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Technical Reference

Topic: Electrodes

UFS Corporation's stainless steel electrodes are tubular and made from Schedule 40 stainless steel pipe. The electrode fits inside the membrane shell and is then submerged in the paint bath. The anolyte supply tubing goes down the center of the electrode and is sealed at the bottom with a C-ring on the inside of the pipe. This is a patented feature of the TECTRON™ Cell. We use Schedule 40 electrodes because they last much longer and cost differential between Schedule 10 and Schedule 40 is approximately $3 per linear foot.

When using stainless steel 316L bare floor or side electrodes be sure that no more than 15% to 20% of the total anode area is bare. This "rule of thumb" is used for three reasons:

1. Stainless steel electrodes give up their iron content when they degrade in an E-Coat application.
2. Using too much bare anode area and not enough flushable anode area may hinder the system's ability to remove enough acid from the paint bath, making it difficult to control the pH.
3. Iron loss is greatly accelerated at higher current densities (above 5 amps per square foot).

NOTE: Excessive iron content in the anolyte fluid is not caused by high conductivity. High conductivity is a symptom of excessive iron content and/or low anolyte pH. The higher the iron content, the darker the anolyte fluid, and, thus, the higher the conductivity.

Iron contamination can result at very low parts per million levels (i.e., approximately 20 ppm) when using ACRYLIC or LIGHT COLORED paints. Darker cationic EPOXIES are not as sensitive to iron but still have unique acceptable iron level limitations. Even though bare electrodes offer advantages from a throw-power perspective, their use must be limited by acceptable levels of soluble iron in the E-coat paint bath. Contact your paint supplier for assistance in this area.

TIP: Ask your paint supplier about using a "nitric acid based" additive in the anolyte system to prolong the life of the electrodes. This additive will protect the electrodes from irreversible corrosion, which is caused by chlorides that reside in D.I. water systems. Nitric acid will form a wax-type layer on the stainless steel, which prevents chlorides from attaching themselves to the electrode's molecular structure.

In the case of using TECTRON flushable anode cells, the majority of the iron content is flushed away by the anolyte fluid. This allows only small traces of iron to enter the paint. This flushing advantage applies only where UFSc TECTRON Cells are being used. All membrane is porous and iron transfer can never be completely eliminated.

Ruthenium oxide (RuO) coated titanium electrodes are used when iron contamination is of great concern, such as, when using cationic acrylic paints. They are also used when consistently operating at high current densities (e.g. above 5 amps per square foot) and when using lighter colors. Ruthenium oxide is an inert material and withstands higher temperatures for longer periods of time. Since it does not contain iron, the anolyte solution will be transparent and the purity of the paint bath is unaltered.

Ruthenium oxide electrodes are about two to three times the cost of stainless steel electrodes and carry a six to eight week lead time. They must also be handled very carefully to prevent scratching the ruthenium oxide coating. If the coating is scratched or gouged, the electrode must be replaced. Bare titanium will burn up almost instantly.