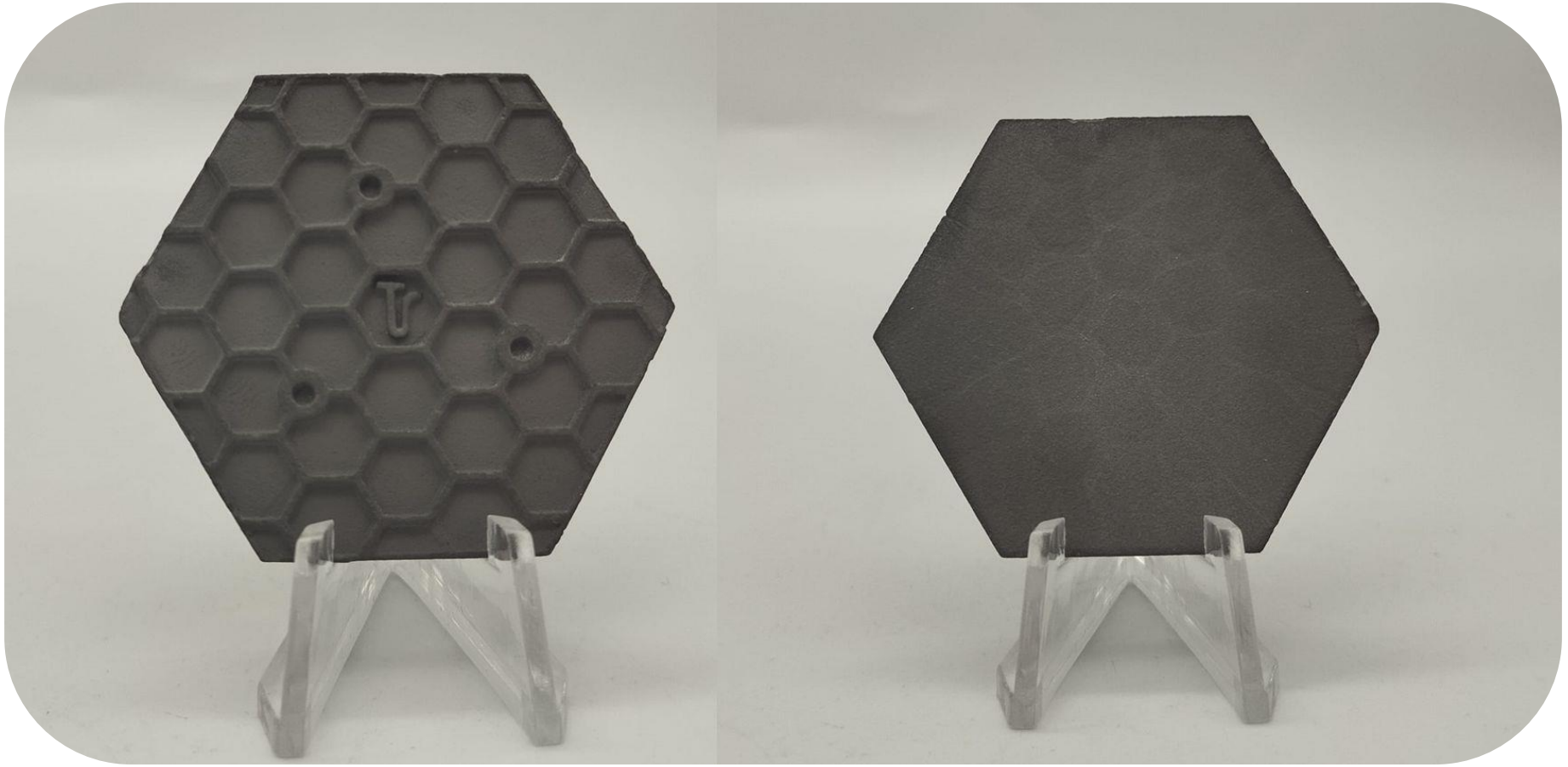
Lightweight Mirrors



Tooling & Molding

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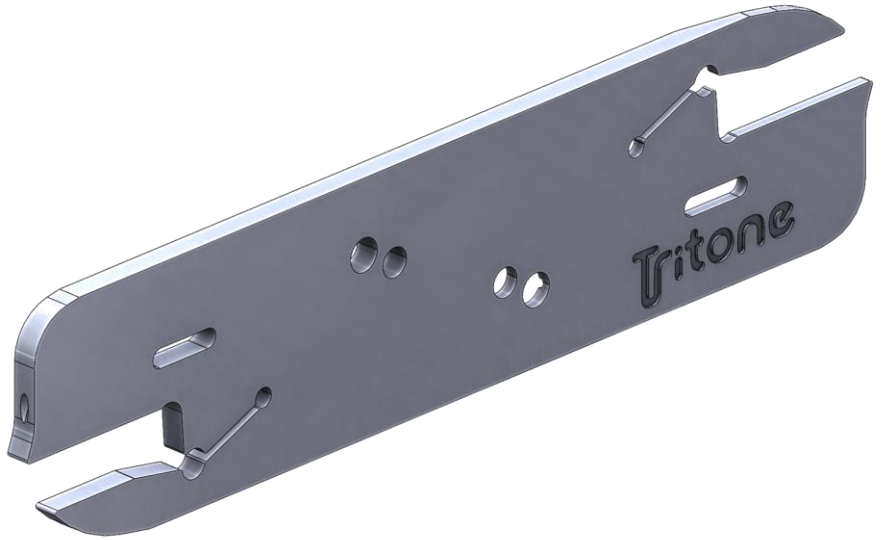
Tooling & Molding

The challenge:

- Qualifying Moldjet Technology by tooling OEM
- Lathe tool-holder, with internal coolant tubes and integrated gripping flexture.
- low-alloy steel and tool-steel.
- Manufacturing rate: Over 1,000 Parts/Week.



Moldjet Vs. Competitors:

- Won this competition against currently-used LPBF technology!
  - Best cost per part.
  - X5 higher productivity Vs LPBF.

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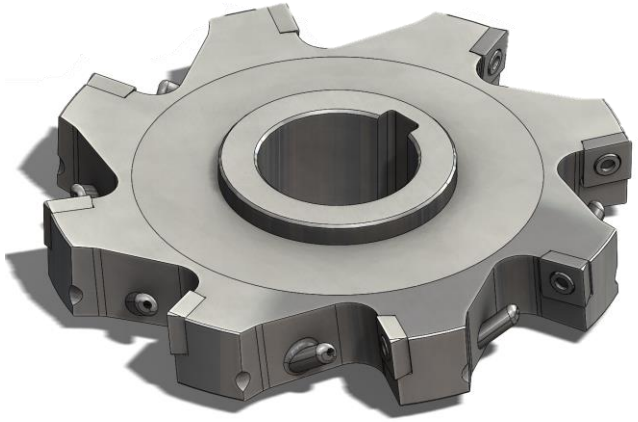
Tooling & Molding

Moldjet Success factors:

- Highest productivity
- Long 3D route tubes
- Improved coolant flow rate
- Thin walls
- Good dynamic loading properties

