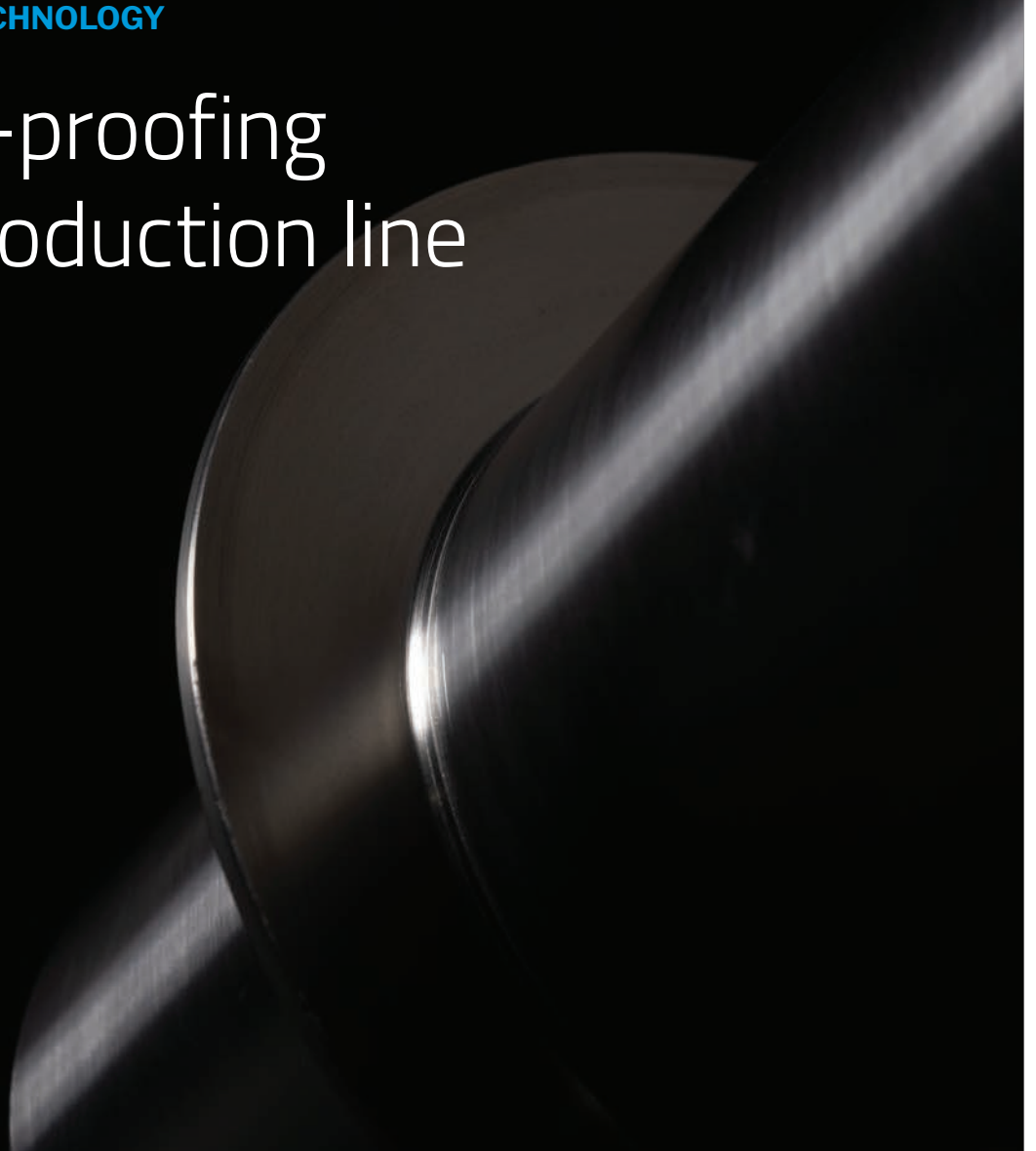




COLD SPRAY TECHNOLOGY

Future-proofing
your production line





With ongoing supply shortages and rising costs, keeping production lines running without interruption is becoming a bigger and more costly challenge for many manufacturing leaders.

