

# A Study on Aircraft Components Repair with Cold Spray Technology; Introduction of Cold Spray Technology to Aviation Industry

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**Abstract** – This paper describes about the Cold Spray Technology and its applications in Aircraft industry. It will give us a clear picture of how CST will change the Aircraft manufacturing and repair industry. This is the first paper to introduce about Aircraft's Components repair with Cold Spray Technology like Aircraft Propellers, Aircraft Landing gears and Aircraft Fabrication. Most of the Aircraft Components repair is done with 7075 Aluminum alloy powder coat or mixture of different aluminum alloys. This makes the repaired component or fabricated area is stronger and Corrosion resistance along with longer life span. However; certain precaution along with procedures need to follow in order to get successful results. There have been great and high success rate of using the Cold Spray Technology is militarily and Air force in many developed countries like Germany, Japan and United States of America. Now it's the time to introduce this CS Technology to commercial industry so that every manufacturing company can adapt this technology.

Over the years many of Aircraft Manufacturing companies scrap all its metal components once they fail to work or throw them once they are not up to the OEM Standards. Researching companies like VRC Metal Systems in Rapid City, South Dakota has achieved patents on Spray technology by collaborating with South Dakota School of Mines. VRC Metal Systems created new wealth opportunities to the manufacturing and metal repair industries. This technology will be helpful to the most of the industries deals with metals that not only repairing with Cold Spray Coating but also in tools and fabrication repairing (vrcmetalsystems).

**Keywords** – Aircraft Components repair with Cold Spray Technology; Cold Spray; stress corrosion cracking; Thermal Spray.

## I. INTRODCUTION OF COLD SPRAY TECHNOLOGY

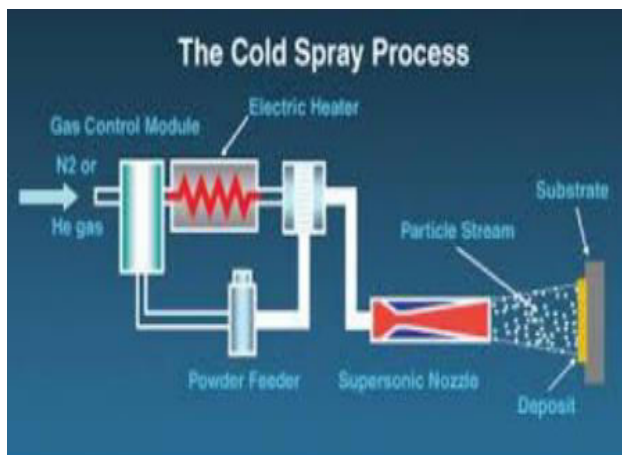


Fig.1. Cold Spray Technology Process (sdmt.edu and vrcmetalsystems.com).

Cold Spray technology is not only versatile but also potentially cost-effective technology. This technology can be used with verity of wide range of metals. This technology can be used and can be applied to any metals that are suffering with corrosion and wear and tear. It's been successfully applied towards rebuild on any worn metal parts. This technology can be applied by hand or also can be used by robot technology either both in factory and in the clients filed. Due to its strong capability this technology can improve the parts quality and its performance along with efficiency and repair cost. This technology can be used and may bring down the cost in industries like Power, Mining, Automotive, Aviation and aerospace industries.

This cutting-edge technology was researched and developed by Soviet Union in 1980's but it was commercially announced to industries in 1year 1990 (Wiki). This technology was divided into two types by naming them as HPCS- High Pressure Cold Spray and LPCS- Low Pressure Cold Spray. This technology can be

used with metals like Steel, Aluminum alloys and many other metals that's use in manufacturing industries.

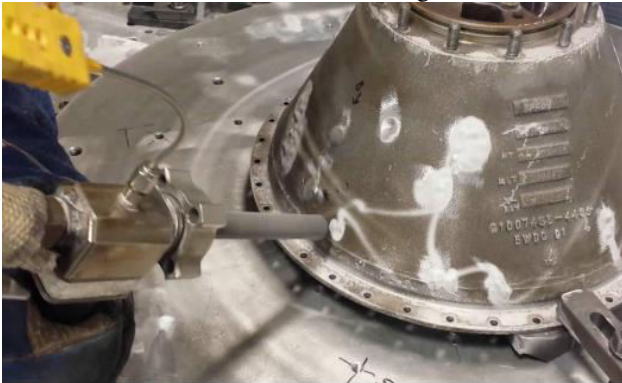


Fig.2. Spraying on Aircraft Component (sdmt.edu and vrcmetalsystems.com).

This technology is very strong and unbreakable once it is applied to the surface of the metal and still will be in compressed stage due to high pressure coating even after it cools. In manufacturing industries, it is considered as one of the toughest coating and once applied cannot be removed. Dr. Christian Widener, PhD, A research scientist and co-founder of VRC Metal systems believed and proved that, Cold Spray technology is not only low cost but also wear and corrosion resistant.

In modern world, manufacturing and metal repairing companies are attracting use advanced technology and engineering coating methods that helps to increase high performance limits to enhance metal components and their usage in Aviation and Aerospace industries. Most of the companies adapting to Cold Spray Technology design guidelines to repairing tips to improve and extend the life of metal components and equipment's used in Aviation and Aerospace industry.



Fig.3. Corroded Pipe and Sprayed with Cold Spray Pipe (Science Direct).

In aviation industry the cold spray technology can improve the sheet-metal fabrication surface properties of ground support equipment's as well as internal components that manufactured with metals. This will let engineers to design and repair that can benefit for the consumer with low-cost and light weight components

with better and strong base materials by increasing extra life span.

With help of Cold Spray coating for metals are proved as they perform way better than parts manufactured and produced with the same materials and it will be significantly cost manufacturer very

low investments. These Cold Spray coated parts are more resistant to not only to extreme heat but also, they are wearing and corrosion resistance which can degrade the resurfacing technical and process.

Cold Spray and its surface coating repair technology is capable to handle a wide range different applications of Aircraft by itself to Aircraft components like; Jet-Engines, Hydraulics, Landing Gear and its Trunnion Corrosion, Aircraft Propellers, Aircraft Rivet-Corrosion, Aircraft Fabrication repair, Aircraft Stress-Corrosion and may other Aircraft Structural Repairs can performed (stocktonpropeller).

Cold Spray is the cutting-edge technology this not only can excel on most of the equipment's that are used at high heat but also can excel as wear resistance. Even though; its primary demand is for heat and wear resistance but it can also improve the oxidation and chemical resistance along with helping in frictional properties by restoring the parts original dimensional Specification given by manufacturer. Not only we can save time and money by spraying multiple components with Cold Spray but also, we can eliminate the contaminated chances.

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