

A Study on the Derivation of the Equivalent Circuit of the Traction Transformers on AC Railcars

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Calculating the harmonics of traction current from AC electric railcars are necessary for predicting interferences to telecommunication systems and railway track circuits. A method called "Reactance matrix method" has been available instead of circuit simulators in Japan for a long time. The Reactance matrix represents the short-circuit inductances derived from the simultaneous equations of the electric circuit of the traction transformer. This report describes a study of the derivation on the equivalent circuit of the traction transformer from the Reactance matrix. The paper first shows the matrix operator between the Reactance matrix and the inductance matrix, which is the most essential matrix of the transformer. Next this also shows that the same matrix operator derives the admittance matrix from the Reactance matrix. The admittance matrix transforms easily into the coefficients of the equivalent polygonal circuit of the traction transformer.