Tooling & Molding – Opportunities



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Medical Devices

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Medical Devices

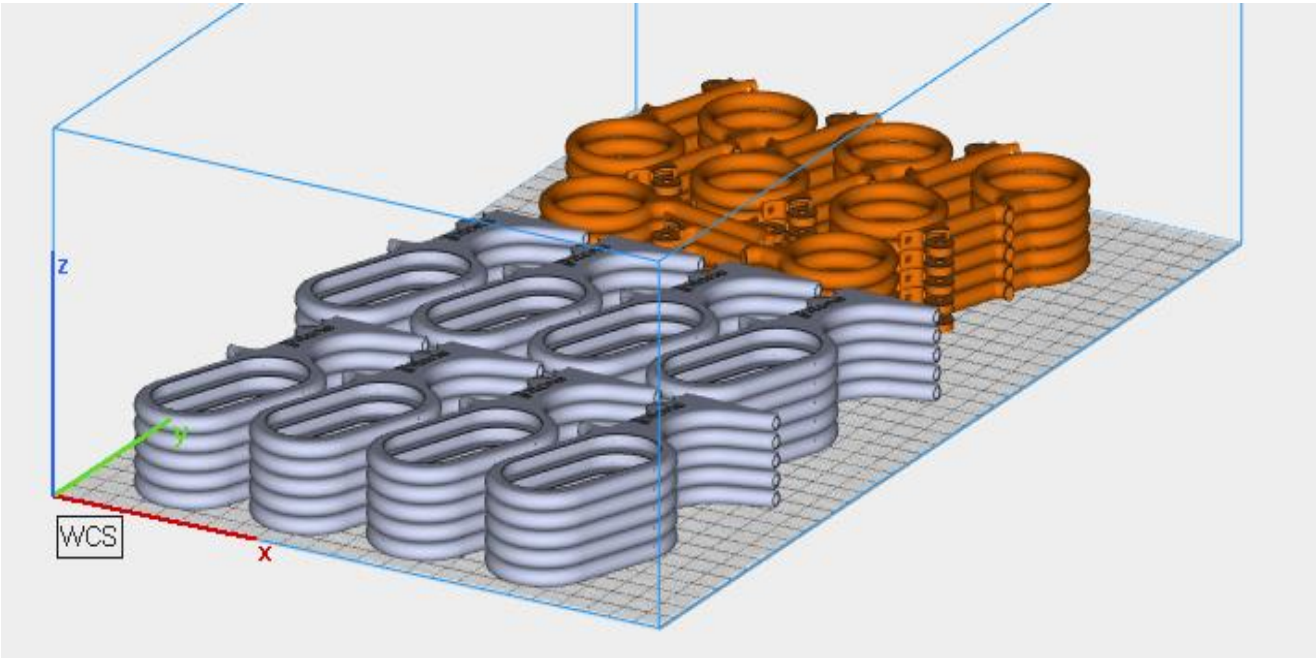
The Case study:

- Qualifying Moldjet technology by a surgical tools OEM
- Manufacturing of a lightweight assembly of minimal-invasive medical device.
- Manufacturing rate: 500 sets per week.

Medical – Surgical Tool Benchmark

Analysis

- Material: 17-4PH
- Manufacturing time per job cycle:
- 6[trays] * 90 [sets/tray] = 540 [sets/job]
- Batch manufacturing time: 72.9 hours
- Average time per set : 8m



