Fluxtrol
Material Etching

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Notes for Material Etching

Main Goal

To remove or modify conductive surface layer for better electrical resistance and electrical strength.

Additional Possible Benefits

– To prevent rusting

– To improve glue or coating adhesion

Conductive layer may be formed on the part in the process of pressing or machining due to smearing of the surface metal particles. Different materials behave differently in these operations.

Ferrotron 559 H and Ferrotron 119 do not form a conductive layer in pressing or any machining operations (turning, milling, saw cutting, grinding). Etching is recommended for electrical strength improvement and rust prevention. Electrical strength may be important when significant external voltage applied to a thin layer of concentrator.

Fluxtrol 25 and Fluxtrol 50 typically do not form conductive layers in machining operations. However conductive layer may be formed on the side surfaces in the process of pressing or some machining operations with dull tool, low speed and high feed. Etching is recommended for surface improvement and for higher electrical strength when the concentrator touches coil turns with different electric potential (non-insulated multi-turn ID coils, long hair-pin and similar coils).

Fluxtrol A forms a conductive layer in the process of pressing and machining, especially when the machining occurs in direction of pressing (see Chapter 6 "Fluxtrol Materials on Induction Coils" in the Training Course "Basics of Induction Heating and Magnetic Flux Control"). Etching is recommended for surface improvement in applications where the concentrator isn't subject to external voltage application (single-turn cylindrical coils and similar as well as coils with electrically insulated copper). Etching is strongly recommended for concentrators, which experience application of external voltage (multi-turn coils without electrical insulation of copper etc.).

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Additional Possible Benefits (Continued)

Presence of conductive layer may be identified by measuring of "touch resistance" using low-voltage ohmmeter (multimeter). If touch resistance on any surface is less than 5 kOhm, it means that there is a conductive layer.

NOTE: Never use high voltage insulation tester to measure touch resistance. High voltage (500 V and above) may break insulation between the material particles and form conductive channels in concentrator, permanently damaging the material.

Etching Materials

- Don't use chloric or nitric acid; they do not provide good "etched" surface and may damage material
- Phosphoric acid may be used for etching and rust prevention
- Fluxtrol Inc. recommends special iron-phosphoric agent CrysCoat 187, produced by Chemetall Oakite (www.oakite.com).

Etching Procedure

- Parts must be clean; clean oily spots, paint and other grease using organic solvent such as acetone
- Use stainless steel, ceramic or acid resistant plastic container
- For best results use 20% concentration of acid solution, i.e. 1 part of standard etching agent to 4 parts by volume of clean water
- Place Fluxtrol parts into preheated solution (temperature – 160° C = 71° F) for 15-20 min
- Maintain temperature in bath at required level; a crock pot may be effectively used for small batches of material
- Use spacers between material pieces and between pieces and bath bottom for secure contact of all the surface to solution

Notes for Material Etching

Etching Procedure (Continued)

– Remove parts from the solution and thoroughly rinse in clean water

– Dry parts with paper towel or compressed air

– Keep parts in dry room temperature area for at least 24 hours for better results (resistance continues to grow during this period after etching).

Concentrator Control and Spent Liquid Disposal

– Chemical composition changes after etching of several material batches

– The best method of etching solution control is measuring of its acidity using Ph meter such as PH 220 EXTECH Instruments

– Ph factor of fresh solution must be in a range 2.8-3.5. When Ph factor goes above 3.5, which corresponds to less acidic reaction, add more etching agent to return Ph to required level

– In the process of etching the solution color changes from light yellow to dark yellow-brown and a layer of slug appears on the container bottom. Periodically clean the container

– For spent liquid disposal, use standard procedure for acidic solutions accepted at your plant; contact manufacturer for specific instructions.

NOTE: Contact Fluxtrol Inc. at +1.248.393.2000 or fluxtrol@fluxtrol.com for additional information, questions or suggestions.