

S O I L R E M E D I A T I O N C O S T S

From "Calculation of stress-dependant life cycle costs of a substation-demonstrated for controlled energization of un-load transformers" by Politano, D; Frolich, K: IEEE Transactions October 2006.

The cost of substation for one hour when the substation is not generating is \$1250.00

From HazMat October/November 2001 by Aaron Dorman

Thermal treatment ranks highest in independent study

Typical costs in 2001 for Thermal treatment of soils ranged from \$150 to \$380/metric ton.

Costs to have a crew of four [4] to remove soils from a contaminated site would typically be as follows:

\$35.00/hour for each labourer and \$50.00/hour for the crew foreman.

Backhoe rental for 1 hour is \$250.00. Trucks to remove the contaminated soils would be \$350.00/hour dependant on distance required to drive to incinerator.

Therefore costs associated with soil remediation, should all the mineral oil remain on site would be as follows:

1. Given a transformer of a 5,000 gallon capacity.

2. It is easily stated that 500 metric tons of soil would be affected by this amount of mineral oil.

A. Cost to remediate 500 metric tons of soil using a cost of \$230.00/metric ton [a middle number] would be \$115,000 – A clayey type of soil would be much higher than \$350/metric ton due to the fact it would retain moisture at higher temperatures and the time to burn off all the residue would be much greater.

B. To remove 500 tons of soil from the substation would take approximately



3 working days at 8 hours per day. Labour costs would be about \$3,750.00

C. To utilize the equipment normally 2 back hoes will be required and at least 2 trucks to cart the soil from the site over the three day period. Cost of the equipment would be \$28,800.

- Total cost to remove the soils and remediate would be estimated at \$147,550.

The soils then need to be replaced, cables replaced, grounding grid replaced which would require additional labour.

1. Before soils can be replaced, they must be tested by an independent laboratory to assure that there is no contamination in the soils. Cost is not high, although this testing can take up to 1 week before receiving approval to use the soils.

2. Then the same labour and equipment will be needed to replace the soils. The time frame will again be 3-eight hour days. Total cost will be \$28,800.

3. Electricians are required to replace cables and ground grid. This typically can be accomplished over the three day period. Given a electrician will cost approximately \$75.00 per hour and that 3 electrician will probably be required the cost for their labor, with-

out material costs will be \$5,400.00

4. Cable replacement and grounding grid replacement can run up into \$25,000 or higher, but we will use a conservative figure of \$25,000.

Now the total cost of this exercise, without looking at the down time for the substation is \$206,700. [This figure is probably a little conservative, but we are basing the remediation costs on a small 5,000 gallon transformer].

Now typically the Utility will have a spare transformer and this spare transformer could replace the failed transformer within a period of 24 hours should there be secondary oil containment where soil remediation is not required.

However, because the soils have to be removed and remediated it is not possible to place the new transformer and have it energized.

Therefore based on a period of 6 days [again a very conservative figure] without allowing for the time for an independent lab to test the soils and based on the article by Politani, D et al the cost of having this substation down for 6 days is \$1250.00/hour or \$180,000.

If we total the five [5] extra days for the lab to report back with the soil analysis then we would be looking at a cost of \$330,000.00

Plus all the remediation costs of \$206,700 for a grand total of \$536,700.00

A Sorbweb™ Plus Secondary Oil Containment System for this 5,000 gallon transformer- installed -

Approximately \$50,000.00