Fusion Bonded Epoxy

Fusion Bonded Epoxy Coating commonly referred to as FBE coating is an epoxy based powder coating and comes under the category of protective coatings in Paints & coating nomenclature.

FBE coating is extensively used in Pipelines & Valves to prevent the base material from corrosion by line fluid. In several European & Middle East countries, pipelines & valves of all potable lines are usually FBE coated. FBE Coating is considered superior to other coating technologies because of its adhesion & coating longevity. It is also safe & environment friendly.

Fusion bond epoxy is different from conventional liquid paint albeit the pupose of both is to protect surfaces from corrosion. Corrosion starts typically on areas of contact of different materials, at the interface between the different materials. A smooth interior surface is the best protection against abrasion and incrustation.

Unlike liquid paint, FBE coatings consists of resin & hardener parts both of which remain dry & unreacted at ambient temperatures. At typical coating application temperatures the contents (resin & hardener in apprporiate proportion) of the powder melt and transform to a liquid form. The liquid FBE film is applied to the surface of the steel surface, pipe or valve and soon becomes a irreversible solid coating by chemical cross-linking assisted by heat. This process is known as “fusion bonding”.

Jotun, 3M, Dupont, Akzo Nobel, BASF and Rohm & Haas are the leading manufacturers of FBE .

FBE coating application process

Regardless of the shape and type of steel surface or valve internal to be coated, the FBE powder coating application has three essential stages:

1. Surface preparation – blast cleaning
2. Pre-heating the surface to the recommended FBE powder application temperature, and
3. Application and curing stage.

Surface preparation — blast cleaning

The surface of the component is blast cleaned using steel grits or shots as abrasives. The commonly used profile for FBE ranges between 37 to 100 micrometers (1.5 to 4 mils). Prior to blast cleaning ,any oil or grease is removed from the surface. Blast cleaning increases effective surface area and better adhesion of the coating. The surface profile can be done as per NACE or Swedish standards.

Heating and FBE powder application

Prior to application of FBE the surface is heated either in an oven or by induction heating. The FBE powder in placed on a fluidization bed wherein the powder is suspended in a stream of air in which the powder behaves like a fluid.

The FBE powder is sprayed onto the heated component using an electrostatic spray gun. The spray gun has an electrode on it which gives the powder a positive electric charge. The component to be coated is earthed through a conveyor. The charged powder wraps around the component and melts into a liquid form. As the curing takes place in the heated condition by way of cross-linking of the resin the molten powder becomes a solid coating. Complete curing is achieved by residual heat on the component.

Valves & FBE Coating

Potable water pipelines are susceptible to corrosion and can be damaging to equipments & humans. FBE coating of pipes & valve internals are considered very essential to prevent corrosion to the steel and therefore avoid contamination of potable water.

Oil & gas major Aramco specifies FBE coating for all potable water lines. Very well laid specifications 09-SAMSS-091 & SAES-H-002 requires supplier of valves & pipes to comply to these specifications to ensure high quality FBE coating.

In valves the internal wetted surface are coated with FBE. These surfaces need to be machined to achieve high degree of sealing. Interestingly FBE coated surface have high machinability, and the internal coated surfaces of valves are machined on CNC machines. Prior to machining, holiday detection test & thickness is checked. The holiday detection test highlights porosity in the coating and the thickness check would confirm the requisite DFT.

Virgo & FBE coated valves

At Virgo , we have pioneered the process of FBE coating on ball valves. A large quantity of our valves used in Potable Water lines is coated with FBE. High-pressure potable water lines in Saudi Arabia use Virgo Ball valves with FBE coating meeting Aramco specifications. Virgo has its dedicated FBE coating centre where valve components of various sizes are coated with FBE. After carrying the holiday detection test & thickness check the valve components are machined on CNCs before carrying out the final assembly.

In conclusion it can be said that FBE coating is used against protection from physical damage & chemical attack. The technology can be used in several industries for surface protection where rust prone material is used. Specialized FBE coated components have replaced the costly materials such as Stainless steel, Al.Bronze, Titanium etc for many critical applications.

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