In this whitepaper, learn how compact cold spray systems make equipment last longer – resulting in more uptime, greater revenue potential, and increased safety and sustainability.

CONTENTS

What is cold spray?	3
Cold spray technology in action	4
Additive Manufacturing	4
Coatings & Repairs	4
5 reasons why your production line needs cold spray	5
Future-proof your production line	7
How we can work with you	8



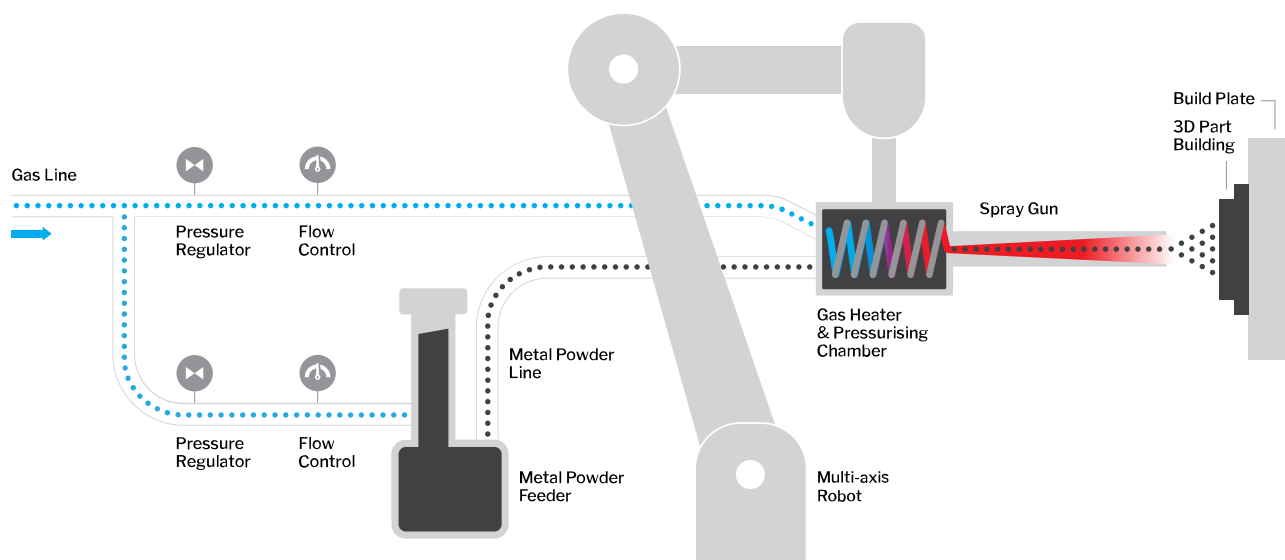
What is cold spray?

Also known as 'cold gas dynamic spray' or 'supersonic particle deposition', cold spray is a melt-less thermal spray coating process in which metal parts are built by accelerating particles through a nozzle gas stream at supersonic speeds.

The particles exit the spray nozzle and collide with the scaffold surface, where they plastically deform, sticking to the surface and each other. The build-up of these particles rapidly develops into near-net-shape metal parts.

Cold spray is the only manufacturing process that can create high-strength metallurgical bonds without melting the materials.

How it works:



1

Metal particles are injected into a gas jetstream.

2

The particles accelerate at supersonic speeds.

3

The particles exit the spray nozzle.

4

The particles collide with the surface and deform, sticking to the surface and to each other.

5

The particles build up, developing into near-net-shape metal parts.

