SELF-MITIGATION OF MAGNETIC FIELD UNDERNEATH OVERHEAD POWER LINES USING EVOLUTIONARY ALGORITHMS

By

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Of

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In

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Thesis summary

The biological effects of low frequency electric and magnetic fields are considered as one of the most attractive topics of the scientific research. Consequently, some epidemiological studies found that there is a relationship between prolonged exposure to power-frequency magnetic fields and health effects.

Different methods of mitigation of the magnetic fields near the overhead transmission line are reported over the last 20 years such as manipulated distances, underground cables and shielding with loops.

This thesis represents a proposed mitigation method of the magnetic fields near an overhead transmission line to avoid the harmful effects on the population around these lines. Magnetic fields can cause diseases such as cancer in additional to change in human brain activity and heart rate. Consequently the magnetic fields was calculated at first to determine the regions that need to be protected against the magnetic fields more than the safe limits. Then self-reactive compensation was introduced to mitigate the magnetic fields. The proposed method causes the current in the power transmission portion near to the residence to be unbalanced. Notwithstanding, it is important to note that the three-phase current is balanced before and after the residence, only the part of the transmission line parallel to the residence is unbalanced. It can be done through shunt reactive elements at the start and end of the specified portion resulting in a lower magnetic fields. Genetic Algorithm (GA) is used to estimate these reactive elements achieving the best condition of the minimum magnetic fields in residence. Results show that the magnetic fields is mitigated to acceptable levels. Moreover, several additional advantages are gained compared to other conventional methods.

The assumptions of the proposed method is as follows: The magnetic field is computed at point one meter above the ground level which is the standard height reference. The calculation at the mid-span of the transmission line which has the maximum magnitude of the magnetic field along the transmission line. The magnetic field is based on two-dimensional space, which the conductor is assuming parallel with the flat ground.

The proposed method provides a considerable reduction in the magnetic field near OHTL at a certain residence better than other conventional methods. The proposed method does not need any additional circuit since the compensating currents flow through OHTL itself. As a result of the compensating currents in the

form of unbalancing flows through reactive elements at the start and the end of the residency. Nevertheless, the proposed method is suitable for the residence where existing at one side of the TL. A new procedure has been presented to mitigate magnetic field in the power line vicinity using current unbalance as self-mitigation technique. Using genetic algorithm can be configured to active optimum results concerning a specific Zone. The number of parameters depend on the configuration of the compensators on the transmission line.

Finally MATLAB SIMULATION was made for studying transient and steady state currents after connecting the compensators and compared the results with the shielding with loops.