



The better way to restore and  
protect your assets

Titomic's D523 Cold Spray System





# Topics

1. Titomic Company Overview
2. What is Cold Spray?
3. What is a D523 Cold Spray Machine?
4. Applications and Case Studies
5. Opportunity for Questions

Speaker

Jesse David Lang  
Product Design Manager, Americas





# Who we are

- Titomic is an integrator of breakthrough **cold spray** technology and **turnkey systems** into your existing facilities to **maximize production uptime**
- Founded in 2014
- **50+ staff** across engineering, quality and commercial
- Presence in **6 countries** (AUS, U.S, Europe, U.K, India, Middle East)
- Operates in **10+ industries** globally including Aerospace, Defense, Mining, Transport and Resources
- ISO 9001, ISO 27001, AS 9100, DFARS

*Titomic's manufacturing bureaus for cold spray production and R&D are located in Australia (top-left and bottom) and The Netherlands (top-right)*



# Where we are





# What we do



## ADVISORY & PROTOTYPE

- Research/development
- Design for manufacture
- Prototyping
- Process development
- Feasibility studies



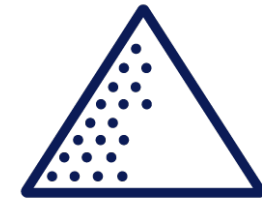
## MANUFACTURING SERVICES

- Cold spray additive manufacturing
- Repairs & coatings services



## SYSTEMS + MAINTENANCE

- Cold spray additive systems
- Low/high pressure coating systems
- Bespoke systems



## METAL POWDERS

- Cold spray additive manufacturing
- Coatings



# What is cold spray?



## **Cold spray is a metal coating process**

- Very minimal heat involved (as low room temperatures at surface)
- Uses metal powder, compressed gas and electricity
- Powders are fused together on impact due to kinetic energy
- Creates very dense, strong metal coatings up to 2 inches thick
- <0.5% porosity, 4 – 11+ KSI bond strengths
- Two major commercial types ("low" and "high" pressure cold spray)



*Rendered time lapse (left to right) of cold spray particle "splat" metallurgical bonding*



# Low vs High Pressure – the complete range

D523 (70 psi) – surface reconditioning/protection

- Coatings & repairs (portable & static)



ISB-11



ISB-12



ISB-10

TKF1000 (700 psi) – hard materials, structural repairs/parts

- Coatings & repairs (static)
- Additive Manufacturing (Titanium, Steels, Nickel Alloys)



Spray metal within 10 seconds



Rapid material build-up



No need to pre-treat



Directly machinable



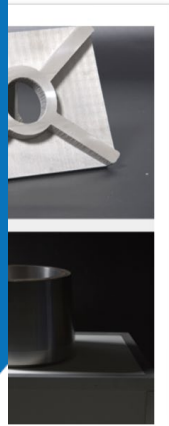
Manual and automated spraying



Easy to move between worksites



Full colour touchscreen control



D523



# Low Pressure Cold Spray





# Materials



A wide range of metals can be processed.

These include:

Aluminium

---

Zinc

---

Copper

---

Tin

---

Nickel

---

Babbitt

---

Gold

---

Silver

---

Platinum

---

Inconel 625 (He)

---



## Application: dimensional restoration

Easily repair damaged parts and surfaces to original condition without the need for welding.

