



MANUFACTURING INNOVATION MADE REALITY

# Titomic - Improving military capabilities

November 2024

Tjalling de Haan



# Titomic overview

# Who is Titomic

## The World's Leading Cold Spray Solutions Provider

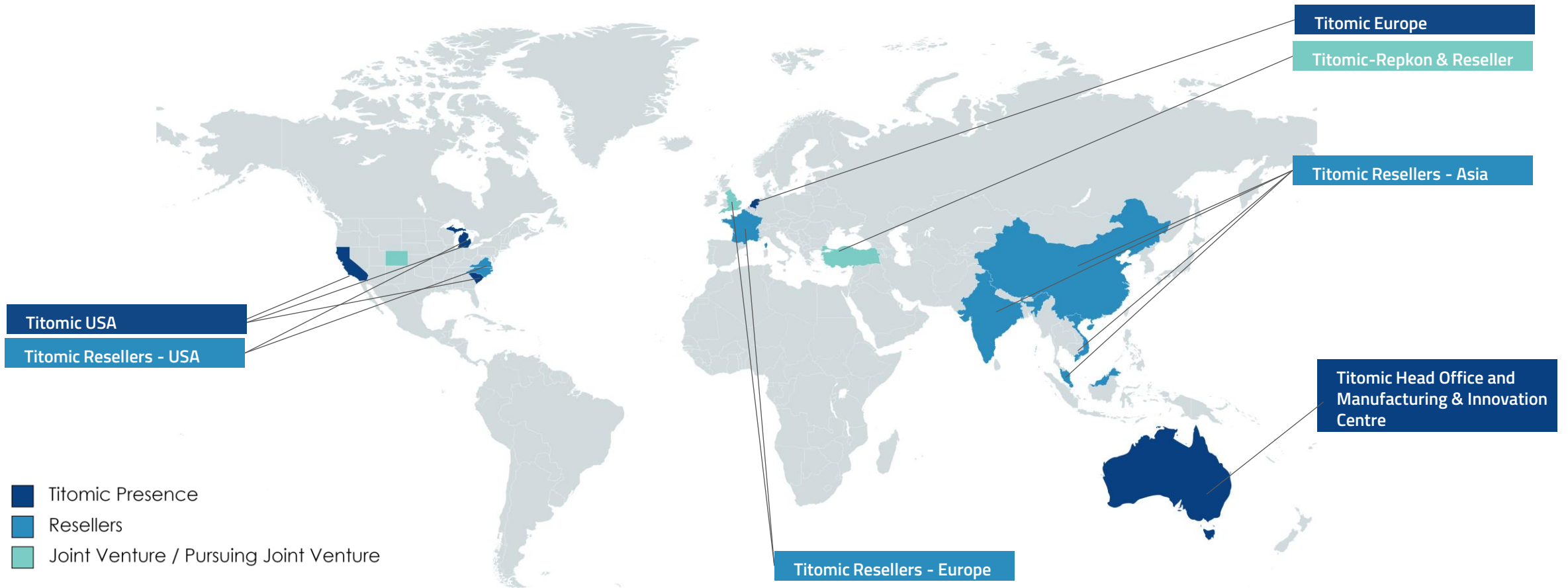
- Manufacturer & Integrator of Cold Spray Systems
- Additive Manufacture of Components
- Coating & Repair Service Provider
- Cold Spray experience spanning 15+ years
- Advanced manufacturing innovator & partner for 15+ years
- Proven applications across additive manufacturing and coating and repair
- ISO 9001, AS 9100, ISO 27001 Certified





