



# Thermal Spray Solutions, LLC

*an Innovative Designer of Thermal Spray Coatings*

*State-of-the-Art Hard facing Technology*

## **WearX<sup>®</sup> 208**



# Equipment and Materials

- Twin Arc X Wire Arc Spray System
- WearX<sup>®</sup> cored wire
  - Intro and Test Data
  - Success Stories
- Other cored wires



# Twin Arc X Spray System: In Field or Shop



## SYSTEM FEATURES AND BENEFITS

- SYSTEM FEEDS BOTH SOLID AND CORED WIRES
- AUTO START FEATURE WHICH PRESETS THE INITIAL START-UP WIRE GAP
- SPRAY RANGE FROM 1/16" TO 3/16" DIAMETER
- MOST ECONOMICAL MEANS OF APPLICATION
- EASY TO OPERATE, ALLOWS FOR VERSATILITY IN FIELD OR SHOP APPLICATIONS!!!



# TwinArc X Wire Arc Spray System



**POWER SOURCE: 350 AMP INVERTER TYPE CV/CC: 200-230/380-575  
(SINGLE OR 3 PHASE 50 OR 60 HZ)**

**FEEDER: Light Weight 55 LBS. (25 KG)**

**JET FORCE SPRAY HEAD AND LEAD ASSEMBLY: Simple, lightweight,  
high reliability**

**INDUSTRIAL CART: HARDENED FOR THERMAL SPRAY  
ENVIRONMENT**



# WearX<sup>®</sup> 208 Wire Introduction

- WearX<sup>®</sup> 208 is a MCAW cored wire producing very hard erosion resistant boride-based weld overlays.
- Unique on the market and patented in North America.
- Offers an excellent protection against abrasion and metal-to-metal friction.
- WearX<sup>®</sup> 208 can be applied via thermal spray or by conventional overlay methods.



## Innovative Metal Cored Wire: WearX<sup>®</sup> 208

- Iron based hard facing wire product for thermal spray coatings or weld overlay hard facing.
- Excellent abrasion and erosion resistance and competes well with the higher cost HVOF carbide coatings.
- Thermally stable to 900°F (500°C) with excellent high temperature performance.
- The micro-alloying synthesis process of **WearX<sup>®</sup> 208** produces at least two-fold increases the quantity of hard phases normally present in arc-sprayed coatings.



## WearX<sup>®</sup> 208 ( cont. )

- High quantity boride crystallites are responsible for excellent anti-wear properties.
- **WearX<sup>®</sup> 208** arc-sprayed coatings are tailored to contain more than 75% in volume of boride crystallites and 20% in a ductile steel matrix.
- The stacking of hard and more ductile phases forms a lamellar composite coating having very high wear resistance.
- Hard phases ensure wear resistance while more ductile phases give coating cohesive strength and toughness required in wear resistant applications.



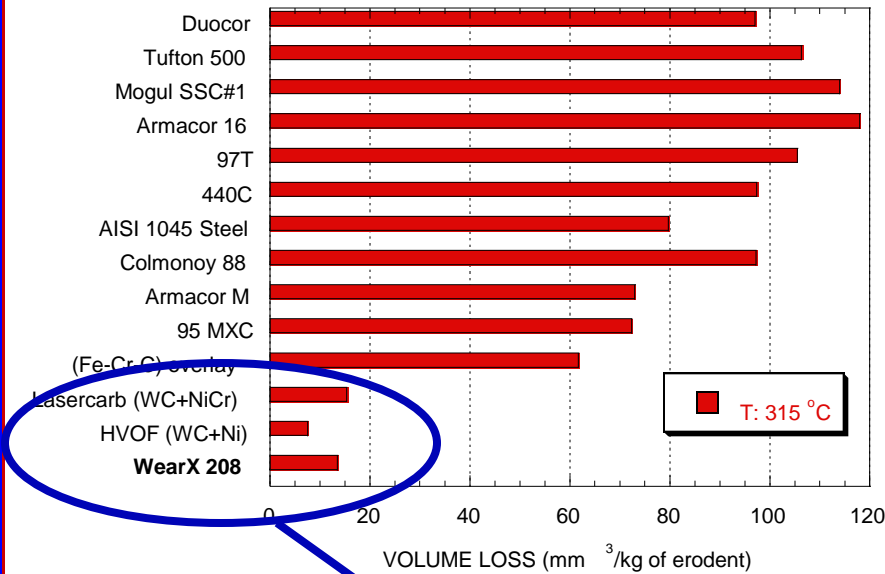
# WearX<sup>®</sup> Surface Preparation

- Surface needs to be blasted to 2-4 mil profile.
- Surface should be SSPCSP5 “white metal”
- Embedment should be to greater than 1-2%
- TSS recommends that glass abrasives such as **New Age Blast Media<sup>®</sup>** be utilized for maximum surface preparation.
- All tests and success stories in presentation utilized **New Age Blast Media<sup>®</sup>** for blasting.