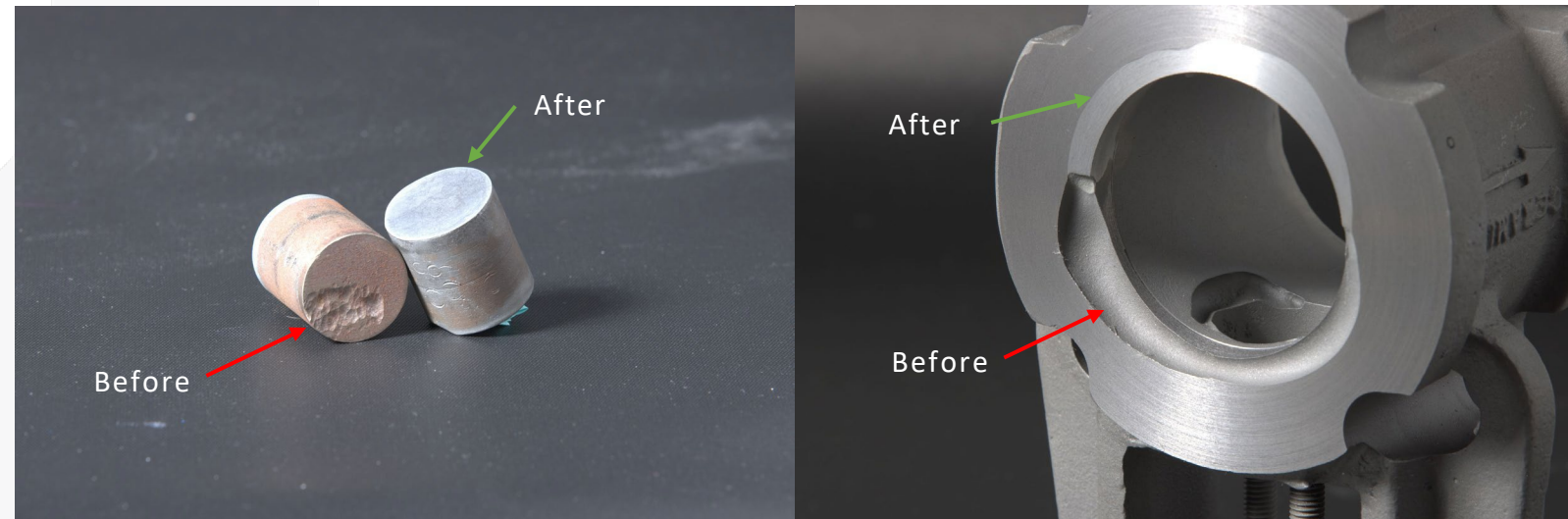
### Applications include;

- Repair of Cast Iron/Aluminum/Steel/Copper and more
- Engine blocks and transmission casings
- Bearing seats and mating interfaces
- Electrical components and heat-exchangers
- Pitting, porosity or cracking
- Hermetic sealing of leaks

Benefits – no heat effected zones, no pre-heating of part, repairs up to 2 inches thick, no robotic programming required, directly machinable, fast and portable, doesn't require dry or clean surfaces.

## Dimensional Restoration

Recovering metal parts to OEM specifications





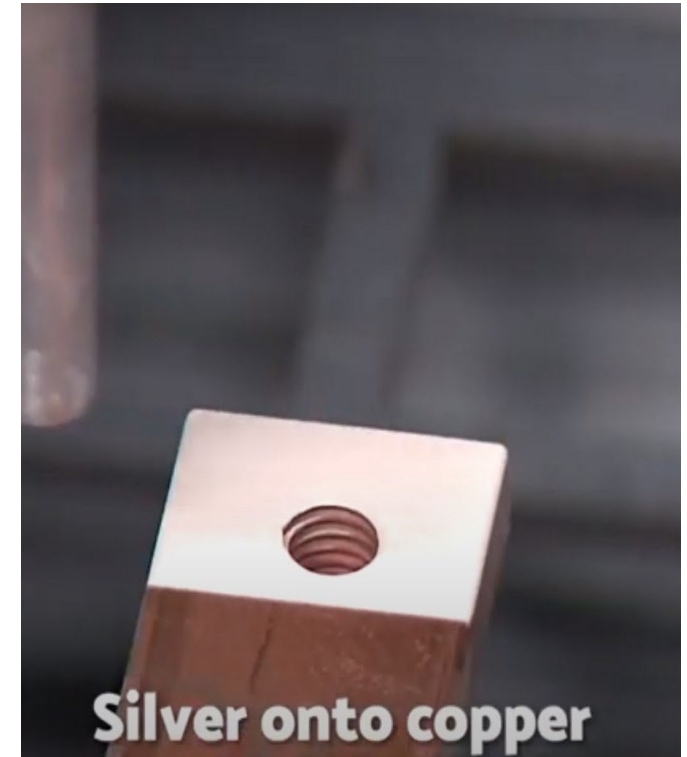
## Application: functional coatings

Apply a large variety of functional metal coatings to protect components in harsh operating environments.

