

Eliminating Sub-Synchronous Oscillations with an Induction Machine Damping Unit (IMDU)

Sujit Purushothaman¹, Francisco De Leon¹

¹Polytechnic Institute of New York University

The IEEE First and Second Benchmark models for Sub-Synchronous Resonance (SSR) are used to analyze the damping properties of an induction machine damping unit (IMDU) coupled to the shaft of a turbo-generator set. This paper investigates the rating and location of the induction machine that, without the aid of any controllers, effectively damps subsynchronous resonance for all line series compensation levels. Eigenvalue analyses are performed on linearized models of the shaft system including the induction machine to find the optimum location. The best location of the IMDU, providing maximum damping, is next to the HP turbine at the end of the shaft. Time domain simulations are conducted to find the adequate rating of the induction machine. It is observed that a small size, high power (about 10% of the generator rating), low energy machine effectively damps SSR. The IMDU reduces peak torques in shaft sections during transients. In the paper, it is demonstrated that the addition of an IMDU at the end of the shaft would have prevented the SSR events of the Mohave Desert shafts.