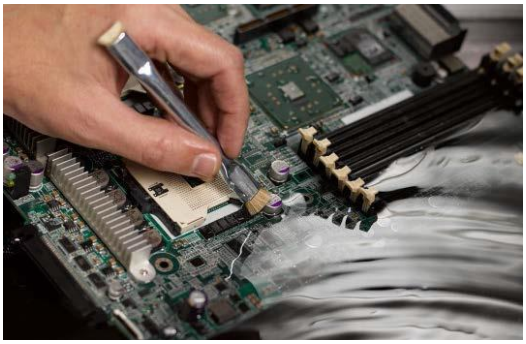
Recovery of Electronic and Electrical Equipment from Catastrophic Water Damage

Our thanks to Chemtronics for allowing us to reprint the following

Overview
Electrical equipment and electronic devices can be recovered from catastrophic water damage due to hurricanes, floods, fire suppression and other severe water impact situations. Water can be removed from electrical motors, electro-mechanical assemblies and electronic devices using cleaning solutions and processes that target water and trapped moisture removal. The assemblies can then be cleaned to remove debris, soot, deposited oil and grease, and other contaminants using a conventional cleaner/degreaser or contact cleaner. While water can cause extensive damage to electronic and electrical equipment, it does not mean that this equipment is lost. When used with the following procedures, Chemtronics® products are an efficient and effective tool in recovery and restoration of water damaged equipment.

Step 1: Rinse Equipment with Clean Water
Electronics and electrical equipment should be flushed well with clean water to remove salt, sediment and particulate matter. Make sure that all equipment is de-energized. Disassemble the equipment to allow access to all interior parts and flush with water until the rinsate is clean. If possible, dip the equipment into a drum or tank of clean water and agitate to dislodge trapped contaminants. After the equipment has been rinsed thoroughly, stand it on end and allow to drain. It must be noted that equipment already damaged by water will not be damaged further by the use of clean water. If clean water is not available, clean assembly with Flux-Off® Water Soluble cleaner (part number ES1530). To speed the drying process, use UltraJet® Duster (part number ES1020). The high pressure of the UltraJet® Duster performs as a “portable compressor” to effectively dry excess moisture and solvent.



Step 1.1: Rinse with clean water

Step 1.2: Remove moisture with Flux-Off® Water Soluble cleaner and UltraJet® Duster

Step 2: Remove Remaining Oil, Grease, Sludge and Other Contaminants
Cleaning will be necessary to remove oxidized oil, grease and other contamination. Most contacts and connectors contain sensitive plastics that will be destroyed using heavy degreasing products. For plastic-safe precision cleaning, remove the remaining contaminants with Electro-Wash® PX (part number ES1210), or for heavy-duty nonflammable degreasing use Electro-Wash® VZ (part number ES6100). Spray the equipment thoroughly or dip the equipment in the solvent and agitate while submerged. Allow the equipment and assemblies to drain and dry completely before returning the equipment to service. Make sure that all contaminated areas have been sprayed and completely cleaned.

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Where removal of caked on grease, sludge and other contamination is required, and where there is little concern for plastic safety, Max-Kleen™ Tri-V™ (part number VVV2279) is used to remove debris and contamination. Spray the equipment thoroughly or dip the equipment in the solvent and agitate while submerged. Allow the equipment and assemblies to drain and dry completely before returning the equipment to service.

Step 2: Remove oil, grease and sludge with aerosol cleaner

Step 3: Protect Bare Metal
After performing the previous cleaning processes on electrical equipment, electric motors, generators, power tools and switches, the use of contact lubricant is recommended to help prevent oxidation and corrosion. DPL Deep Penetrating Lubricant (part number ES1626) is a multi-purpose precision contact lubricant ideal for protecting the bare metal found in all electrical and electronic contacts, maximizing contact integrity. Spraying low voltage contacts with DPL will clean and protect the contacts. Electrical contacts that are not embedded in plastics can also be cleaned and protected by using DPL.

Battery terminals and semi-permanent plug connectors can be further protected and electrical conductivity maximized by using CircuitWorks® Silver Conductive Grease (part number CW7100) on all connector surfaces.

Step 3.1: Spray DPL lubricant on exposed metal to prevent oxidation

Step 3.2: Apply conductive grease to connectors

Step 4: Test Equipment
Test electrical equipment to ensure correct resistance levels have been achieved prior to operating equipment. If correct levels have not been reached, then it may be necessary to repeat Step 2 and 3 of this procedure. When correct resistance levels have been reached, energize equipment under “no-load” conditions and allow operating for a period of time before returning to normal operations.

Technical and Application Assistance
Chemtronics® provides a technical hotline to answer your technical and application related questions. The toll free number is: 1-800-TECH-401.

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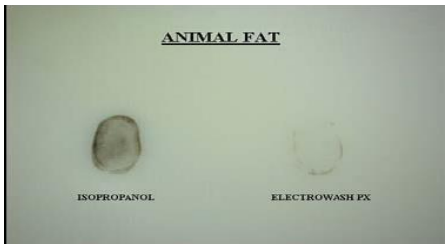
1. Animal Fat – Armour® Lard, which is used to represent the type of grease contamination caused by fingerprints, or transferred to the fingers from handling greasy foods (like French Fries).

Soil Prior to Cleaning

Soil After Cleaning



2. Motor Oil – Quaker State 10W 40 motor oil, which is used to represent the type of light machinery lubricating oils that may be encountered in conjunction with dusty residues, in Outside Plant cleaning applications.

Soil Prior to Cleaning

Soil After Cleaning

3. Silicone Oil – Dow Corning SF96100, which is similar to the type of contamination from Buffer Gel or Pulling Lubricant, used in Outside Plant cable installation operations.