### Applications include;

- Corrosion resistant coatings
- Heat resistant coatings
- Electrically conductive coatings
- Anti-fouling/bacterial coatings

Benefits – no heat, much thicker coatings, no size limitations, coatings applied on site



Silver on Copper Bus Bar – electro-plating replacement

## Functional Coatings

Extend and protect the life of valuable assets





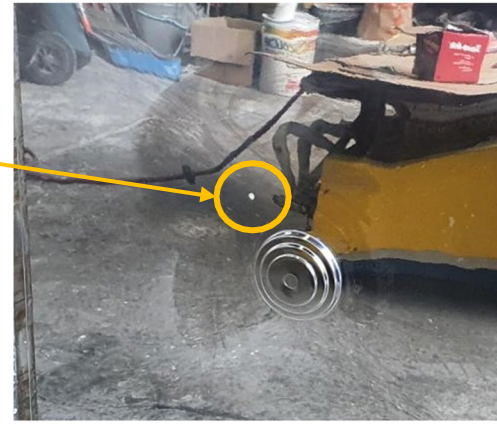
## Use case: dimensional restoration

Composite Materials Engineering



**\$2,850 vs \$38,000**  
**4 hours vs 3 months**

- 4-Tonne Steel tool working surface damaged during operation
- Required urgent repair, holding up production
- CME quoted \$38K + 3-4 months turnaround via international
- Titomic took the D523 to site, repair conducted in 4 hours and cost \$2,850
- Tool was finished manually and has since produced over 400+ shower floors





