Rejuvenation Instructions

#700 – Failure Sample Handling

This NRI covers the following:

- How to obtain a failure sample for a Novinium treated power cable.

Trademarks: http://www.novinium.com/trademarks/

Patents: http://www.novinium.com/patents/

WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

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Failure Sample Handling

Novinium's Perficio™ and Ultrinium™ fluids meet or exceed the reliability of older injection approaches. Ultrinium™ fluids in particular provide at least twice the dependability of competing products. Occasionally, even these treated cables or their attached components fail. Novinium learns from each failure and adjusts procedures, improves the equipment design, or reformulates the chemistry to provide a continuously improving post-injection reliability experience. These instructions help the circuit owner to provide the failure evidence in a way that preserves the failure story so that the most complete analysis can be performed. The principles of failure sample handling can be summarized into a handful of actions that you should do and not do.

DO	DON'T
• Take photos of **a)** the failure site in its "as found" condition, **b)** the affected sample and components removed, and **c)** the package prepared for shipment. • Remove all damaged cable and/or components, preferably as a single assembled unit. • Secure bare neutrals with electrical tape. • Seal all ends and fault hole to minimize fluid loss or contamination from outside sources. • Collect a warranty tag. • Send the sample to the Reliability Lab right away. • Complete the Novinium Warrant Claim Form, available at www.novinium.org.	• Do not throw anything away. • Do not cut at the failure location. • Do not clean anything. • Do not bend or cut the sample to fit it in a package. • Do not straighten a bent sample.

1. Take photos of the failure site.

a. Take photos of the fault location in its "as-discovered" condition to document the cable environment and cable lay.
   - It is helpful to also take photos after cutting the cable.

b. If the cable or component is bent significantly, take a photograph at a right angle to the bend to document the bending radius.

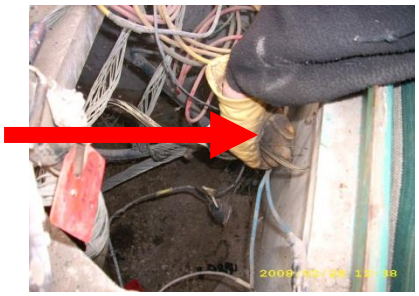

Figure 1: Fault location.

2. Cut the treated cable.

- Follow the instructions in **NRI 710 Cutting a Treated Cable** before proceeding to the next step.

3. Preserve recovered fluids.

a. Place any fluid-stained paper towels or rags in ziploc bags.

b. Pour any fluid into clean bottles that can be tightly sealed.

c. Wrap vinyl electrical tape around the bottle-cap joints to help keep the cap in place.

Figure 2: Apply vinyl tape to prevent the cap from unscrewing.

4. Apply vinyl tape to the bare neutrals.

- Apply vinyl tape to the bare neutrals to keep them in place.

Figure 3: Bare neutrals secured with vinyl tape.

5. Examine the cable for defects.

Examine the cable near the fault site for any of the following defects:

- The insulation shield is separated from the insulation.

Figure 4: Insulation shield is not bonded to the insulation.

- The insulation shield has discharge marks, mechanical damage, or thermal damage.

Figure 5: Pits caused by rodents chewing on the cable.

- The cable is bent more severely than its minimum bending radius.
  - The minimum bending radius is 15X the cable diameter.
  - Measure the OD of the insulation shield and multiply by 15 or use **NRI 210 Bend Radius Template**.

Figure 6: The 1/0 cable is bent more severely than its minimum bending radius.

6. Remove damaged components.

a. Cut off the entire portion of the damaged cable and, where appropriate, cut off the cable components that include all damage from the step 5 survey.

b. Record all known information about the failure conditions such as cable loading, mechanical disturbances, and large amounts of ground water, etc.

Figure 7: Damaged components have been removed.

7. Seal all cable ends and the fault hole.

a. Seal all cable ends and the fault hole to minimize any fluid loss.
  - Shrink-to-fit end caps are ideal for cable ends, but a tight fitting plastic bag secured with vinyl tape is okay.
  - Plastic sheeting over the fault hole cinched at either end with vinyl tape is the best way to seal the fault hole.

b. Avoid allowing fluid to pool in the package if possible.

c. Take a photo of the sealed cable sample at this stage.

Figure 8: Sealed cable ends.

Figure 9: Sealed fault hole.

8. Document removed components.

a. If any portions of a cable or component must be removed in the field, apply marking tape to identify where the component ended.

b. Remove the component with minimum damage to the underlying portions.

c. Note any inadvertent damage.

d. Take a photo of the failure site again after the component has been removed with the marking tape showing.

Figure 10: The re-jacketing sleeve and splice were removed without marking tape, making it impossible to know for sure if the splice had been centered. With a lot of hard work it was still possible to determine that it was not centered properly.

9. Package the failure sample for shipment.

a. Without bending the sample, package it for shipment.

b. Place all fluids in sealed bottles.

c. Secure the bottle lids with vinyl tape.

d. Place the bottles into ziploc bags.

e. Use packaging filler to prevent damage during shipment.

f. Include a warranty tag and a copy of the completed Novinium Warranty Claim Form (available at www.novinium.org). Warranty claims take 30 days to process.

g. Send the photos to Novinium. Failure analysis takes 60 days from receipt of the sample and/or photos.