# MEC

## THERMAL SPRAY FACILITIES

COATING SYSTEMS FOR HVOF, PLASMA, FLAME SPRAY, ARC SPRAY & ROD SPRAY

Tech. Bulletin#06/102.00

# THERMAL SPRAYING OFFERS IMPECCABLE SOLUTION TO BOILER TUBE PROTECTION


High temperature erosion-corrosion and oxidation of heat transfer pipes and other structural materials in coal fired boilers are recognized as being the main causes of downtime at power generating plants, accounting for 50-75% of the total arrest time. Maintenance costs for replacing broken pipes in the same installations are also very high, and can be estimated at up to 54% of the total production costs. Superalloys have been developed for high temperature applications, but they are not able to meet both the high-temperature strength and the high-temperature erosion-corrosion resistance simultaneously. One possible way to address these problems is by applying a thin layer of anti-wear and anti-oxidation coatings with good thermal conductivity, such as thermally sprayed nickel- or iron based alloyed coatings. Coatings provide a way of extending the limits of use of materials for higher temperature applications.

In the recent years, there has been a growing interest in the use of HVOF process to deposit protective overlaycoatingsontothesurfacesof engineering components to allow them to functionunderextremeconditions.

## COATING REQUIREMENT :

- High hardness (to prevent erosion because ofashandsilica).
- Hot Corrosion resistance (that will react with the environment to produce a slow growing protective oxide scale, which should not allow thecorrosivespeciestodiffuseinto the coating )
- Low porosity (Less area for erodent particle toimpactandabrade).
- Small grain size (Small grains tend to be stronger).
- Absence of cracks (Ductile structure, thermal stability,crackingleadstospalling).
- Uniform coating structure (Homogenous distribution of hard constituents & ductile behavior).
- Smoothsurface.

From the coating requirements it is clear that the coating should have sufficient erosion resistance as well as should be corrosion resistance as well. The coating which meets the said requirement is Chromium Carbide- Nickel chrome.

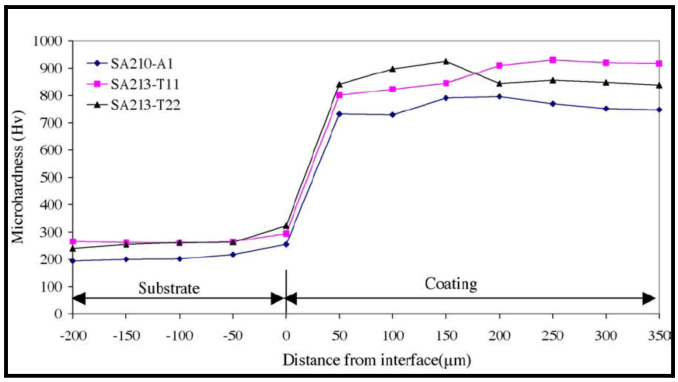


**Fig. 1 : Hardness Profile of $Cr_3C_2$-NiCr coated on various boiler grade steels**

## Criteria for Selecting $Cr_3C_2$-NiCr

**CHROMIUM CARBIDE**

a) Due to hard chromium carbide content, it offers more erosion resistance (Fig.1)

**NICKEL CHROMIUM**

a) Chromium is a corrosion resistant alloy that binds the continuous skeleton of erosion resistant chromium carbide constituents.

b) Due to high binding energy and ductility, nickel exhibit enhance erosion resistance by their ability to dissipate the impact force of particles by plastic deformation.

When these coatings were subjected rigorous testings they gave very excellent properties to combat corrosion. This is illustrated in the Fig.2.

Boiler tubes are huge structures and considering the down time involved in transporting the same, best results are obtained if they are coated with $Cr_3C_2$-NiCr using HVOF system. ***MEC offers this state of art technology that can be carried to any site using a pick up truck and the coating would be executed as the installation can be done in ready time.***

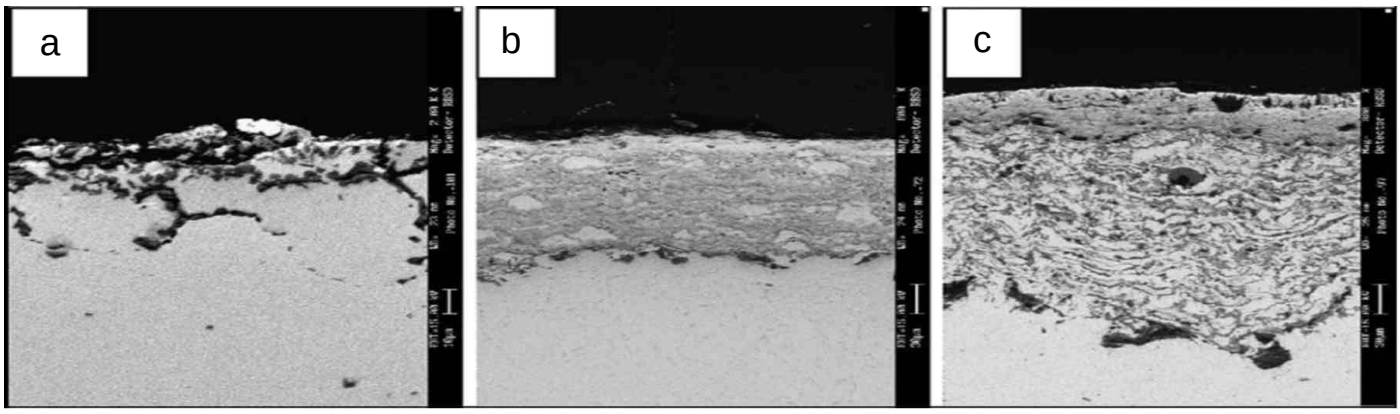


**Fig : 2 SEM back scattered images for the bare and HVOF coated Superni 600 superalloy subjected to hot corrosion in $Na_2SO_4$-60%$V_2O_5$ environment at 900 Deg. C for 50 cycles (a) Bare Superalloy (b) $Cr_3C_2$-NiCr coated (c) Ni-20%Cr coated**


METALLIZING EQUIPMENT CO. PVT. LTD.

E-101, M.I.A., Phase-II, Basni, Jodhpur-342005 (India)
Ph. : +91 291 2747601 Fax : 2746359
E-Mail : mecpl@sancharnet.in / mecpl@vsnl.com
**Web : www.mecpl.com**

| Delhi | Mumbai | Bangalore | Secunderabad |
|---|---|---|---|
| 09312890541 | 022-24934370 | 09343861755 | 040-27813760 |
| mecdly@ndf.vsnl.net.in | mecbby@bom5.vsnl.net.in | mecpl.bgl@gmail.com | mecsec@satyam.net.in |