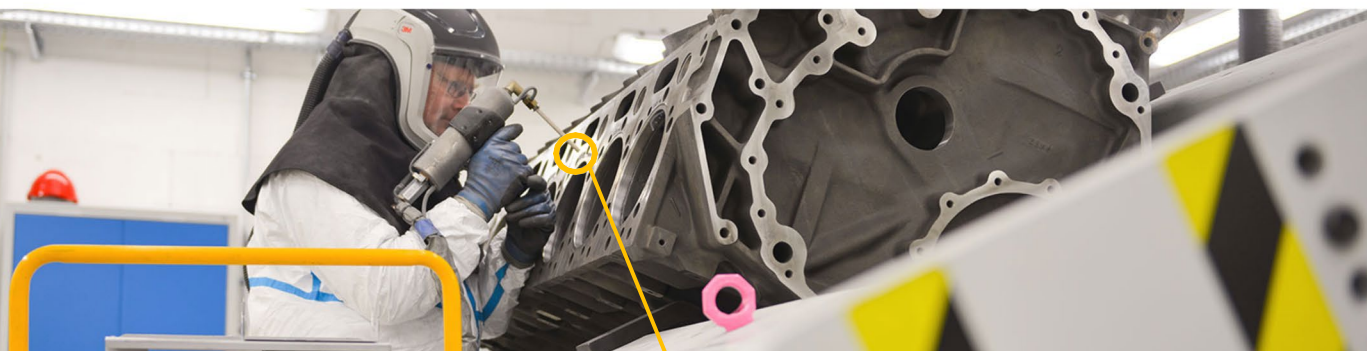
## Use case: dimensional restoration



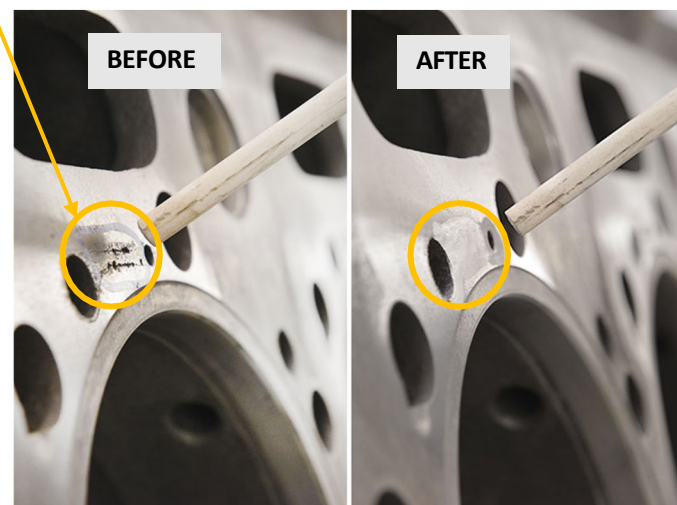
MTU GmbH



- Adopted cold-spray in 2011
- Significantly faster and stronger repairs
- An established part of the engine remanufacturing process
- In Magdeburg alone, over 60 crankcases are repaired per year with CS
- One crank case can be upwards of USD \$300K, and 6 months lead time



*"It can fill surface damage up to 10 mm deep within a few minutes. And the best thing is, the crankcase itself is hardly heated at all, does not have to dry out and can be further processed immediately afterward. As well as that, the repair lasts significantly longer." - MTU Reman Technologies Magdeburg.*



*"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.*

*Images and quotes courtesy of MTU Reman Technologies Magdeburg*





## Use case: dimensional restoration/coatings

### D&C Coating Singapore

- Using cold spray since 2015
- One of the main reman workshops in APAC
- Repairs over 200+ cast iron and bronze parts per year with CS
- Saves 100's of man-hours vs welding per year, and tons of scrap
- D523 offers far superior repairs to other forms of thermal spray





# Who we currently serve

Over 70 D523 machines sold in the last 5 years





Contact Us:  
[www.Titomic.com](http://www.Titomic.com)

Questions?

**TITOMIC**

Titomic Limited 3/270 Ferntree Gully Road, Notting Hill, Victoria 3168, Australia  
PO BOX 225, Mount Waverley, Victoria 3149, Australia

[info@titomic.com](mailto:info@titomic.com) | [titomic.com](http://titomic.com)



**BACKUP SLIDES**



# ISB Series – ISB 10





# ISB Series – ISB 20



# Titomic Machine Portfolio



Configurations of each system are available for specific customer needs.



## TKF 9000

- High pressure robotic Cold Spray additive manufacturing and coating
- Build volume of 1,430 ft<sup>3</sup>
- Deployed in the Titomic Melbourne Bureau



## TKF 1000

- High pressure robotic Cold Spray additive manufacturing and coating
- Build volume of 26.5 ft<sup>3</sup>
- 1<sup>st</sup> gen system operating at Titomic Melbourne Bureau
- 2<sup>nd</sup> gen system under construction for TWI (UK)