Some key advantages include:

- ✓ Low thermal load on materials (typically: scaffold 50-250°C, spray material 50-900°C) allowing the ability to work with thermally sensitive materials as well as dissimilar materials
- ✓ Deposition results can be in compressive residual stress for better as-built mechanical properties of many geometries
- ✓ Deposition rate typically 1-8kg/h, up to 15kg/h of material making it fit for production speeds/volumes
- ✓ Mechanical properties similar to highly deformed bulk material
- ✓ Absence of a heat affected zone (HAZ), ensuring a quality bond without changing the microstructure (and thus, structural characteristics) of the scaffold

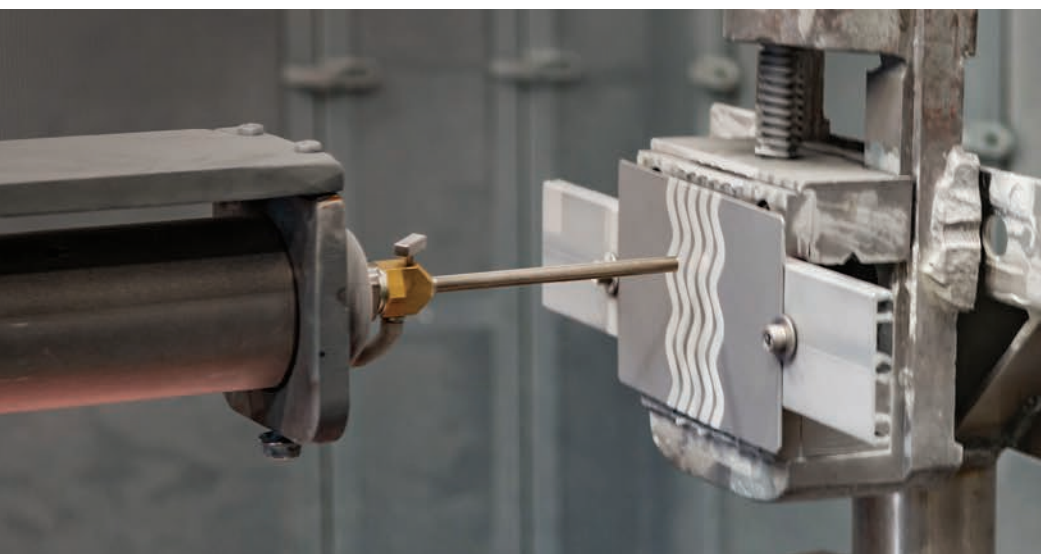


Cold spray technology in action

Cold spray can be used to quickly repair worn or damaged components – or as a form of additive manufacturing to rapidly build parts layer by layer.

Seamlessly integrated into existing production lines and built to each customer's specific requirements, Titomic's Kinetic Fusion Additive Manufacturing (TKF AM) and Coatings & Repairs systems harness patented cold spray technology to produce high-performing parts or perform coatings and repairs on demand – while combating the most complex manufacturing challenges.

	Additive Manufacturing	Coatings & Repairs
What	Highly efficient manufacturing cell that harnesses patented cold spray technology to fuse dissimilar metals and create custom parts.	Fully customisable, compact cold spray systems that enable rapid repairs and metal coatings without heat.
How	High-pressure cold spray system coats surfaces with strong layers of specialty metals without melting, to unlock limitless design possibilities with minimum heat distortion.	Low and medium-pressure cold spray with integrated advanced powder feeders easily and rapidly applies thinner coatings to repair and restore temperature-sensitive parts using softer metals, mixtures, and powders.
Why	<ul style="list-style-type: none">• Superior to cast & wrought materials• Maximised uptime, output & productivity• Reduced waste• Fully scalable system• Cost-competitive digital manufacturing	<ul style="list-style-type: none">• On-demand coatings & repairs• Denser, thicker & corrosion-resistant parts• Increased adhesion• Improved conductivity• Maximised uptime, output & productivity
Where	<ul style="list-style-type: none">• Ballistics protection• Armaments• Tooling• Structures	<ul style="list-style-type: none">• Radiation shielding• Wear-resistance• Corrosion protection• Remanufacturing• Embedded sensors• Wind & energy• Inductive coatings



Cold spray additive manufacturing is also known as 3D printing.