# Taking our technology to the world – Global footprint

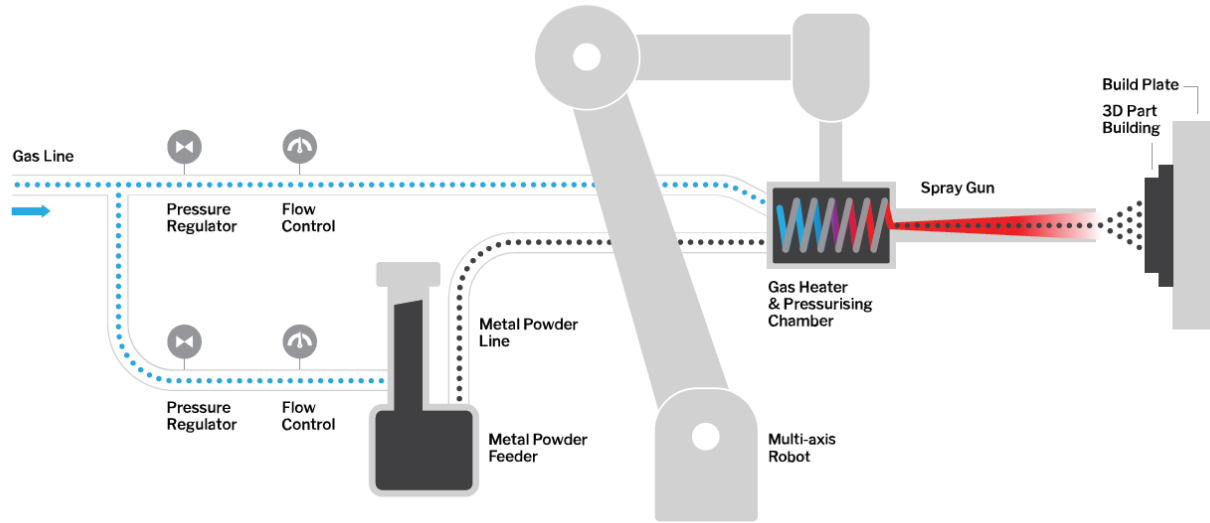
Global production, supply and service network to meet our customer's needs,



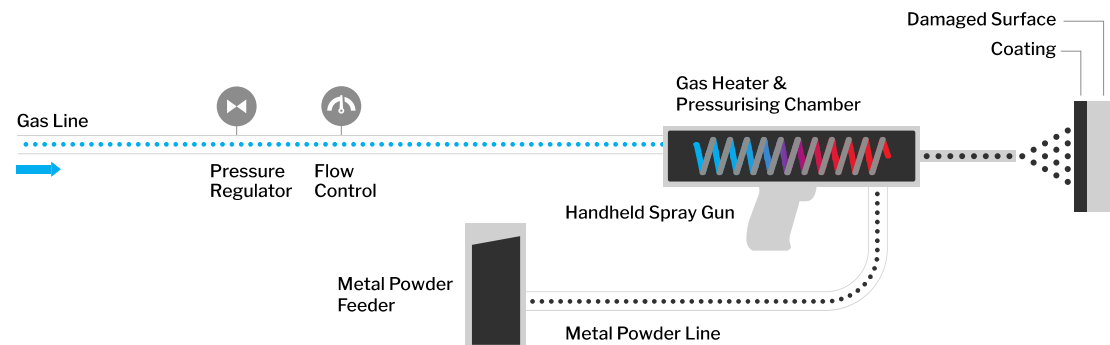


# Our cold spray process

## Robotic High-Pressure System for AM



## Low to Medium Pressure System for Coating and Repair



## Our story

- Founded in 2014 to commercialise cold gas spraying metal particles to produce 3D structures
- Now the only globally active, publicly listed cold spray solutions company
- Our cutting-edge technology and systems are changing manufacturing for the better

# Why TKF cold spray?

## Better deployment

- Cost savings
- Enhanced protection
- Environmentally friendly
- Rapid & simple deployment
- Ease of use



Deposit metal  
in seconds



No welding or  
heat needed



Restore  
metal parts



Repair corrosion  
damage



Apply hard-wearing  
coatings

## Better parts

- No heat introduction to substrate metal
- No need for complex metal preparation
- High-speed process
- Near-net geometries
- Novel, cost-effective materials



