How Thermal Spray Technology can Grow Manufacturing

*Thermal spray coatings are low-cost technologies that can reduce corrosion in aircraft, ships, vehicles, and bridges; reduce the cost of protecting a multitude of industrial products; reduce energy usage for equipment; and increase jobs in the manufacturing sector.*

**What is Thermal Spray?**

Thermal spray is an environmentally friendly, low-cost coating process that requires no hazardous chemicals. Coating materials include a wide range of metals, ceramics, polymers, and composites that protect against wear, corrosion, abrasion, heat, chemicals, and erosion. The coatings lengthen part life, improve efficiency, and reduce repair costs in the aircraft, automotive, marine, power-generation, and many other industries. Thermal spray can also rebuild worn parts of almost any metal, and can be applied by hand or by robots, in the field or in the factory.

**How it works**

The thermal spray process involves transferring melted materials to a metal surface at high speed. The material is used in wire or powder form. It is first melted, then is accelerated onto a surface by a high-speed jet of a carrier gas such as air or oxygen.

Thermal spray equipment basically consists of a spray gun, a heat source, material to be sprayed, a carrier gas, and simple to highly-sophisticated controls. Equipment, materials, processes, and controls may be designed for specific applications. This versatility enables engineers in almost every industry to improve the function and operating lifetime of equipment and structures.

**What Industry is doing to grow applications and technology**

**The Consortium for Thermal Spray Technology** is operated by the Center for Thermal Spray Research at Stony Brook University in New York. It is a consortium of more than thirty companies involved in making thermal spray equipment, applying thermal spray, developing new powders, and supplying thermal spray gases. It was established in 1996 through the NSF Materials Research Science and Engineering Centers program. Government sponsors include the Dept. of Energy, Air Force Research Laboratory, and the National Science Foundation.

**The Commonwealth Center for Advanced Manufacturing (CCAM)** is a 50,000 square-foot, state-of-the-art facility that enables manufacturers to collaborate with faculty and students from Virginia's top research and teaching institutions on advanced manufacturing research in surface engineering and manufacturing systems. Members include Rolls-Royce, Aerojet, Sandvik Coromant, Chromalloy, Sulzer Metco, Virginia Tech, Newport News Shipbuilding, Siemens, and others.
Professional Societies such as the ASM International’s Thermal Spray Society (TSS) are dedicated to expanding thermal spray applications, improving the technology, and promoting the industry. Toward this end, TSS sponsors annual conferences such as the Cold Spray Conference and the International Thermal Spray Conference and Exposition. In addition, TSS publishes the Journal of Thermal Spray Technology and the Handbook on Thermal Spray Technology.

Thermal Spray application examples

• Jet engines operate at higher temperatures to burn fuel more efficiently. The size and weight of jet engines have been dramatically reduced over the past 30 years in part because thermal spray coatings enable operation at higher temperatures, which improves combustion efficiency and reduces emissions. Many other engine components are protected by thermal spray coatings to prevent wear, erosion, and abrasion.

• Circuit boards are made faster with less chemical processing and less energy. A thermal spray process enables copper traces to be directly deposited quickly and economically onto a circuit board. The process conserves energy, greatly reduces water consumption, eliminates nearly all process chemicals, and enables recycling of all copper material.

• Military vehicles and weapons are protected against corrosion.

• Nuclear power plant equipment needs less maintenance.

• Coal-fired boilers in power plants emit less pollution.

• Navy ship structures need less maintenance, last longer.

Industrial equipment functions better, lasts longer.

• Hydroelectric turbine blades resist corrosion, cavitation, and erosion.