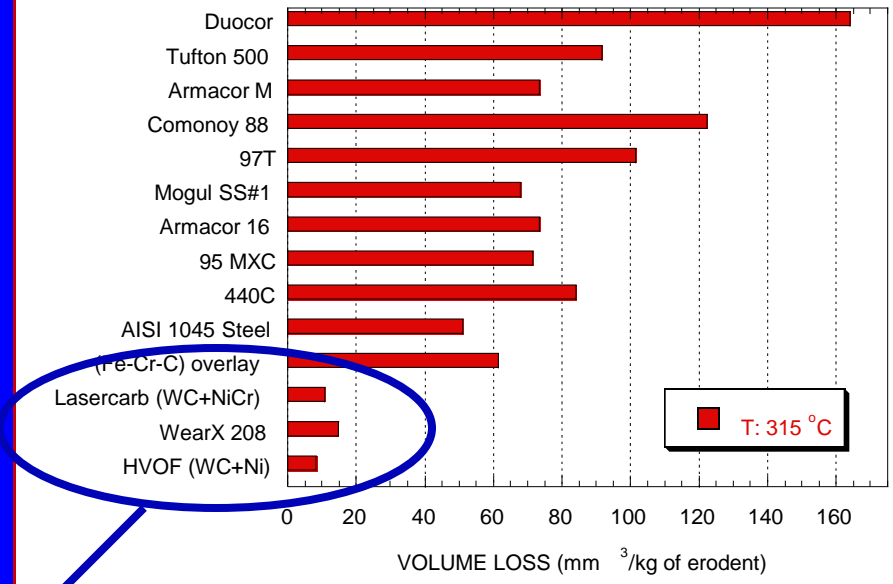


# Wear X Test Results: Particle Erosion Resistance at 315°C

**Particle erosion - impact angle: 25 °**



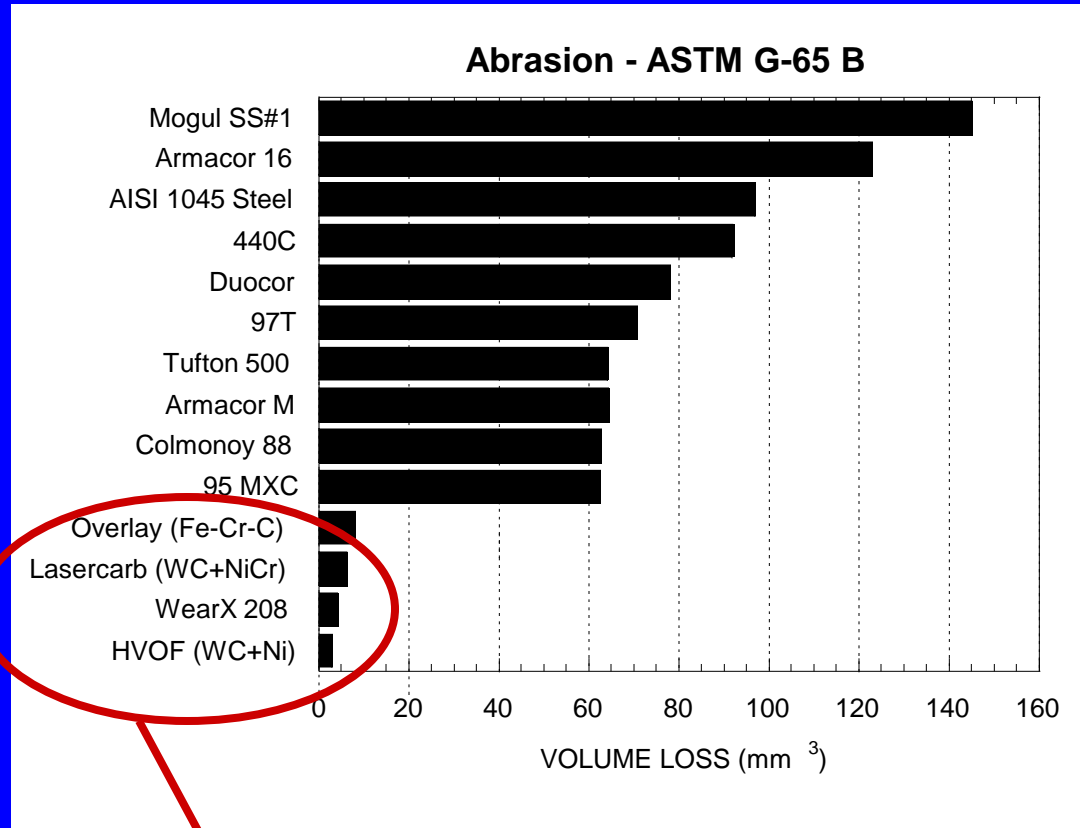
**Particle erosion - impact angle: 90 °**



