

Fusion Bonded Epoxy coating - what is the fuss all about?

Gone are the days where aesthetics and appearances don't matter and valves are no exceptions to this. "Fusion Bonded Epoxy Coatings" (FBE in short) are increasingly being accepted in the Indian market for the internal & external surfaces of valves. Although this was first introduced more than five decades ago by 3M, this article attempts to lay out the facts detailing the advantages of this coating process and a comparison with some of the other techniques.

Research shows that corrosion costs an estimated 3-4% of gross national product (directly/indirectly) in the developed countries in the world. Needless to say that selection of the most economically effective technique for minimizing the effects of corrosion is a critical design decision.

This consideration also is of critical importance particularly in case of the Resilient Seated gate Valves (RSLVs),

which clients are increasingly looking to use in place of the traditional-old metal seated valves. In this case, the wedge takes seat directly on the painted inner surface of the valve body casting. Hence the seating forces such as shear & tension are imposed on the paint in the seat contact areas. The weaker paint as in case of the ordinary paint process is prone to fail much earlier. This will result in damage to the rubber seating surface on the wedge & render the valve leaky giving it a very short service life. Therefore, FBE coating in the case of RSLVs is an absolute must!

A fusion-bonded epoxy is a one part, heat curable, thermosetting epoxy resin powder that utilizes heat to melt and adhere to a metal substrate. The essential components of the powder are resins, hardener/curing agent, fillers & extenders and colour pigments. At typical coating application temperatures, usually >2000C, the

contents of the powder melt and transforms into a liquid form. The liquid FBE film wets and flows onto the surface on which it is applied, and soon becomes a solid coating by chemical cross-linking, assisted by heat. This process is known as "fusion bonding". The chemical cross linking reaction taking place in this case is irreversible. Once the curing takes place, the coating cannot be returned to its original form by any means. Application of further heating will not "melt" the coating and thus it is a "thermoset" coating.

The FBE coating application process typically has three essential stages, irrespective of the shape and size of the valve:

- " Preparation of the surface to be coated (usually through blast cleaning) - this increases the effective surface area and ensures better adhesion of the coating
- " Pre-heating the surface to the

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recommended temperature

" Actual application (either through a fluidized bed or an electrostatic gun) and curing

These coatings offer the following benefits:

- ▶ Enhanced corrosion protection
- ▶ Very smooth, hard & tenacious with no runs, sags or thin spots common with applying liquid paints
- ▶ Extremely long lasting when subjected to normal waterworks purposes & usage
- ▶ Higher thickness such as 250 to 500 microns are very easily possible
- ▶ Food grade coatings are also available (suitable for drinking water applications)
- ▶ Coatings are energy efficient as the smooth surfaces lead to lesser pressure drop across the valves
- ▶ FBE has a long term performance history in water and sewage environments including salt water

One of the limitations of FBE is that it can suffer mechanical damages during shipping, and hence extra precaution needs to be taken by the coating applicator, field construction and transportation companies.

An experiment worth pointing out is the one conducted by Val-Matic's Engineering department where they

Table: Volume of sludge build-up on the interiors of Air Valves

Type of Coating	Body Avg. volume (cu in)	Cover Avg. volume (cu in)	Float Avg. volume (cu in)	Valve Total volume (cu in)
None	61.37	6.84	1.01	69.2
FBE	9.69	0.76	3.03	13.5
Teflon	19.38	1.9	6.06	27.3
Epoxy	48.45	1.14	18.18	67.8

Source: Val-Matic

conducted a trial installation of four 2" Air Valves, each with different coatings. The objective was to determine which coating provided the most protection against harmful build-up and deposits in a wastewater application. The different coatings included FBE, Teflon and a two-part epoxy. After three years of installation and nearly equal usage of all four types, the valves were removed from the system and inspected. The following table gives a summary of the observations:

Clearly, the lowest volume of sludge build-up over those three years was in the case of FBE coating, and thus offered the greatest levels of protection to the valve.

FBE coating has become the universal norm for surface coating in pipelines transporting water & also in case of the rebars used in construction industry. Specialized FBE coated components have also replaced costly materials such as Stainless Steel, Aluminium

Bronze, Titanium etc for many critical applications.

Multiples, we have successfully mastered the process of FBE coating, which we are currently using for our Bi-Stream Air Release valves and Resilient Seated Gate valves - for some of our projects under execution for drinking water applications in Rajasthan and Telangana.



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