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Tue-Af-Po2.25-12 [121]: Detection of Underground Tower Base for Distribution Transmission Network Based on Transient Electromagnetic Method

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In the construction of distribution transmission network, in order to check whether the poles and towers are built as required, it is necessary to detect the underground tower base which is made up of concrete-filled steel tubular. The transient electromagnetic method can obtain location information of underground metals when they induced secondary induced voltage on receiving coil caused by eddy current effect of these metals. It is efficient and non-destructive which can be used in the detection of underground base.

However, due to circuit transient process and electromagnetic coupling, signal collected on receiving coil not only has secondary induced voltage, but also mixes primary induced voltage caused by mutual induction between transmit coil and receiving coil. Since the magnitude of primary induced voltage is much larger than secondary induced voltage, accurate detection becomes rather difficult.

In this paper, a hardware decoupling method using decoupling coil and precise potentiometer is proposed. The decoupling coil and transmit coil are coaxially reversed wound but independent to each other. Meanwhile, decoupling coil and precise potentiometer are connected to the receiving coil. By fine-tuning the precise potentiometer, the output voltage of the decoupling circuit counteracts to the primary induced voltage so that the acquired signal on receiving coil is a pure secondary induced voltage waveform.

A detection system is designed according to the analysis of the transient electromagnetic process. Finite element analysis method is adopted to establish equivalent detection model and obtains the spatial induced field distributions. Experimental results of the prototype show that acquisition waveform on receiving coil is generated by eddy current effect of underground base and compared with the feedback waveform of standard underground base, the proposed method can verify whether the poles and towers of distribution network is buried as required.

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