Soil Prior to Cleaning

Soil After Cleaning

Samples prepared from each of the four soil types tested showed only partial removal of the soil (<50%) after a 5-second spray when using the 99.9% IPA. More than 90% of each soil type was removed by the Electro-Wash® PX

Fiber Optic Cleaner after only a 2-3 second spray. These results demonstrate the exceptional cleaning performance of Electro-Wash® Fiber Optic Cleaner PX for a wide range of soils.

CCp™, The Combination Cleaning Procedure

Development of an effective cleaning solvent was critical to overcoming the drawbacks of a Wet Cleaning process, but this solved only half the problem. In order to prevent damage to the optical fiber end face during the cleaning process, ITW Chemtronics researchers have developed an entirely new cleaning tool – the QbE® Cleaning System.

Traditionally, Dry Cleaning has been accomplished using a spooling device, containing a cleaning tape, which slides over a non-replaceable neoprene platen. Opening a sliding door positions a small area of cleaning tape within a narrow slot. The fiber end face is then drawn across the tape surface exposed within the slot. Although a fresh section of tape is presented for use with each opening of the sliding door, the only practical way to make efficient use of the small tape area presented, is to use a “twist and turn” motion as one draws the fiber end face across the cleaning surface. This twisting motion can cause scratching of the end face and does not always remove complex soils. Furthermore, attempting to use a cleaning solvent with these devices

usually results in the fiber connector becoming over-saturated with solvent.

An additional concern with cleaning spool devices is hardening of the non-replaceable neoprene platen. Over time, the platen in these devices tends to harden, due to plasticizer loss caused by natural atmospheric degradation and the repeated action of end face cleaning which is restricted to the same area of the platen. The optical fiber can be damaged if it is pressed too hard against this unyielding surface.

End face contaminants, which include dust, can be more effectively removed using CCp™, The Combination Cleaning Procedure, wherein the end face is moved from "wet-to-dry", using a smooth, unidirectional cleaning stroke over the larger cleaning surface provided by the QbE® Cleaning System. This process incorporates a small amount (<1ml) of cleaning solvent, with an "automatic" drying process.

The QbE® Cleaning System consists of 200 individual sheets of non-linting material. Each sheet is 3 inches square. This ample surface area encourages technicians to use a long cleaning stroke in only one direction, with no twisting or "back and forth" motion, which could result is scratching of the end face. The QbE® is packaged in a reinforced, double-walled container which was designed with input from Outside Plant service technicians. In use each fabric sheet slides over the platen so there is always a new cleaning surface for use. The platen will not harden over the expected life of the 200 individual cleaning sheets. When empty the box and platen is discarded, and a new QbE® cleaning unit is opened. There are no costly cleaning tape spools to replace.

To clean an end face using the CCp™, the technician sprays a small spot (about the size of a quarter) of Electro-Wash® PX Fiber Optic Cleaner onto one corner of a QbE® cleaning sheet. The optical fiber end face is moved from the wet area of the sheet, across the dry portion of the material. Because the lint-free QbE® sheet has such a large surface area compared to conventional cleaning tape devices, it better lends itself to using a long, single direction stroke rather than an abrasive twist and turn motion. The long, smooth cleaning motion acts, in effect, like a light-handed burnishing action. As in any cleaning procedure, the end face is then checked with a fiberscope or other inspection device, and the cleaning procedure repeated if necessary. The CCp™ technique is so efficient that many technicians report that the number of post cleaning fiberscope inspections is reduced.

After cleaning the top sheet of the QbE® should be discarded. While leaving the soiled sheet in place until the next cleaning is good practice, sheets should never be reused or cleaning performed over a previously used area. Some technicians leave this used sheet in place to remind themselves not to use it again. As the soiled sheet is discarded, a new sheet is drawn over the platen, giving a clean surface for further use. Technicians report that the low cost of the QbE® allows them to use a clean sheet for each end face to be cleaned. Complete training in the use of the CCp™ technique is readily available from ITW Chemtronics, through an established network of manufacturer's technical representatives.

ITW Chemtronics researchers developed the QbE® Cleaning System to be highly effective with either wet or dry cleaning techniques. Dry cleaning is acceptable when it can be verified that the contaminant to be removed does not contain potentially abrasive dust. The QbE® Cleaning System and the CCp™ technique should be used whenever the contaminant is more complex than simple hand oil residue or when visual inspection of the end face is not practical. The Combination Cleaning Procedure incorporating a small amount of solvent is field-proven to be highly effective.

Conclusion

The QbE® Cleaning System offers more complete removal of microscopic contaminants, with far less likelihood of damage to the optical fiber end face, than conventional cleaning methods in use today. Because the solvent is so effective, complex soils are completely removed. Finally, since the end face is being drawn from wet to dry along the surface of the lint-free cleaning material, all contaminant residues are captured within the weave of the QbE® sheet. Electro-Wash® PX Fiber Optic Cleaner offers the advantage of evaporating more completely and rapidly than IPA and of cleaning far more soil types. The CCp™ method combines the best features of both the wet and dry cleaning techniques to create a new process, which is superior to either.

The Combination Cleaning Procedure, or CCp™, is safe and effective. It is also faster and easier to use than traditional cleaning devices. The CCp™ is also claimed by field personnel to be highly intuitive, requiring minimal technician training. The most complicated issue in adopting the Combination Cleaning Procedure and the QbE™ Cleaning System is the willingness to abandon old habits and work routines. The combination of effective products and application techniques make the CCp™ ideal for both Outside Plant and OEM cleaning applications.

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