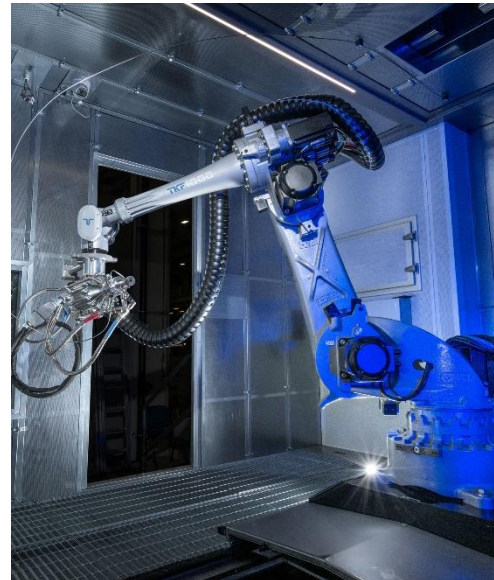


# Titomic Machine Portfolio



## TKF 9000 (Custom)

- High pressure Cold Spray additive manufacturing and coating
- Demonstration of Titomic's ability to engineer and construct bespoke AM systems
- Deployed in the Titomic Melbourne Bureau



## TKF 1000

- High pressure Cold Spray additive manufacturing and coating
- Designed for prototyping and low volume production tasks
- 1<sup>st</sup> gen system operating at Titomic Melbourne Bureau
- 2<sup>nd</sup> gen system installed at TWI (UK)



## ISB Series

- Low pressure Cold Spray coating
- Robotic or linear coating system
- Automated loading and unloading of parts
- Utilises D523 core cold spray system
- Ideal for R&D deployment or as a base for customised automated coating systems



## D523/D623

- Low pressure & Medium pressure Cold Spray coating & repair system
- D523 - Modular portable repair system
- D623 - Modular site-based repair system
- Designed for robotic or manual repair and coatings
- Deployable for in-field repairs



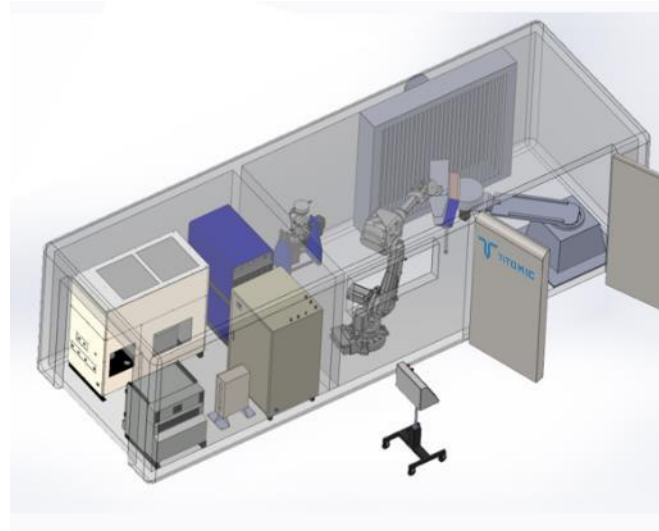
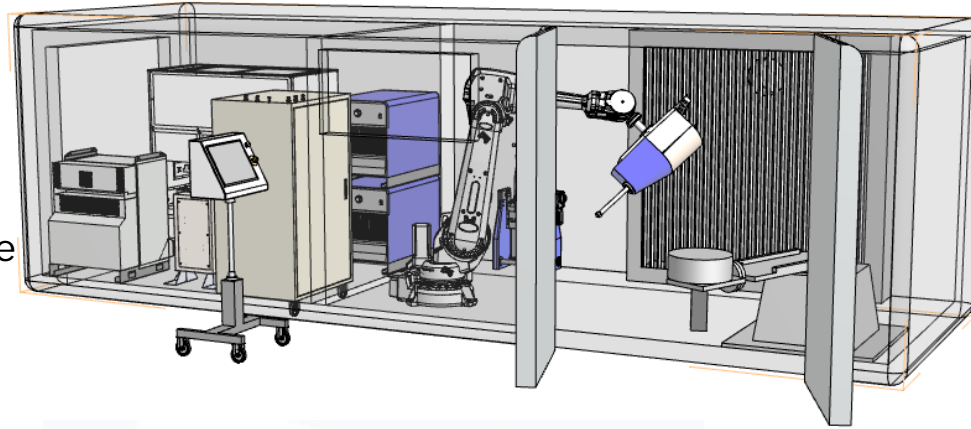
# Coating & Repair applications



