

## THERMAL SPRAY FACILITIES

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

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### Coating improves Surface Wear Resistance on Ball & Gate Valves



The limitations of other conventional surface protective processes have thrown some light on the applications of thermal spray for the surface wear resistance of ball & gate valves. Several organizations were setup to promote Thermal Spray, such as HVOF & Plasma Spray Technologies.

Although the valve industry started utilizing the thermal spray coatings in the early days of its development, it only become more accepted and widespread in the early 80's once the associated costs become economically feasible. As the number of coated parts grew and the performance tracking proved its viability, more and more sceptics, including valve manufacturers, started to be convinced of its real benefits.

The use of valves in many industrial processes has attracted more demands in terms of safe working temperature, pressure, environmental working conditions and economics. With these demands, the valve business has developed significantly over the last 10 years with respect to corrosion resistant materials, overlays & hard coatings.

#### Working Environment of Valves

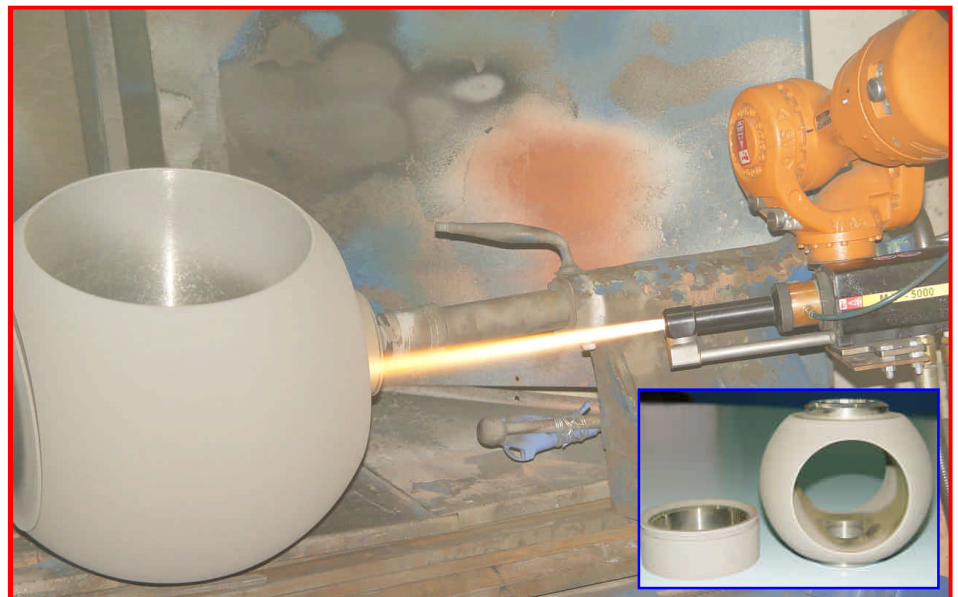
New wear and corrosion resistant coatings have been developed and made it possible to increase the working envelop of valves, and fail free operation under the most extreme conditions, considerably improving the valve change over economics.

High Quality valves are used in special demanding environments and applications. The proper performance of these valves is many times critical to the whole process. The valves are frequently operated under the following extreme conditions:

- Fluids containing abrasive particles
- Corrosive fluids
- Operating at high temperatures ( $> 600^{\circ}\text{C}$ )
- Operating at pressures over 130 MPa.

#### Replacement of Hard Chrome Plating

In early days of ball valve manufacturing, there were many practising use like chrome plating on corrosion resistant substrates, nickel plating with associated heat treatment, stellites, and colmonoys. But each process had their limitations in the performance & properties, since the industrial acceptance of those processes were minimized. New stringent rules were implemented under Environmental Protection Agency in the last couple of decades. These rules have drastically limited the amount of allowable hexavalent chromium ions, (carcinogenic), released during the hard chrome plating process.



## COATINGS ARE PART OF VALVE DESIGN

Careful engineering review of the application and selection of coating material needs to be part of the valve design process. Referring to existing standards is definitely helpful, however it is not enough to guarantee continuous performance.

The behaviour of a coating on a small size ball valve is entirely different to the performance of coating on a large diameter valve. The elastic deformation on the diameter of seat needs to be exactly accommodated by a flexible coating.

## COATING MATERIAL SELECTION

There are many choices of hard coatings available today for the valve industry. The pure ceramic materials, like Chrome Oxide, are generally used in the chemical processing industry, whereas the carbides, like Tungsten Carbide, are mainly utilized in the petrochemical and Oil & Gas industries. Methods of applications will be selected according to their properties & coating materials.

The industry, both the manufacturer and the end user, need to recognize that the coatings increase the life of the component rather than it last forever. Once the valve is in operation, the coating may be damaged by a variety of mechanisms, such as chemical attack, thermal shock, erosion, wear or mechanical damage and its intended functionality will be hampered.

The selection of coating material should always be reviewed against the specific application. The end users often make the mistake of generalizing their selection by product line, by particular plant area, or even worse, plant wide.



