

CLOR-N-Oil™ Test Kit as a Risk Management Tool - An Update

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ABSTRACT

The Clor-N-Oil™ 50 PCB Screening Kit can be considered an effective risk management tool only if the probability of a false negative is sufficiently small. Utah Power & Light Company has used the kit on approximately 200,000 pieces of equipment and has classified over 123,750 transformers as either positive (over 50 ppm) or negative (under 50 ppm). A random sample of the Clor-N-Oil™ negatives were tested by Gas Chromatographic (GC) methods to evaluate the probability of a false negative (negative by Clor-N-Oil™ but positive by GC). The results showed that the Clor-N-Oil™ 50 PCB Screening Kit is an effective tool for reducing the risk or probability of a PCB spill.

RESULTS

A random sample of 937 Clor-N-Oil™ negatives were tested by Gas Chromatography at an independent laboratory to confirm the Clor-N-Oil™ results. After testing each sample once by GC, twenty of the 937 samples were found to be over 50 ppm. Of these twenty samples, only thirteen could be located for repeat testing. Each of these thirteen samples were retested with the Clor-N-Oil™ kit. Seven of the retests were once again negative, while six were positive. The seven negatives were GC tested a second and third time, and all had a value of less than one ppm PCB. To verify that the lab results were inaccurate, oil was drawn from the corresponding equipment, Clor-N-Oil™ tested, and GC tested again. Results were once again negative and less than 1 ppm PCB. The discrepancy could be due to sample mix-up, incorrect labeling, cross-contamination, or other interferences.

TABLE I

GC Retest Results of 930 Negatives
Class Interval (ppm)

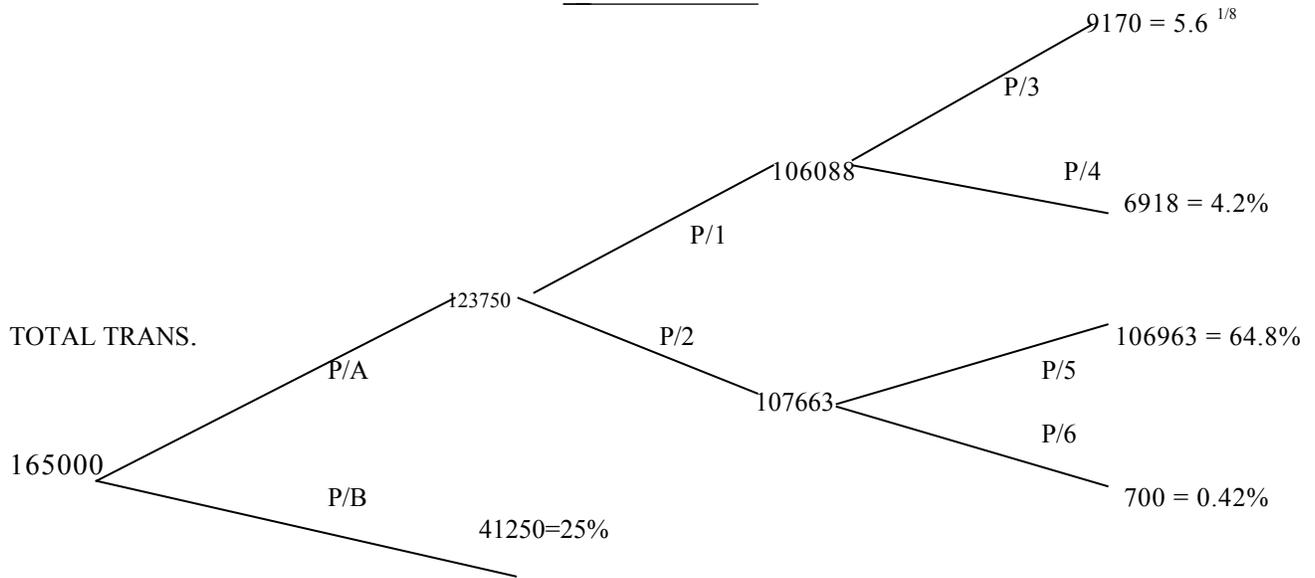
	<u>-1</u>	<u>1-5</u>	<u>6-15</u>	<u>16-25</u>	<u>26-46</u>	<u>47-99</u>	<u>100-475</u>	<u>476-999</u>	<u>1000+</u>
Number	768	93	48	5	10	3	3	0	0
Percent	82.6	10	5.2	0.5	1.1	0.3	0.3	0	0

The six samples that retested positive were also tested again by GC. The second GC tests confirmed the results of the first test. Assuming these six samples to be false negatives, a false negative rate of 0.65% is predicted from this study.