**WearX<sup>®</sup> 208 arc-sprayed coatings are more erosion resistant than any other thermal spray coatings at 315°C!**

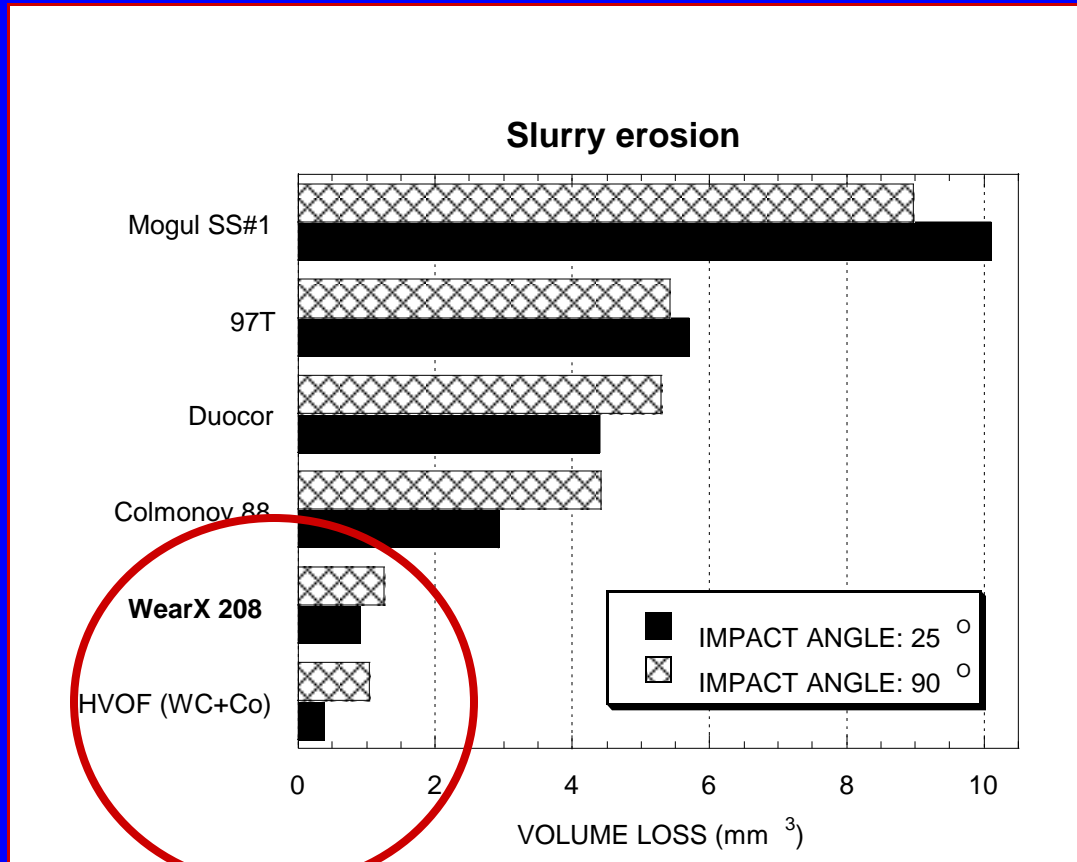


# Wear X Test Results: Abrasion Resistance (ASTM G-65 B)



**WearX<sup>®</sup> 208 arc-sprayed coatings are more Abrasion resistant !**

# Slurry Erosion Resistance (Water Containing Ottawa Sand)



**WearX<sup>®</sup> 208 arc-sprayed coatings are more slurry erosion resistant !**



## WearX<sup>®</sup> Success: Concrete Block Chute

- Thermal Spray Solutions applied the WearX<sup>®</sup> 208 in August 2005 to the top surface of a steel plate used as a chute for concrete blocks at a local block manufacturing plant.
- The concrete blocks drop onto the ramp and slide to a conveyor for palletizing. Wear comes from the impact and sliding action of the blocks.
- Test was to protect the plate from the effects of the wear of the blocks. Plate typically lasts 6 months until wear becomes severe.
- Benefits include increasing life of plate, decreasing downtime of plant from plate replacement which translates into increased production.