## METAL TO METAL TECHNOLOGY

An innovation from MEC which introduces a new surface coated ball and gate valves used in the petrochemical industry, will set new standards of wear resistance and reliability. Surface engineering developed at MEC has produced a hard coating solution of ball and gate valves for METAL TO METAL (MTM) seals, as typically used in the oil and petrochemical industries and for power generation and marine application.

MTM valves have very clear advantages over soft seated valves.

- a) Ability to operate in a wide temperature range; from cryogenic to very high temperatures.
- b) Excellent corrosion, wear and abrasive resistance.
- c) Fire safe & Extended (Service) Life Cycle.

The features of High Quality MTM Valve features:

### 1. PERFECT FIT :

- a) The valve will be tight, both at low or high differential pressures.
- b) The valve has a high tightness efficiency in both flow directions.
- c) Temperature, pressure and bearing force fluctuations have no influence on the seat performance.
- d) The valve remains tight, even when handling fluids.



## COATINGS ARE PART OF VALVE DESIGN

### 2. NOJAMMING

- a) Valve jamming, caused by scaling and solids, are reduced to a minimum.
- b) The restriction of Corrosion minimizes the jamming problems.

### 3. SMOOTH CONTROL

- a) The friction is regularized throughout the operation window.
- b) Friction fluctuations were brought under control which is the enemy of proper valve control.

### 4. LOW TORQUE

- a) Modern ball/seat surface materials show a low torque. A lower torque results in smaller actuators, saving costs and dimensions.

### 5. LIFETIME

- a) The MTM seats have a long lifetime (service) cycle.

### 6. WIDE TEMPERATURE WORKING RANGE

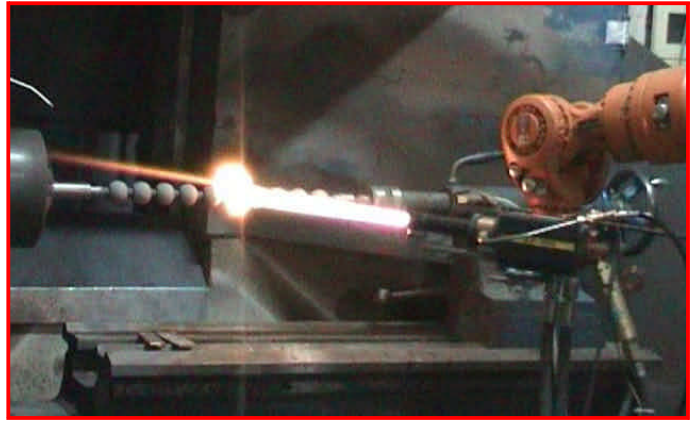
- a) MTM Seats are able to operate reliably and trouble-free in a wide temperature range, from cryogenic to high temperatures.

### 7. CORROSION, ABRASION & EROSION RESISTANCE

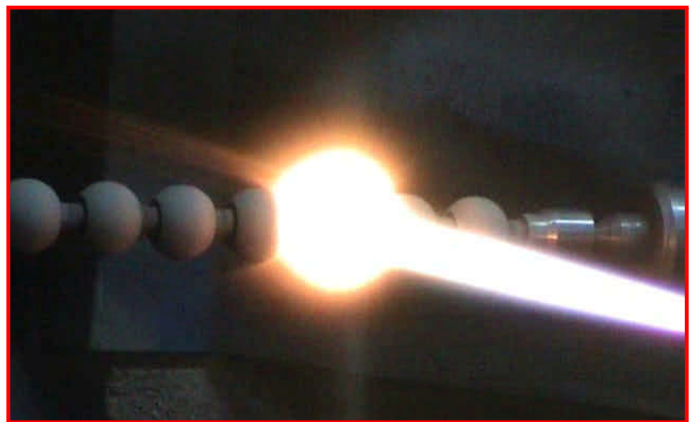
- a) A good coating selection and a good knowledge of the working conditions will ensure the best possible protection against corrosion, abrasion and erosion problems.

### 8. ECONOMY

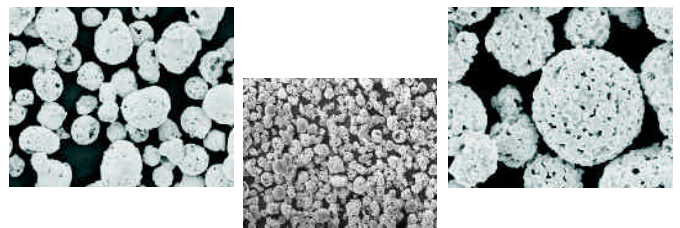
- a) Long lifetimes
- b) Low maintenance
- c) Reduce changeover time of spare parts.



