

## A Method to Saturation Modeling of Synchronous Machines in d-q Axes

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**Abstract :** This paper discusses the general methods to saturation in the steady-state, two axis (d & q) frame models of synchronous machines. In particular, the important role of the magnetic coupling between the d-q axes (cross-magnetizing phenomenon), is demonstrated. For that purpose, distinct methods of saturation modeling of dumper synchronous machine with cross-saturation are identified, and detailed models synthesis in d-q axes. A number of models are given in the final developed form. The procedure and the novel models are verified by a critical application to prove the validity of the method and the equivalence between all developed models is reported. Advantages of some of the models over the existing ones and their applicability are discussed.

**Keywords :** cross-magnetizing, models synthesis, synchronous machine, saturated modeling, state-space vectors

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