# Wear Effects from Impact of Concrete Blocks



Plate accepting blocks on their way to conveyor.

Wear due to Impact and Sliding



Wear from 6 months



## Results of Chute Tests for Wear X®



- Plate was sprayed with **WearX®** 208 with a thickness of .040.
- After 8 months operation, plate shows no sign of wear
- The **WearX®** coated plate continues to perform!
- Increased product and savings on repair costs build every day!



## WearX<sup>®</sup> Success: Cyclone Boiler Door

- Thermal Spray Solutions applied the WearX<sup>®</sup> 208 to the inside surface of the cyclone door on “G” cyclone at Public Services of New Hampshire on April 13, 2004
- The primary air-flow that creates the cyclonic effects within the cyclone creates secondary eddy current flow patterns of coal particles against the door.
- Goal was to protect the door from the effects of erosion caused by abrasive coal particles and re-injected Fly Ash as they enter the cyclone.
- Historically, the doors experiences erosion from the pre-burn coal particles at temperatures ranging from 700°F to 1000°F.

## Example of Wear on Boiler Door



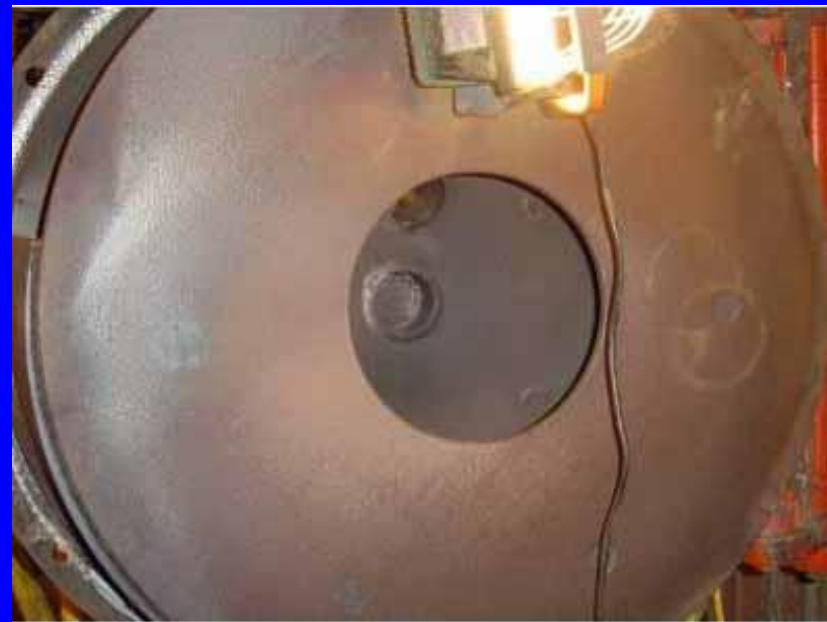
- Cyclone Boiler door after 12 months of operation.
- Door shows the typical wear and erosion effects during normal operation period.
- Current repair methods involve either replacement or costly weld overlay.



