DIGITAL COMPUTER ANALYSIS OF STATIC CONVERTER CIRCUITS

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Static converter circuit analysis presents countless difficulties, due to the non-linear characteristics of the diodes and thyristors present in these circuits.

A diode or thyristor can either be conducting, or, non-conducting. For practical purposes, a linear circuit representation could be made for this, with a resistance, having a very low value for the conducting state and a very high value for the non-conducting state.

In order to make this representation, the proper states of the non-linear elements in the circuit should be known at every instant of time. Step by step solution of the circuit by Digital Computer enables this. From this knowedge, the values of the representing resistances are appropriately changed for the next step. They may have to be rechanged again and again, until consistency is obtained and once achieved, a further step could be advanced.

The representations at the very beginning are arbitrarily assumed. The subsequent solutions will not depend on this choice.

The solutions obtained are practically acceptable, if the step length chosen is small. The problems arising with a large step length are, time shifting of the input voltage waveforms, improper commutations between diodes and thyristors and unrealistic values necessary for holding currents of thyristors.

This computer program was used in the design of the Direct Current Chopper, now being constructed at the Power Electronics Laboratory at the University of Moratuwa.

References:

Ketter, R. L. and Prawel, S. P. (1970). Modern Methods of Engineering Computations. McGraw Hill, New York.