THERMAL SPRAY COATINGS IN THE PRINTING INDUSTRY

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MATERIALS & PROCESS TECHNOLOGIES
THERMAL SPRAY MARKET
OVER $1 B

AEROSPACE
POWER GENERATION
MEDICAL IMPLANTS
GENERAL INDUSTRIAL
THERMAL SPRAY TECHNOLOGY
Thermal Spray Components

THE THERMAL SPRAY PROCESS

1. Solid or powder feedstock
2. Electric or gas heat source melts material
3. Molten particles are accelerated
4. Particles impact on substrate and flatten
5. Oxide inclusions
6. Cleaned and roughened substrate
7. Finished coating
Complete System Components

- Acoustical Room
- Robot
- Dust Collector
- Chiller
- Spray Lathe
## COATING SYSTEM CHARACTERISTICS

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WIRE SPRAY
Arc Spray Process

The wires are fed into a “gun” where they are electrically charged and directed together to create an arc. The resulting heat melts the wire, forming droplets that are propelled by compressed air or gas to the part surface.
WIRE SPRAY CHARACTERISTICS

- LOW COST
- LOW TO MODERATE BOND STRENGTH
- HIGH POROSITY, OXIDES, UNMELTED PARTICLES
**Plasma Spray Process**

Electric & Combustion Energy

Utilizes Argon, Helium, Hydrogen, Nitrogen or Combinations

- High performance coatings of all types
- Thermal barrier (TBC)
- Most complicated thermal spray process
- Highest thermal energy
PLASMA SPRAY CHARACTERISTICS

• MODERATE COST
• MODERATE TO HIGH BOND STRENGTH
• MODERATE TO LOW POROSITY, OXIDES
• COMPLEX CONTROL
HVOF TECHNOLOGY
HVOF Processes

Powder Feedstock
Combustion Energy
- Oxygen-Kerosene
- Oxygen-Gaseous Fuel

- High integrity metallic and carbide coatings
  - Particle velocity = density
  - Low oxides
  - High bond strength
  - High spray rates
HVOF CHARACTERISTICS

- HIGH COST
- VERY HIGH BOND STRENGTHS
- VERY LOW POROSITY, OXIDES
- NEAR THEORITICAL DENSITY
Coating Quality Comparison

Inconel 718 Combustion Wire (10% porosity)

Inconel 718 Arc Spray (6% porosity)

Inconel 718 HVOF (<2% porosity)
COATING MATERIALS

• WIRES
• POWDERS
• BLENDS
• AGGLOMORATED
• FULLY ALLOYED
METALS

• PURE
  – Al, Cu, Ta, Ti, Zn, Zr etc.

• ALLOYS
  – Bronze, Stainless Steel, Co, Ni, Al
INTERMETALLICS

• CARBIDES
  – WC, Cr2C3, TaC, TiC
  – MIXTURES
  – ALLOYED WITH METAL MATRIX MATERIALS
CERAMICS

• AL2O3
• TIO2
• CR2O3
• ZRO2
• VARIOUS SOLID SOLUTIONS
  – MgAl2O4, 3Al2O3-2SiO2, ZrSiO4
SEALERS

• ORGANICS
  – EPOXIES
  – POLYESTERS
  – SILANES
  – SILOXANES
SEALERS

• INORGANICS
  – SILICATES
  – ALUMINATES
  – PHOSPHATES
  – CHROMATES
SELF RELEASE COATINGS

PREVENT PICK-UP

PREVENT ADHESION
COATING PROPERTIES

GENERALLY BALANCED

CAN BE SKEWED
Thermal Spray Benefits

Cost Effectiveness

- Lower total cost than replacement
- Downtime reductions
- High resource utilization
- Less machining required
- Inexpensive base material option

Cost of Coating < Cost of an Alternative
PRINTING & CONVERTING
IDLER ROLLS

• BARE AND POLISHED
• THERMAL SPRAY COATED WITH SELF RELEASE
• ANODIZED
ANALOX ROLLS

- HIGH PERFORMANCE CERAMICS
Gripper Rolls

- Coating must be wear resistant
- Coating should also be self release
CORONA TREATER ROLLS

• SILICONE SLEEVES, TAPE
• GLASS
• HIGH PERFORMANCE CERAMIC
THERMAL SPRAY COATING FOR THE PRINTING INDUSTRY

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