## ISB Series

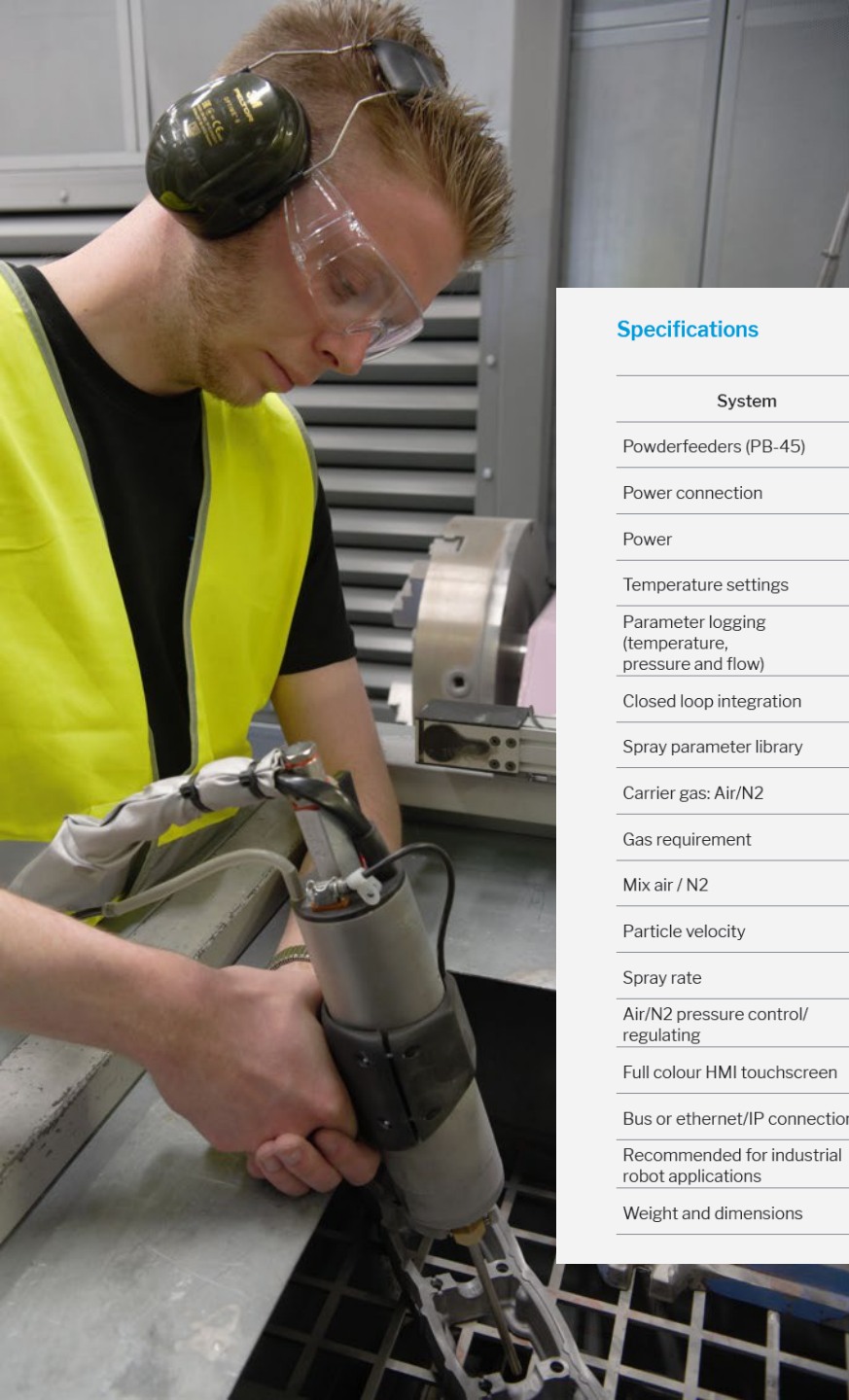
- Low pressure robotic Cold Spray coating
- Robotic or linear coating system
- Automated loading and unloading
- Ideal for R&D deployment or as a base for customised automated coating systems



## D523

- Low pressure handheld Cold Spray coating
- Modular portable repair system
- Deployable for in-field repairs
- Five figure price point (\$USD)





### Specifications

System	D523
Powderfeeders (PB-45)	2
Power connection	230V AC 50/60 Hz
Power	3.3 KW
Temperature settings	Variable 20 – 600°C
Parameter logging (temperature, pressure and flow)	Yes
Closed loop integration	Yes (optional)
Spray parameter library	Yes
Carrier gas: Air/N2	Yes
Gas requirement	6 bar/400L/min
Mix air / N2	Yes (optional)
Particle velocity	-600 m/sec
Spray rate	-30 gr/min
Air/N2 pressure control/ regulating	Yes
Full colour HMI touchscreen	Yes
Bus or ethernet/IP connections	Yes
Recommended for industrial robot applications	Yes
Weight and dimensions	43kg / 550 x 1420 x 266mm

## D523 specifications



Spray metal within 10 seconds



Rapid material build-up



No need to pre-treat



Directly machinable



Manual and automated spraying



Easy to move between worksites



Full colour touchscreen control





# Nozzle types



## Nozzle Inserts

- LPOA.CK20 (steel)  
Steel nozzle insert  
Very suitable for manual repair applications