# In-field coatings & repairs

## Maximising uptime

- Technology to the target for battle damage repair & continued operations
- Rapidly produce parts on demand
- Develop new materials: reduce in-service damage and degradation from corrosion, wear, impact damage, radiation compromise & more





# In-field coatings & repairs



## D523

- Low-pressure cold spray coating
- Modular portable repair system
- Designed for robotic or manual repairs and coatings
- Deployable for in-field repairs



## D523

- Portable low-pressure cold spray coating
- Modular portable repair system
- Designed manual repair and coatings
- Deployable for in-field repairs
- Can be vehicle mounted



# European Defence Agency – Live Trials



“Unbeatable” high quality, fast, long-lasting repairs.

- Logistics Exercise May 2023
- Evaluate Cold Spray in-field
- Using
  - Portable Compressors
  - Portable Battery Packs
  - Portable Generators
- Significantly **faster** and **stronger** repairs



D523 with Battery Pack



Bullet Hole Repair - Sweden



# European Defence Agency – Live Trials

“Unbeatable” high quality, fast, long-lasting repairs.



Bearing seat repair  
Finland



Ball Valve corrosion repair  
France



Engine puncture repair  
Netherlands



# European Defence Agency – Live Trials

“Unbeatable” high quality, fast, long-lasting repairs.



Track repair  
Sweden



Proven performance



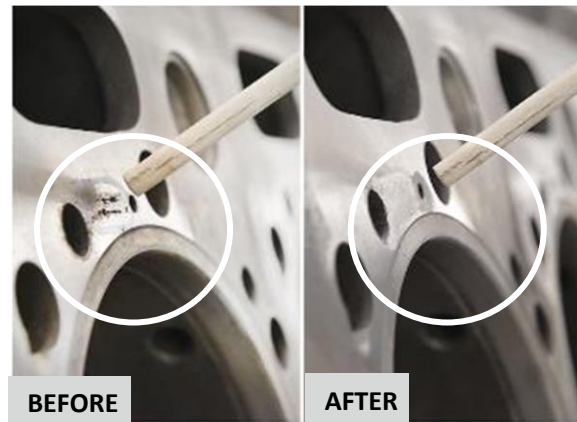
# Metal Restoration

“Unbeatable” high quality, fast, long-lasting repairs.

- Adopted cold-spray in 2011
- Significantly **faster** and **stronger** repairs
- Established method of engine remanufacturing
- In Magdeburg alone, **over 60 crankcases are repaired with cold spray yearly.**
- Repair of crank cases worth **\$455,000 often for less than \$350**
- Mitigating effects of 6-month lead times.



Titomic's D523



“We can offer customers quick and high-quality reconditioning of parts, the speed with which the component is ready for use again is unbeatable”

MTU Reman Technologies Magdeburg.



# Proven in Defence & Aerospace

Militaries and defence organisations are saving millions of dollar by utilising cold spray.

1

## Australian Defence Applications

- RAN Seahawk  
\$5M transmission cost savings over 4 years ,75% reduced downtime of gearbox
- RAAF F/A-18  
\$3M savings by recovering 'beyond-repair' Replacement Spares

2

## US Defense Applications

- US ARMY UH-60 Black Hawk | AH-64 Apache | Sikorsky H-53 repairs  
\$23.6M estimated savings per year repairing magnesium gearbox housings, \$300M estimated total savings
- US ARMY  
Patriot missile component manufacture
- US NAVY AIR F/A-18  
Approx 200 applications, \$13M estimated total savings.
- US NAVY SEA  
>18 applications, > \$2M estimated savings to date, reduced downtime Average of 11 months

3

## Aerospace Commercial Applications

- Airbus  
Repairs under EASA umbrella
- Boeing  
OEM component under FAA umbrella

## Proven maintenance capability

A user-friendly, simple, effective maintenance solution that's proven in-field.





# Dimensional Restoration, Coating & Sealing



Easily repair damaged parts, surfaces and secondary structure to original condition without the need for welding, mechanical fastened repairs or adhesive repairs.