5 reasons why your production line needs cold spray



1. Faster output

With industry-leading build rates, Titomic's cold spray systems enable:

- the manufacture of near-net-shape geometries for faster speed to market and better buy-to-fly ratios;
- the rapid build of titanium components for lighter aircraft, armoured vehicles, rockets and more; and
- rapid surface repairs with closed loop robotic systems.

EXAMPLE

Our D523 low-pressure cold spray system was used at remote Alaskan wind farm, Fire Island Wind, to repair a wind turbine heat exchanger.

This is typically a logistical challenge, as the parts need to be drained, removed, and replaced – requiring hours of labour and costing up to \$80,000.

The D523, however, blasted away corroded material and re-coated the heat exchanger in just two hours – and for less than \$500 worth of materials that will withstand challenging coastal conditions.



2. High performance

Compared to traditional manufacturing methods, cold spray makes it possible to build and restore solid-state metal components that are faster, lighter, stronger, and longer lasting – even in the most demanding environments, such as aerospace, oil and gas, defence, and mining.

Plus, the flexible nature of the technology enables manufacturers to access novel, cost-effective materials with unprecedented capabilities. This includes combining materials to make heterogeneous metal alloys and exclusive blends (such as titanium with ceramic) to combat corrosion, wear, and any other issues impacting operations.

EXAMPLE

While titanium has always been a preferred material for the production of lighter, more mobile, and more protective combat vehicles, it is often cost-prohibitive, complex to manufacture, and difficult to source.

However, by combining titanium with high-speed additive manufacturing technology, our defence clients have been able to produce affordable, lightweight, and high-performance titanium armour with multi-material architectures.



3. Reduce waste

Compared to conventional approaches, our cold spray additive manufacturing systems enable the manufacturing of high-density structures with reduced carbon footprint. Specifically, we have seen reductions in carbon emissions of up to 60%, together with reduced material waste of up to 80%. Moreover, cold spray technology has 100% renewable energy capability.

EXAMPLE

When engineering shop Mallee Machining Services required the resurfacing and repair of an electrical motor bearing housing, a lengthy and expensive sleeving process seemed to be the only option. This requires a large cylindrical pipe billet to be machined to the desired diameter and thickness, and then cooled so that it can be forced inside the bearing.

Not only is this a costly and time-consuming endeavour, it also results in around 80% of material being wasted, since the standardised billet has to be machined down to the right size.

Instead, Titomic's D523 low-pressure cold spray system with nickel was used to repair the bearing in just 1.5 hours at a material cost of \$120 and a significant waste reduction.



4. Portable repairs

Typically, reconditioning and repairing equipment such as fuel tanks requires off-site solutions involving removal from the vehicle, drainage, explosion proofing, and welding.

