Tech Sheet #117
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WATERBOX COATING TECHNICAL SHEET

When preparing a specification for a steam surface condenser, one item that must be addressed is the type of coating to be applied to the internal surfaces of a carbon steel condenser waterbox. This coating is needed due to the corrosive nature of circulating water.

In a steam surface condenser, the tube and tubesheet material is chosen based on the chemical composition of the circulating water (among other criteria). These materials are chosen so they will resist corrosion and erosion while in contact with the circulating water. Waterbox material is typically made from carbon steel. If the carbon steel parts of the waterbox are exposed to the circulating water, corrosion of these parts will occur.

In order to minimize this corrosion (erosion), carbon steel internals of the waterboxes are coated with a protective material that will form a barrier between the carbon steel and circulating water. The coatings typically used on the waterbox internals can be broadly categorized as the following:

1. **Coal Tar Epoxy Coatings:** Coal tar epoxies are essentially a mix of coal tar and epoxy resins. These types of coatings have been used in condenser waterboxes for over 40 years. These coatings can be applied in a similar manner to exterior paints. The internal surface of the waterbox is cleaned and sandblasted prior to applying the coating. These coatings can be applied by spraying or brushing (as recommended by the manufacturer).
2. **High Solids & 100% Solids Coatings:** Due to the environmental concerns about using coal tar epoxies and the limitations on volatile organic compounds (VOC), high solids coatings were developed. These coatings typically use epoxy or polyurethane resins as the solids components in the coating, and can be applied in multiple coats to obtain film thicknesses that are greater than those possible with Coal Tar Epoxies. Solid epoxies also provide improved performance as compared to coal tar epoxies. These coatings are applied in the same manner as Coal Tar Epoxies.
3. **Rubber Linings:** Rubber linings entail the bonding of thin sheets of rubber to the internal surfaces of the waterbox. Neoprene rubber is the most common material used for this application. First, the internals of the waterboxes are cleaned and sandblasted to white metal conditions. The rubber is then bonded to the waterbox internals using a bonding agent (cement, etc.), utilizing a hot or cold curing process. . Rubber linings are used for their chemical and abrasion resistance. They are typically used in once-through circulating water systems where debris may be present.

The choice of the waterbox internal coating material can be made in conjunction with the cathodic protection system . Every coating type has strengths and weaknesses. These values can be matched with a suitable cathodic protection system to maximize the corrosion protection of the waterbox internals.

Please refer to the latest edition of the Heat Exchange Institute Standards for Steam Surface Condensers for more information.

This Tech Sheet was developed by the members of the Heat Exchange Institute's (HEI) Condenser Section. HEI is a trade association comprising the leading manufacturers of heat exchange and vacuum equipment. HEI Tech Sheets are information tools and should not be used as substitutes for instructions from individual manufacturers. Always consult with individual manufacturers for specific instructions regarding their equipment.