### Applications include:

- Corrosion damage repair including exfoliation , pitting and stress corrosion cracking,
- Repair of mating surface damage (wear, corrosion etc.) including bearing seats etc.
- Impact damage repair.
- Erosion
- Hermetic sealing of leaks to components and secondary structure
- Specific area applications

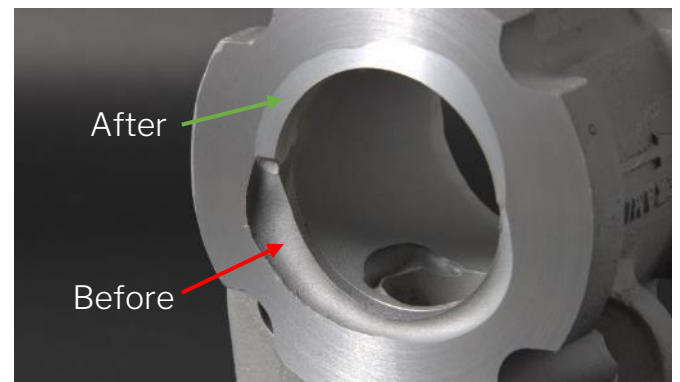
Typical products that are repaired include pumps, transmissions, engines, landing gears, wheels, shafts, skins, heat exchangers, valves and more.

### Benefits:

- In most cases disassembly is not required
- Material deposition type can be tailored for longer in simple surface preparation required.
- No heat-affected zones, no pre-heating of part
- Can be delivered by hand or robot
- Repairs up to 50mm thick,
- No post heat treatment ,
- Directly machinable,
- Fast and portable.

## Proven maintenance capability

A user-friendly, simple, effective maintenance solution that's proven in-field.





# Manufacturing applications



# Armaments

Enabling multi-metal, high-performance barrels

## Value Proposition

- Unique manufacturing solution for high performance barrels
- Enabling better material selection for:
- Improved erosion and corrosion resistance
- Improved strength to weight ratios
- Higher velocity rounds

## Applications

- Hybrid Barrels offering
  - Lightweight
  - Better thermal management
  - Better erosion resistance
  - Better corrosion resistance
- CSAM Barrels offering
  - Rapid manufacturing
  - Onshoring
  - Lower Capital investment



Partnering with Repkon, leveraging Titomic Kinetic Fusion and flowforming to innovate and create high-performance, lightweight, heat resistant barrels.

## Armaments

Creating lighter, stronger armour to extend mission range and keep personnel safe.



# Ballistics

For lighter, monolithic protection

## Value proposition

- Affordable and lightweight titanium armour
- Near-net shape manufacturing
- Monolithic structures: weldless assembly
- Tailored performance with multi-material architectures
- Weight reduction for increased speed, range and space

## Applications

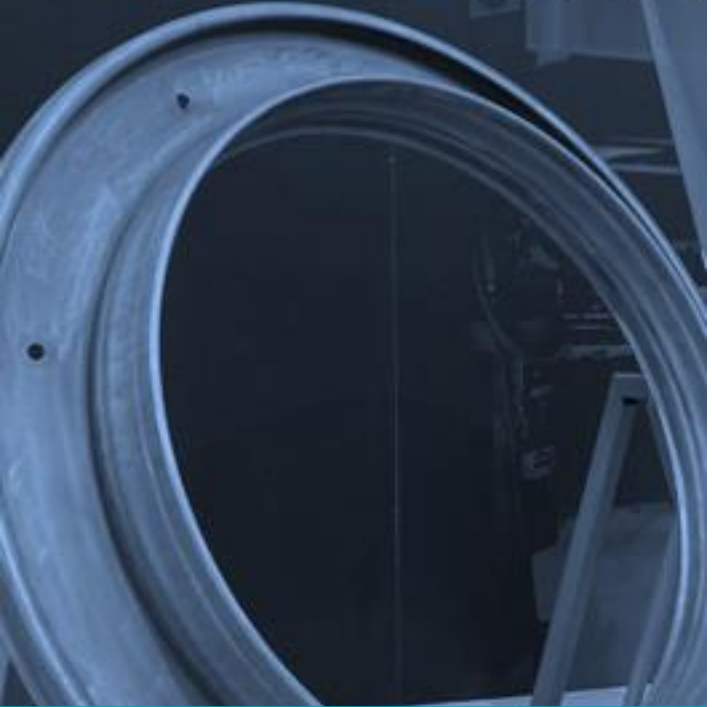
- Ballistic protection
  - Armoured vehicles
  - Naval vessels
  - Lightly armoured aircraft/helicopters



Ballistic protection

Targeting the defence industry

Manufacturing  
made sustainable



## Structures

Exploiting Titomic's technology and cost benefits for lightweight, rapidly manufactured solutions

# Structures



For lighter, stronger, larger titanium components and endless possibilities.