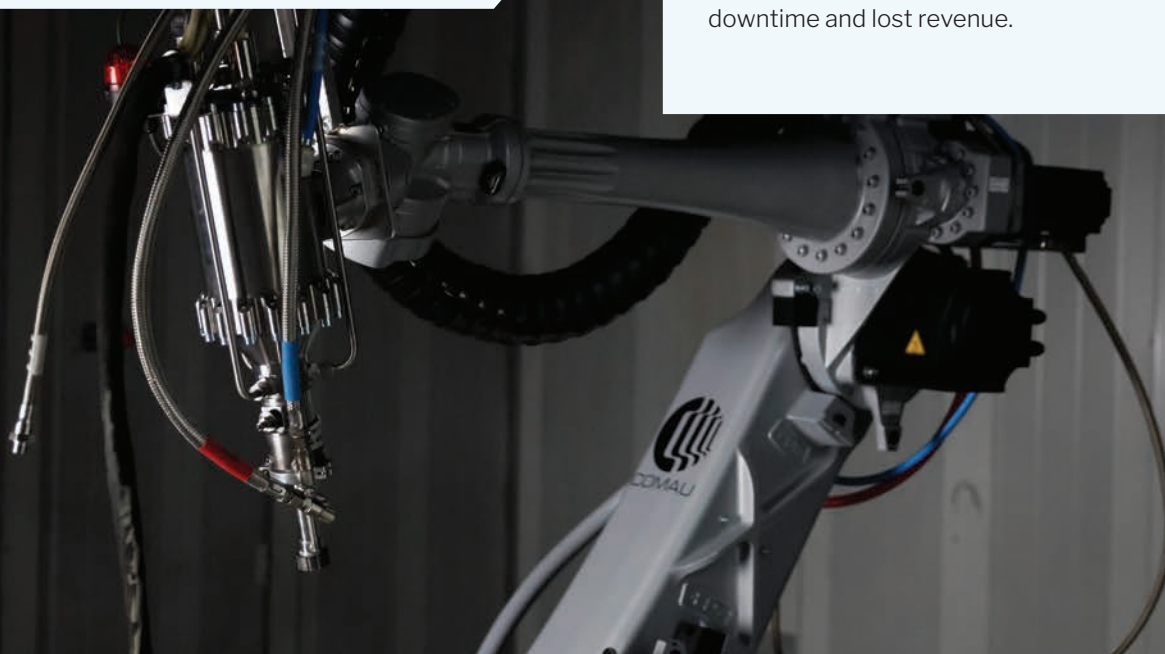
This multi-step process requires significant time and resources – in fact, it often takes months and incurs significant logistics costs to compete. This downtime can also lead to lost revenue, leaving expensive assets lying dormant.

Titomic's portable cold spray systems, however, allow equipment and parts to be repaired and restored in-situ – providing customers with significant time, cost, and labour savings. Moreover, since cold spray is a low-temperature, no-melt metal deposition process, operators are able to rapidly repair fuel tanks by hand – without having to remove them.

EXAMPLE

Rather than detach and drain its 5000-litre fuel tank to repair a crack, Brauntell Engineering was able to 'vee out' the crack and used Titomic's hand-held D523 unit to fill the divot with nickel, before grinding it back, fully restoring the crack and returning the tank to a safe and operable condition.

In all, the repair job took just 30 minutes with a material cost of less than \$100. Furthermore, the manufacturer avoided potentially lengthy downtime and lost revenue.





5. Cost-competitive

It's evident that cold spray technology offers significant time, labour, and resource savings, allowing manufacturers to maximise uptime and minimise downtime. More specifically, a considerable reduction in maintenance costs can also be expected.

As a comparison, a titanium structure manufactured using cold spray technology, totalling \$3,000 in material costs, would cost minimum \$100,000 using traditional methods, and take days to complete machining.

Bear in mind that these advantages of our customisable cold spray systems are just the beginning. Our turnkey technology presents limitless possibilities for overcoming your manufacturing challenges now and in the future.

EXAMPLE

By bringing the portable D523 low-pressure cold spray system on site, a leading composite materials company was able to repair a damaged resin-transfer moulding tool in just four hours (including five minutes to fill the hole with nickel, before removing the excess and hand-polishing the tool) for a total cost of \$2,850 – compared to four months and \$38,000 to ship the tool overseas.

In the time since it was made functional again, the tool has gone on to manufacture over 300 parts. While operations continue, the manufacturer can take the time to decide whether or not to replace it in the future.

Future-proof your production line

As a global technology integrator, Titomic can work with you to bring the best metal manufacturing method to your supply chain.

Bring us your greatest manufacturing challenges and we'll apply our advanced technology, team, expertise, and support to help you overcome it quickly and cost-effectively.

By working together, we can ensure your operations are as competitive, productive, and profitable as possible – whatever the future brings.



How we can work with you



Need to manufacture a prototype?

We can do it quickly and cost effectively.



Need to build your first parts?

We can be your small-to-medium-volume manufacturer.



Want to bring it all in-house?

We can integrate our system into your production line.



Ready to expand?

We can invest in your production line, sharing the risks and costs.

Book a complimentary consultation to help decide if our solutions are right for you.



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