International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India

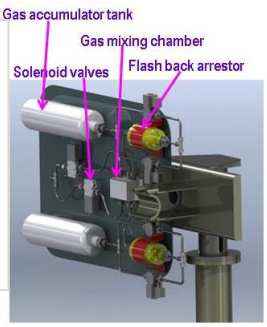
Advanced Detonation Spray Coating Technology (DSC) MARK-II

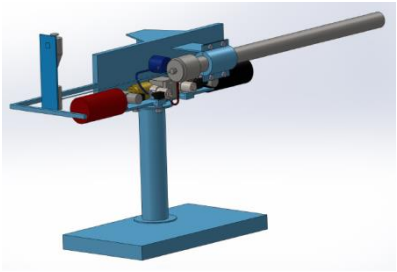
Overview

With an overall objective of enhancing the efficiency, productivity and reliability by increasing the detonation frequency (more than 3Hz) of the existing DSC system, design of various critical parts and its integration with the existing system has been initiated. Accordingly, one DSC advanced system has already been fabricated and subjected to thorough testing with regard to functional aspects and resulting coating quality. Towards design and development of such an advanced DSC system, major challenges such as modification of existing mixing chamber, elimination of numerous mechanically moving parts such as cam, gear, piston, roller, bearings, re-engineering of solenoid valves, flashback arresters, mass flow controller, PLC computer controlled system have been successfully accomplished. Subsequent to the integration of all newly designed and re-engineered parts with the main assembly system, numerous coatings were generated at higher detonation frequencies such as 6Hz, process parameters were optimized to achieve the bench mark coating quality. The new system with enhanced functional features and increased productivity and reliability will be transferred to the existing technology receivers and also to the other industries.

Key Features

- High productivity due to high pulse frequency
- Less maintenance: absence of mechanically moving parts
- Good adhesion strength (>10000 psi)
- Dense microstructure (< 1%)
- Negligible thermal degradation and excellent tribological properties
- Ability to coat wide range of powders, carbide, oxide, metal powders
- Lower substrate temperature & low oxide content
- Coatings with 50-2000 microns thickness can be produced

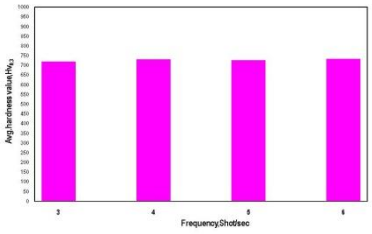




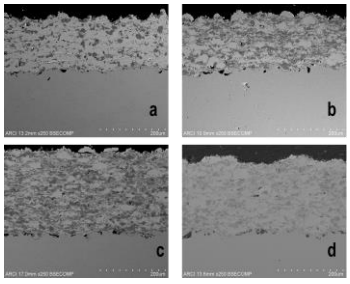
DSC gas control system & advanced detonation spray coating (DSC) system

Potential Applications

- Steel industry application such as Bridle rolls
- Textile & Paper industry applications such as wire passing pulleys, plungers, steeped cone pulleys, bearing stopper plates, guide rolls
- Gas compressor applications such as spindle valve, compressor disc, compressor shaft
- Strategic applications like HP & LP turbine blades, compressor discs, LCA nozzles, thrust beating sleeves, propeller shaft seals.
- Power and Energy applications such as guide vanes, spindle valves, hydro turbine blades.



Hardness value of Cr_3C_2-25NiCr coatings at various frequencies



Typical microstructure of Cr_3C_2-25NiCr coatings at various frequencies namely (a) 3Hz (b) 4Hz (c) 5Hz (d) 6Hz

Intellectual Property Development Indices (IPDI)

- Process parameters were optimized, coating quality, repeatability and reliability studies were completed
- Subsequent to the technology launch, new systems will be fabricated, inspected, tested and transferred to the interested industries

Status	1	2	3	4	5	6	7	8	9	10

Major Patents / Publications

- D. Srinivasa Rao et al, Detonation Sprayed Coatings for Aerospace Applications, in "*Aerospace Materials and Material Technologies*", Ed: N.E. Prasad, R.J.H. Wanhill, Pubs: Indian Institute of Metals Series, Springer Science + Business Media, Singapore, 2017, pp: 483-500, ISBN: 978-981-10-2143-5, Article DOI: 10.1007/978-981-10-2134-3_22.

- D.Srinivasa Rao et al, "Detonation Sprayed Coatings and Their Tribological Performance" in Thermal Sprayed Coatings and Their Tribological, M. Roy, & J. Davim (Eds.) Thermal Sprayed Coatings and their Tribological Performances, IGI Global, 2015. (pp. 294-327). Hershey, PA: Engineering Science Reference. doi:10.4018/978-1-4666-7489-9.ch010

Centre for Engineered coatings (CEC)

ARCI, Balapur PO., Hyderabad 500005, Telangana, India

Tel : +91 40 24452374 / 24452342; Fax : +91 40 24442699

Email: dsen[at] arci [dot] res [dot] in / dsrao [at] arci [dot] res [dot] in