471. On Model Updating of Turbo-Generator Sets

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Abstract. Models can be applied for simulating dynamical behavior of rotating machinery or specific faulty conditions. Efficient model updating techniques could be very useful for increasing model accuracy. Model updating of rotor systems is significantly different with respect to the well-known model updating techniques and related modal analyses performed in the field of vibrating structures. This paper investigates both the difficulties and the conditions of rotor vibrations measurement tests as well as the approximations introduced in the rotor model. Some experimental cases of turbo-generator machines indicate the difficulties and problems in the identification of eigen-frequencies and damping modal parameter. In the second part of the paper uncertainties and non-linearity of the model are investigated. An example of updating of some shaft and bearing parameters by means of an evolutionary algorithm, for fitting the natural frequencies of a shaft line, is presented and discussed. Model updating techniques of bearing coefficients are also discussed and a procedure is proposed to avoid misleading results of widely-used model updating approaches.

Keywords: model updating, rotor dynamics, model identification, bearing coefficients, evolutionary algorithm.

1) Introduction

Models can be used for simulating dynamical behavior of rotating machinery as well as specific faulty conditions. Provided that the models of the machine and of the malfunction are available, these models can be applied for diagnosing malfunctioning conditions in a model based diagnostic approach, by comparing the measured results with the simulated behavior. On the basis of the result of the diagnosis, also a prognosis can be elaborated, which allows to program the outage period necessary for inspection and repair, if required, or to evaluate the residual life of the machine. Obviously the accuracy in malfunction identification (with type of malfunction, its severity, and its position along the shaft line) depends strongly on the accuracy of the models.

Therefore, in order to improve the identification quality together with the complete diagnostic and prognostic procedure, efficient model updating techniques could be very useful for increasing the accuracy of the models.