- LPOA.CK35 (ceramic)  
Wear resistant ceramic nozzle insert  
Very suitable for automated processes



- LPOA.CK7 (steel)  
Steel nozzle insert  
For applying larger flat coating surfaces



## Nozzle for inner diameter

- LPOA.K40  
Minimum ID 60 mm  
Modular extensions available



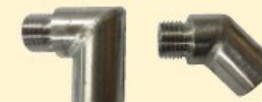
## Water-cooled nozzle (set)

- LPOA.K35-WC & LPOA.CK35-WC  
Watercooled nozzle  
For spraying low melting point metallic and plastic powders  
Can be supplied including a high efficient cooling unit



## Set of adaptors 45° and 90°

- LPOA.CK25  
Makes spraying under 90 and 45 degree angles possible  
Suitable for the LPOA.K20, the LPOA.K35 and the LPOA.K7







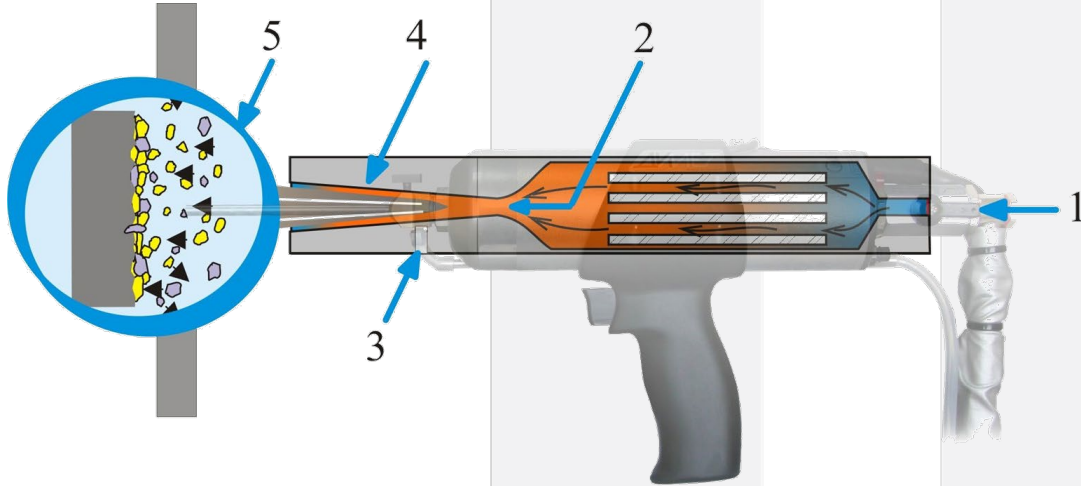
## Dycomet (Titomic Europe)

- Acquired by Titomic in December 2021
- European OEM of Cold-Spray Equipment
- Industry leader, established in 2006
- Services 10+ industries (Rail, Mining, Automotive, Transport, Off-shore, Defence, Aerospace, Energy...)
- Over 70 machines sold in the last 5 years





# Principles of Low-Pressure Cold Spray (LPCS)



- 1) Cold gas (5-8 bar)...air or nitrogen
- 2) Heated gas (0 – 600C)
- 3) Powder injection point
- 4) Supersonic particles
- 5) Impact surface/coating build up



