

# **A PHYSICAL VISUALIZATION OF TRANSIENTS IN SYNCHRONOUS MACHINE**

Orlando S. Lobosco

Instituto de Eletrotécnica e Energia  
Universidade de São Paulo  
05508-900 - P.O. Box 64521 - São Paulo - Brazil

## **Abstract**

Recent papers [1, 2, 3, 4] have emphasized the idea of using vector diagrams to analyze the performance of electrical machines in dynamic conditions. This has encouraged the author to resume a contribution only briefly mentioned in the ICEM'88 (Pisa) [5]. In that paper, an approach leading to an easy construction of vector diagrams for transient conditions was presented.

The present paper shows the application of vector diagrams to represent the behavior of synchronous machine *during* a transient process. This article does not intend to penetrate into the core of theoretical discussions on space-vector versus space-phasor diagrams, as previous papers on the subject have done, but merely to introduce the application of dynamic vector diagrams for practical and teaching purposes.

As an example, a dynamic power diagram is introduced, showing the oscillation of the rotor following a sudden change in the generator operation. It is the author's belief that the visualization obtained from geometric constructions is particularly useful for teaching purposes, since nowadays the widespread use of computers to solve numerically the machine equations, tends to stray the student's attention from the actual physical phenomenon occurring during the performance of the electrical machines.