Medical Biocompatibility

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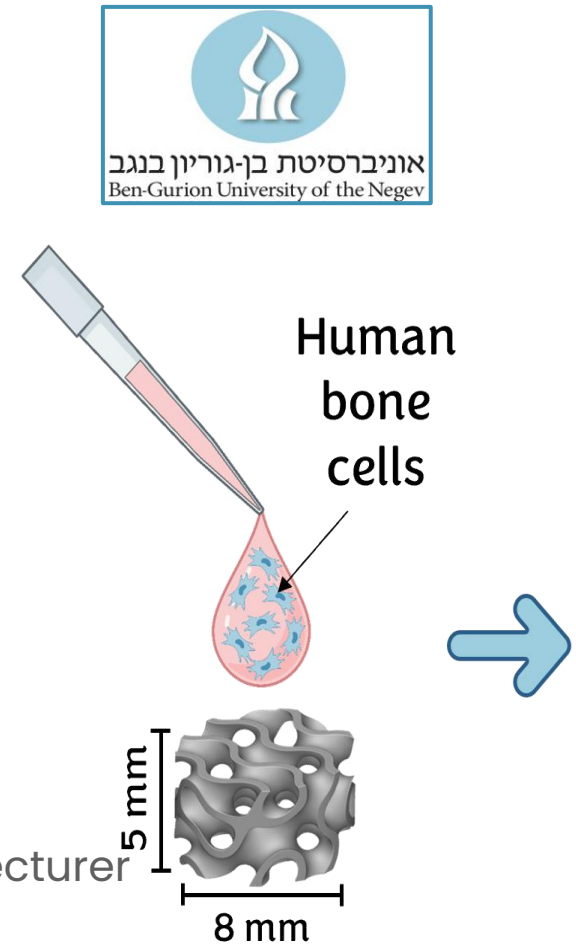
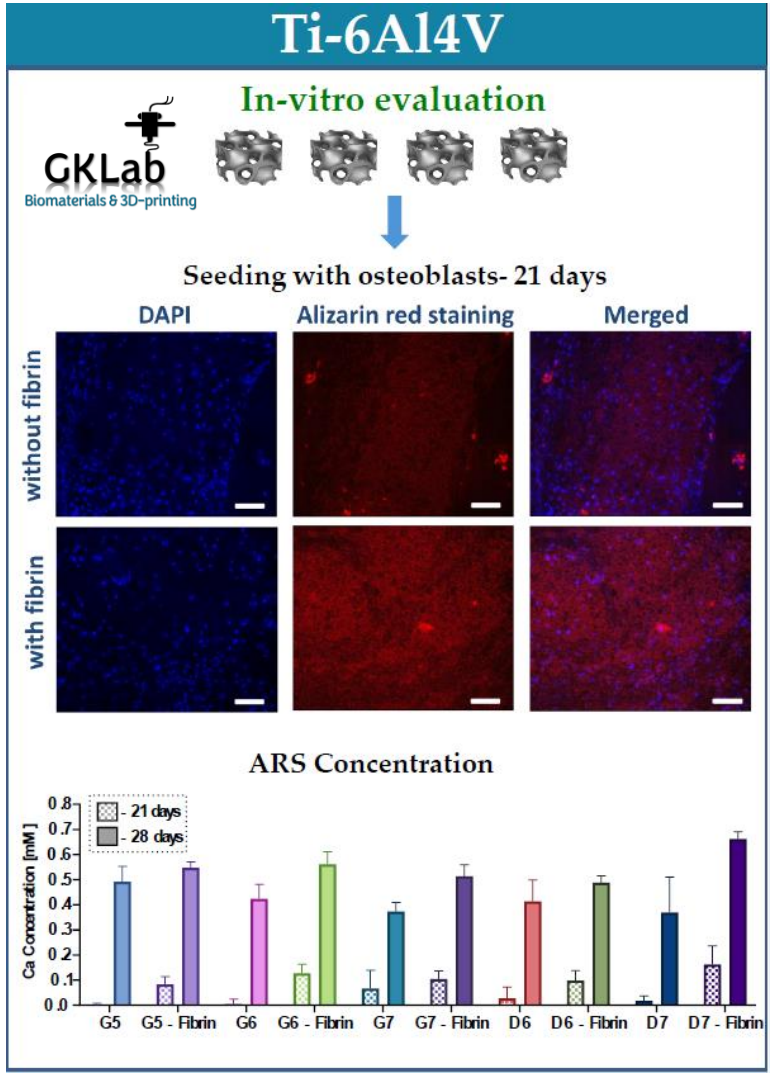
Medical

Biocompatible Study

Seeded bone cells on Ti-6Al4V and 316L Moldjet lattice specimens.

✓ Biocompatibility proved!





Courtesies to Galit Katarivas Levy, Ph.D. - Senior Lecturer

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Ben-Gurion University of the Negev

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MoldJet's Technology Benefits

1. **Open system** allows your own materials development
2. **Simple**, safe & easy materials **changeover**
3. **Integrated** in-process **QA and corrective** capabilities
4. **High** density and repeatability
5. **No** geometrical constrains

Share your application challenge

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