## Key attributes of LPCS

### Speed

- 0.5 – 3kg/hr
- Spray within 10 seconds

### Energy

- Single Phase

### Gas

- Air (6-8 bars)
- Particle velocity up to 600m/s

### Materials

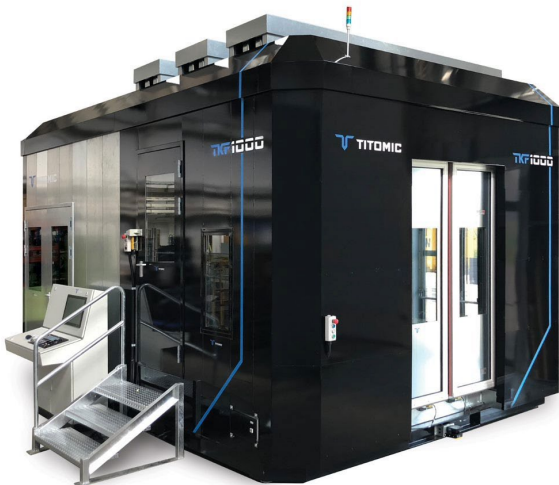
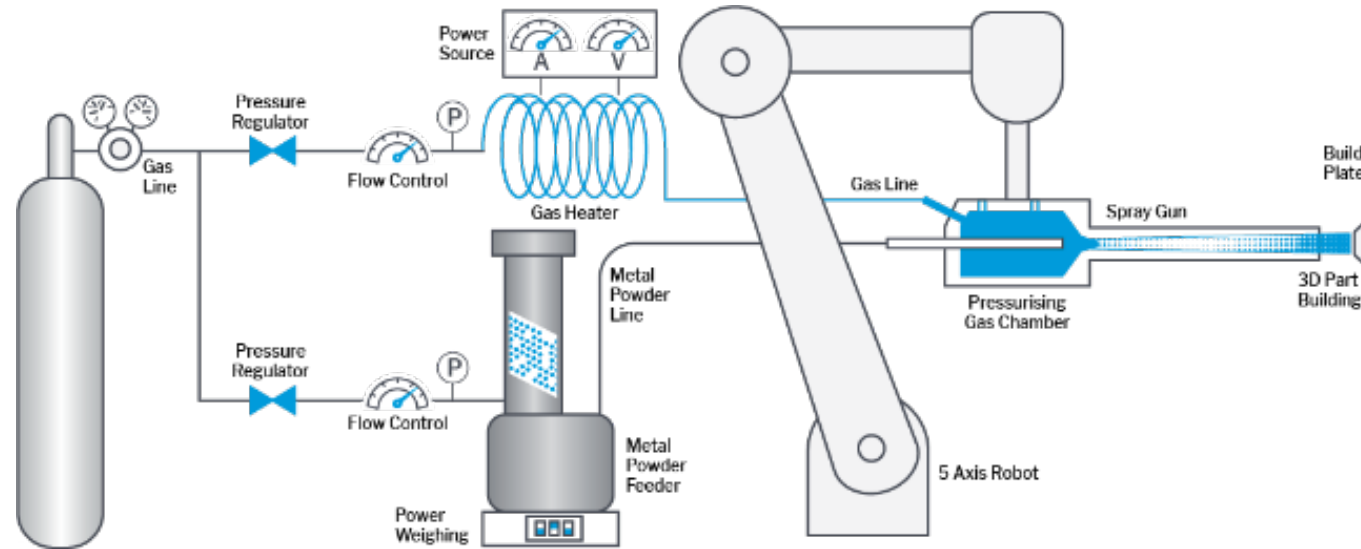
- Aluminium, Copper, Nickel, Zinc, Tin, Silver, Babbit...

### Cost

- Low



# Principles of High-Pressure Cold Spray (HPCS)



Proprietary to Titomic Limited

## Key attributes of HPCS

### Speed

- 3 – 10+ kg/hr

### Energy

- Three Phase

### Gas

- Nitrogen/Helium (50 bars)
- Particle velocity up to 1000m/s

### Materials

- All LPCS + Titanium, Nickel Alloys, Steels and more...