## WearX<sup>®</sup> 208 on Cyclone Door

Door as sprayed, April 13, 2004

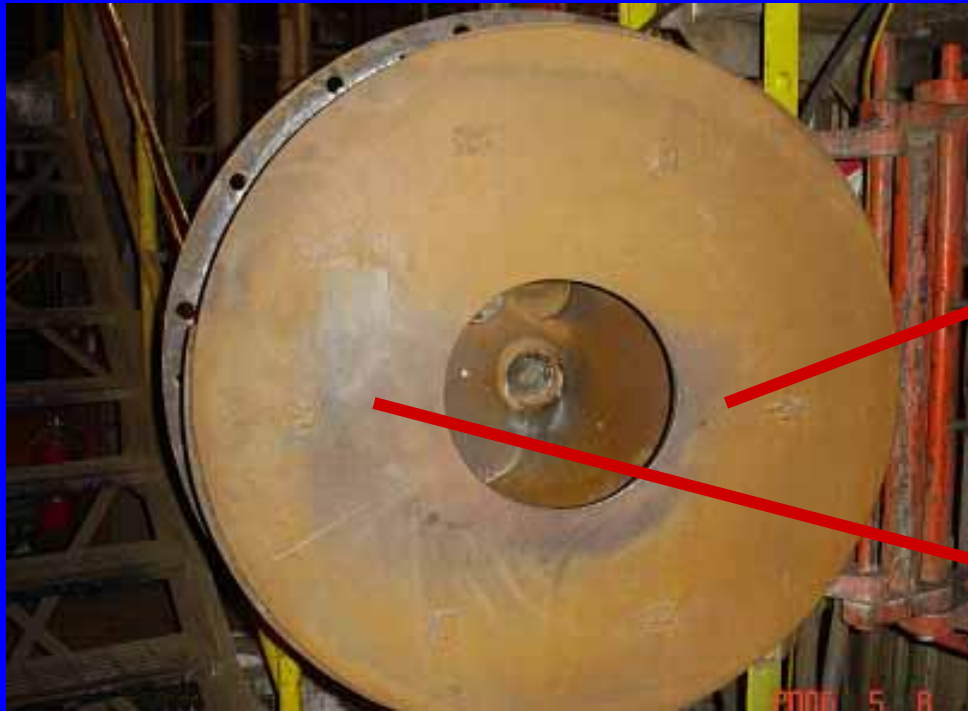
Door opened, 13 Months May 18, 2005



- Door was sprayed with **WearX<sup>®</sup> 208** with a thickness of .040.
- Total Spray time was **ONE** hour!
- After 13 months operation the cyclone was opened and inspected.
- Verbal feedback in Feb 2006 indicates door still not wearing!
- The coating still had a rough, as-sprayed appearance that reflects the erosive environment had no impact on **WearX<sup>®</sup> coating** !



## WearX<sup>®</sup> 208 on PSNH Cyclone Door as 5-8-06



- Boiler door after **24 months** of operation.
- Minimal wear and erosion are evident on door
- Coating continues to have a metallic glass appearance and profile.
- No significant repair work is needed on the door at this time.
- **WearX<sup>®</sup>** door is still operational for use going into 3<sup>rd</sup> outage period.



## WearX<sup>®</sup> Test: Boiler Soot Blowers

- Based on Boiler Door Success, Thermal Spray Solutions was asked to apply WearX<sup>®</sup> 208 in May 2006 to the tubes around 13 Soot Blowers and surrounding duct work at Public Service of New Hampshire's Bow plant.
- The boiler tubes around the Soot Blowers are exposed to severe wear from the effects abrasion and erosion. Temperatures during operation of blowers will range from 500-800° F.
- Hardfacing is currently used to protect tubes. This process takes a robotic machine up to 26 hours to do the over lay.
- During the overlay process the tubes must be filled with water to minimize the effects of the tube distortion from heat input .
- Overlay process on tubes is performed every 12 months.



## WearX<sup>®</sup> Test: Boiler Soot Blowers

- Total spray area of the project was 500+ sq. ft.
- Average time per to Thermal Spray per blower area was 4 hours vs. 26 hours for overlay process
- Spraying was accomplished during normal outage period without the requirement of water in tubes. This is due to reduced heat applied to tube for thermal spray process vs. overlay.
- Duct work surrounding Boiler typically wears from continuous exposure to fast moving particles and is left unprotected. Thermal spray process allows for opportunity to add layer of protection and reduce need for continual part replacement.

## Application on PSNH Boiler Soot Blowers



TSS Technician applying WearX<sup>®</sup> to boiler tubes surrounding soot blower opening.

Typical application per soot blower area was done in 4 hours.



WearX spools  
on Twin Arc feeder

## Application on PSNH Boiler Duct Work



Examples of WearX<sup>®</sup> applied to duct work around boiler .

These hard to reach parts typically receive minimal wear protection





## WearX<sup>®</sup> 208 Applications

- Cement-handling equipment
- Heat exchangers, boilers and duct work
- Slurry pumps and slurry pipelines
- Turbines operating in sand and dirt
- Agitators or mixing devices for fine solids
- Conveyors of solid particles in fluid streams
- Transfer points for industrial aggregates
- Industrial Fans in dirty environments



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