Half the weight of steel



Build heterogeneous parts from multiple metals



World's fastest AM process



Freeform 3D structures



**Titomic Kinetic Fusion - a better way to manufacture with titanium.**

Example part	Large titanium ring
Diameter	1.2 metres
Weight - as built	60kg
Weight - post machining	56kg
Buy-to-fly ratio	1.08
Build time	12 hours
Machining time	2 hours
Material cost	~AUD 3,000
Weight reduction compared to steel	-50%



# Propulsion Systems

High temperature and MMC components

## Value Proposition

- Other methods of forming refractory metals are costly and require expensive systems.
- Forms near-net shapes at lower temperatures and pressures, and **not in hours, but minutes**.
- Enables solid rocket motors to travel **further and faster**, compared to pure refractory metal counterparts.

## Applications

- Solid rocket boosters
- Nozzles
- Heat-resistant componentry

Fast, cost-effective, and enables advanced material combinations for enhanced in-field performance.



Tantalum nozzle, manufactured in under 20 minutes



Inconel fused with copper to create inbuilt cooling channels



## Propulsion systems

Utilising multi-metal parts to enable novel capabilities for propulsion and other rocket componentry.



# Thin-Walled Pressure Vessels



Rapid manufacture of seamless or sectioned pressure vessels



~4.5 kg/hr build



Single piece



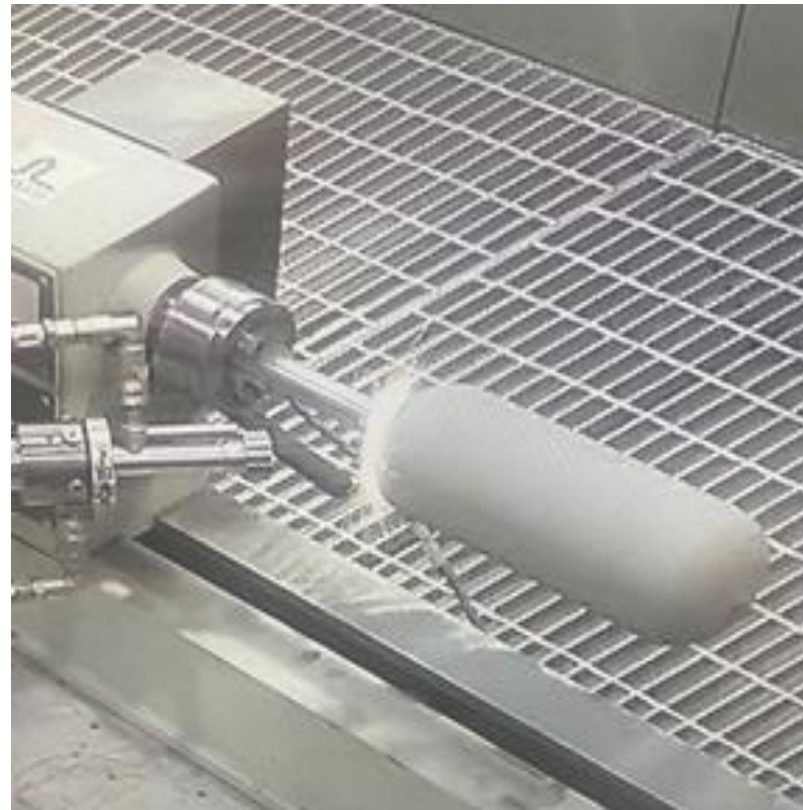
Customizable wall thickness



No weld seams  
No heat-affected zones



Integrated features



## Pressure Vessels

Exploiting Titomic's technology and cost benefits for lightweight, rapidly manufactured solutions



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