**COATING OF SMALLER DIA (1 INCH) BALL VALVES BY HIGH VELOCITY LIQUID FUE SPRAY SYSTEM**



### Typical Coating Materials (Powders)



The selection of coating material is a very important factor and should always be reviewed against the specific application. The end users often make the mistake of generalizing their selection by product line, by particular plant area, or even worse, plant wide. Few of the HVOF powders which are generally used for Ball Valve & Seat Ring coating, are:

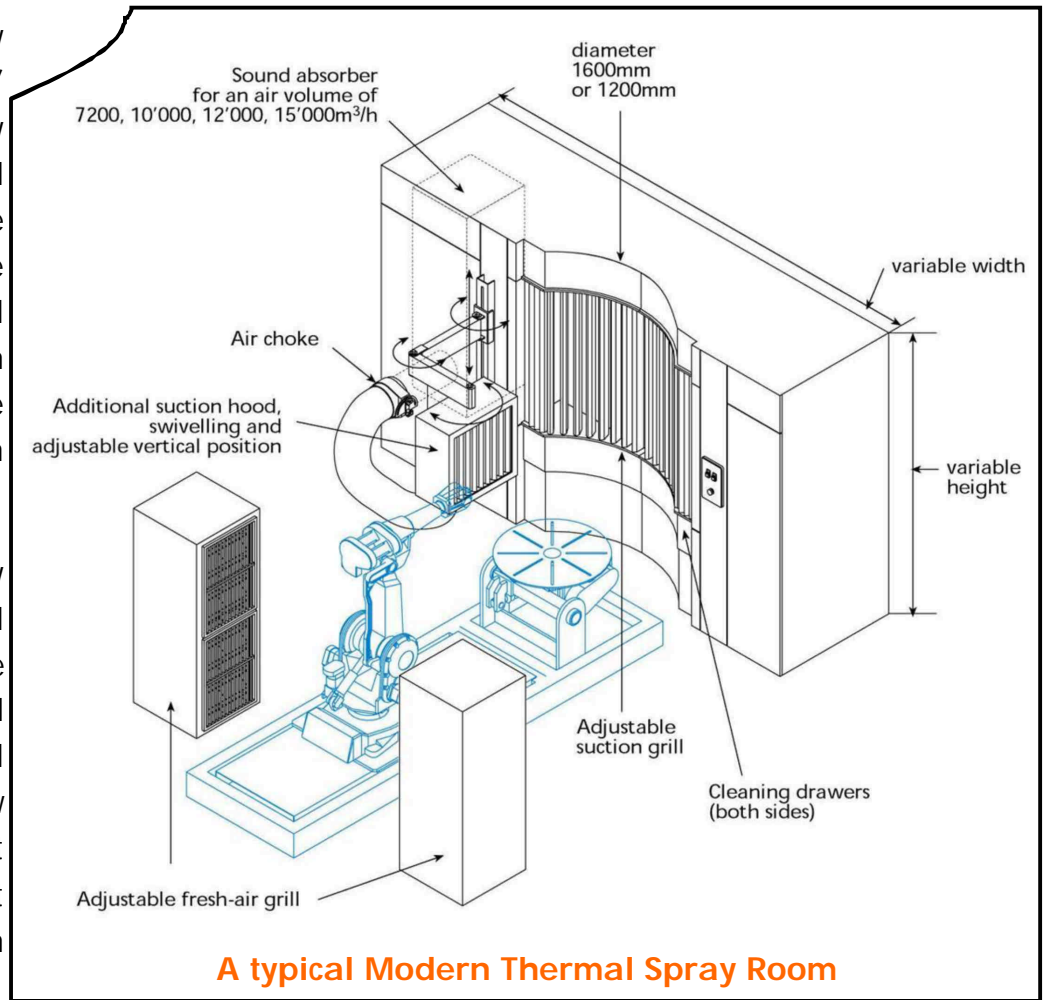
Amperit518	WC-Co88/12
Amperit556/588	WC-Co-Cr86/10/4
Amperit544	WC-Ni 88/12
Amperit529	WC-HasteloyC
Amperit584/588	CrC-NiCr75/25
Amperit551	WC-CrC-Ni73/20/7



## Typical Coating Processes

The MTM seal technology applies an HVOF (Gas / Liquid Fuel) thermal spray coating to the metal substrate of the valve components which are then diamond ground and polished to a super-finish for a very intimate surface and tight fit between components.

This process gives a very smooth wear-resistant and abrasion-resistance surface, able to withstand the highly abrasive and corrosive fluids which flow through the valves at extreme pressure, and at temperature greater than 600 deg.C.



During HVOF process, high noise level (> 130 dBA) is generated. It is advisable to operate the system in sound proof booth (Acoustic Room) which protects both personnel & environment. The figure shown above is a modern Thermal Spray Cell complete with Robot & Turn Table.

## Offers from MEC

- A) Complete High Velocity Oxy-Fuel / Liquid Fuel Coating System on turnkey basis at customer site.**
- B) Carryout coating Job at MEC factory in Jodhpur (India).**
- C) Develop specific coatings for special applications at our R&D Laboratory, approved by Department of Scientific & Industrial Research, Govt. of India.**



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