### Cost

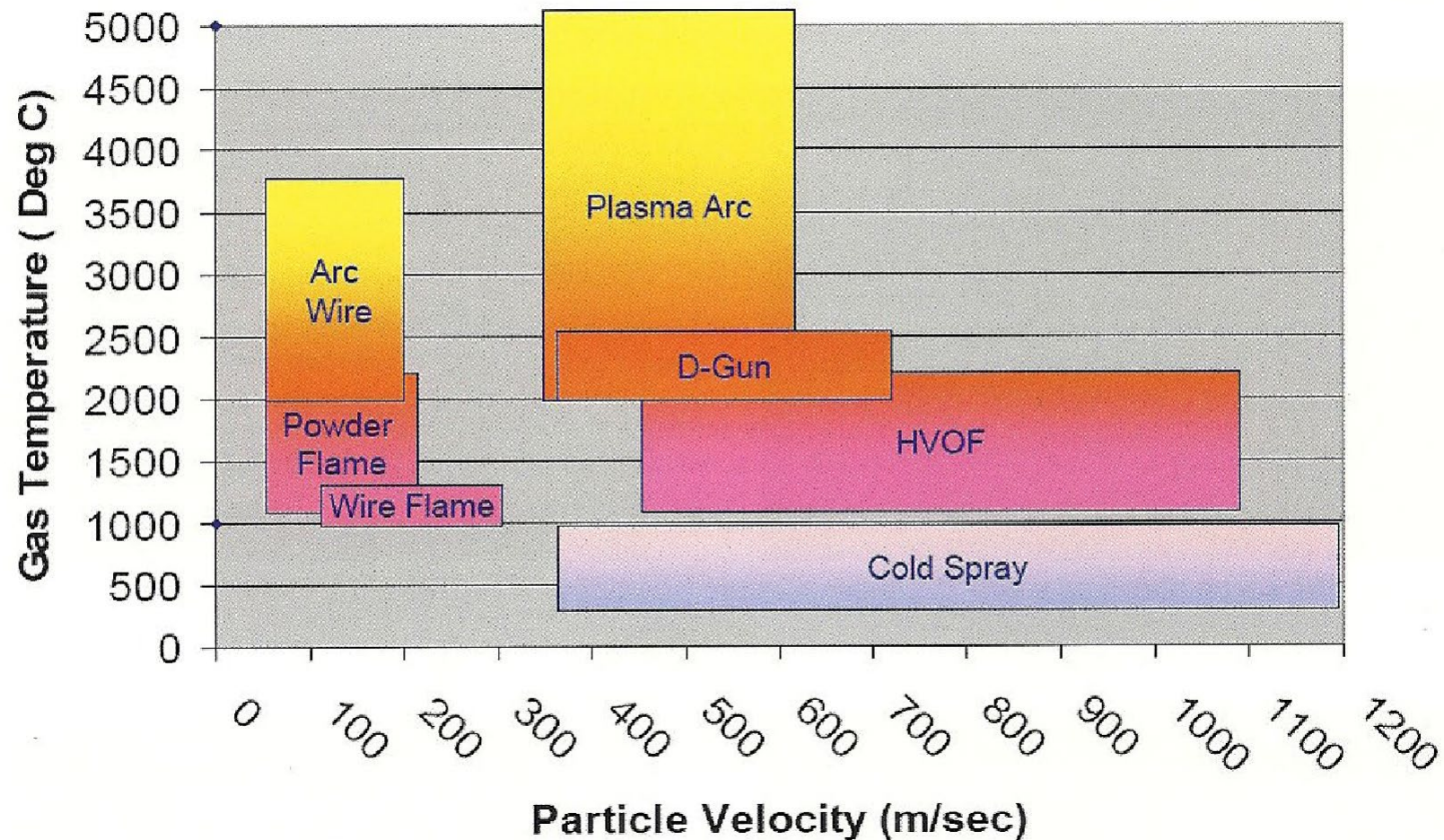
- Medium/High





# What is cold spray?

**The Thermal Spray T-V Diagram**







## The Challenge

- A 2018 survey of 500 Australian manufacturers showed 55% of respondents intend to reshore their operations to Australia by 2023 due to COVID market volatility.
- This was compounded with international freight delays, costs, and long lead times due to labour shortages, leading to a significant impact on revenue and operations.
- Titomic's cold-spray solutions put control back into the hands of businesses
- Allows manufacturers to extend the life of critical assets and maximise uptime/profitability by reducing their reliance on international suppliers

<https://pros.com/news/australian-manufacturers-say-reshoring-by-2023-is-likely-due-to-market-volatility-according-to-pros-survey/>