A 0.65% rate of false negatives throughout the UP&L system means that of the 107,663 transformers that tested negative with the Clor-N-Oil™ kit, 700 may actually contain greater than 50 ppm PCB. This compares to 6,002 contaminated transformers that will be left in service if the Clor-N-Oil™ kit is not used.

Disposal, cleanup and environmental costs increase approximately ten-fold if PCBs are present, not to mention health effects and public relations problems associated with PCBs. Therefore, what is the probability of possessing a contaminated transformer, given it has been Clor-N-Oil™ tested and found to be less than 50 ppm (negative)? Figure 1 on the following page, illustrates the different probabilities

FIGURE 1



P/A =	Probability of a transformer being Clor-N-Oil™ tested	.75
P/B =	Probability of a transformer being manufacturer-certified as non-PCB	.25
P/1 =	Probability of a Clor-N-Oil™ positive	.13
P/2 =	Probability of a Clor-N-Oil™ negative	.87
P/3 =	Probability of a false positive	.57
P/4 =	Probability of a true positive	.43
P/5 =	Probability of a true negative	.9935
P/6 =	Probability of a false negative	.0065

Probability of possessing a contaminated transformer that has been tested with the Clor-N-Oil™ kit and found to be negative
0.42%

Utah Power & Light Company expects .05% of all transformers to fail per year. That corresponds to 83 failures per year. What is the expected number of failures of contaminated transformers per year, given that the units tested were Clor-N Oil™ negative?

$$165,000 \quad (.0005) \quad (.75) \quad (.87) \quad (.0065) = 0.35$$

What is the expected number of contaminated transformer failures per year if the Clor-N-Oil™ kit is not used to screen out these units? (4.85% is the percentage of true positives).

$$165,000 \quad (.0005) \quad (0.0485) = 4.0$$

$$0.35/4.0 = 91\% \text{ reduction in risk}$$

To determine if the false negative rate of 0.65% was due to testing, sampling, labeling, or record keeping, other studies were conducted. One study involved 100 previously Clor-N-Oil™ tested samples - 50 negative, 50 positive. Each sample was retested using the Clor-N-Oil™ kit and run twice by GC using two different laboratories. All fifty negatives were again negative by Clor-N-Oil™ and were all less than 50 ppm by GC. All fifty positives were again positive by Clor-N-Oil™ - 14 were less than 50 by GC and 36 were greater than 50 by GC. In this study, neither the GC nor the Clor-N-Oil™ kit gave false negative results. Another study of 100 spiked samples was Clor-N-oil™ tested and then GC tested. The rate of false negatives in this study was 3%. The high rate was attributable to inaccurate interpretations of the calorimetric results of the Clor-N Oil™ kit. Other UP&L studies, in all totaling 1,210 GC tests of Clor-N-Oil™ negatives, revealed an overall false negative rate of 1%. These studies led to the belief that the inaccuracies are. due to sampling, labeling, interpretation and record keeping

errors, all of which are controlled by the operator. Therefore, false negatives are mainly a result of human error.

CONCLUSIONS

The Clor-N-Oil™ kit can reduce risk by as much as 91%, is simple to use, and is inexpensive. By Clor-N-Oil™ testing rather than GC testing equipment, UP&L has saved approximately \$2,800,000 and will continue to save in disposal, cleanup, and other costs associated with a PCB spill. Any equipment that ruptures or spills will be GC tested, but UP&L believes that only 1 in 237 will be over 50 ppm PCB. By not using the kit, 1 in 21 would be over 50 ppm PCB. UP&L believes that the Clor-N-Oil™ 50 PCB Screening Kit is an effective risk management tool.