On-line estimation of synchronous generator parameters

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Abstract: Generator parameters are employed in the construction of models used in transient stability studies and other routine power engineering studies. These studies are critical for the operation of the power system, and therefore accurate representation of synchronous generators and their parameters is important. The existing off-line techniques are often not practical and do not capture the behavior of the generator at all operating levels. Generator parameters vary due to aging, changes of the generator internal temperature, magnetic saturation, and coupling between the generator and external systems. The method presented in this presentation estimates generator parameters at any operating level, taking into consideration the effect of saturation in the mutual inductances. Estimation of synchronous generator parameters is a fairly complex mathematical procedure, and there is a need for an easily used mechanism for model parameter estimation. The proposed method is based on least squares estimation and on a simplified synchronous generator model. A saturation model of the inductances of the synchronous generator is proposed and implemented in the estimation procedure. Accurate representation of saturation leads to accurate estimates that reflect the true status of the machine at every operating point. Saturation in both the direct and quadrature axes of the generator is considered. Results from actual on-line measurements are presented. The estimated parameters are compared to available manufacturer data and the accuracy of the method is assessed.

About the Speaker: Elias Kyriakides received a Diploma in Electrical Engineering from HTI, Nicosia, Cyprus in 1996 and a B.Sc. degree in Electrical Engineering from the Illinois Institute of Technology, Chicago, IL, USA in 2000. He received M.S. and Ph.D. degrees in Electrical Engineering from Arizona State University, Tempe, AZ, USA in 2001 and 2003 respectively. He has worked as a Research Associate at Arizona State University from Aug. 2000-Dec. 2003 and as a Faculty Research Associate from Jan.-May 2004. In July 2004 he joined the Department of Electrical and Computer Engineering at the University of Cyprus where he is a Visiting Lecturer. His research interests include electric machines, state estimation, renewable generation, and computer applications in power engineering. He has published papers in refereed journals and international conferences. He is a Member of the IEEE, the IEE, and the Technical Chamber of Cyprus. He is a reviewer for the IEEE Transactions on Power Delivery, the IEEE Transactions on Power Systems, the IEEE Transactions on Education, the IEEE Transactions on Control Systems Technology, and the International Journal of Energy Technology and Policy. He was the recipient of the Palais Outstanding Doctoral Student Award at Arizona State University (2004), the third prize in the IEEE poster-paper session and contest for the paper entitled "On-line identification of generator and exciter parameters" (2002), the Alumni association award at the Illinois Institute of Technology (2000), and the Presidential award at the Higher Technical Institute (1996). His interest in the advancement of power engineering education led him to the development of PowerSurf: a dedicated search engine for power engineering.

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