



## Joint ITP Materials & FreedomCAR Project Wins R&D 100 Award

**C<sup>3</sup>'s Nanocoatings Extend Equipment Service Life at Low Cost**

### Background

- Conventional coatings often fail via spalling and cracking, which generally arise from the coefficient of thermal expansion (CTE) mismatch of the coating and the substrate, and thus limit equipment life.

### The Process

- Coatings are applied by dipping or spraying with a patented fluid, then thermally treated at temperatures not more than 450°C producing a 100 to 500 nanometers (nm) thick coating anchored to the substrate at the molecular level.

### Results

- Metal Infusion Surface Treatment (MIST) produces nano coatings that are 10 to 100 times thinner, require 10 to 100 times less coating material, and are independent of any CTE mismatch issues.
- MIST is scalable to large components, can be applied “in-field,” requires no expensive equipment, and is not limited to the type of coating or substrate material.
- Because of excellent soldering resistance to molten aluminum, C<sup>3</sup> has implemented the MIST technology in more than 35 aluminum die-casting companies.

### Highlights

- Hayes-Lemmerz International has reported a 10 time increase in the life of its laser-sharpened tungsten carbide cutting tool inserts and a doubling of machine throughput.
- Dip tests with molten aluminum performed at Pyromation reported a 8 time extension in the life of 1010 steel thermocouple sheaths.
- MIST testing at Heinz on cutting blades used in the processing of ketchup polymer bottles showed the life of the cutting blades was extended more than 5 times.

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