

MODEL BASED DIAGNOSTICS OF ROTATING MACHINERY

Joanna Iwaniec
jiwaniec@agh.edu.pl

Jarosław Bednarz
jaroslaw.bednarz@agh.edu.pl

Tadeusz Uhl
tuhl@agh.edu.pl

Tomasz Barszcz
tbarszcz@agh.edu.pl

AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY
Mickiewicz Alley 30, 30 – 059 Krakow, POLAND

ABSTRACT

The paper concerns identification and diagnostics of rotating machinery with nonlinear dynamic properties. In the first part of the paper there is presented identification method combining restoring force, boundary perturbation and direct parameter estimation techniques. This method, on the contrary to classical nonlinear system identification methods, requires neither input measurement nor linear behaviour of the considered system around an operating point and, therefore, is a suitable method for identification of nonlinear systems working under immeasurable operational loads. In the paper there are presented results of method application to parameter identification of machine shaft flexible support.

The second part of the paper concerns detection and identification of turbine blade cracking by means of the NARX model based damage detection technique, which is especially efficient in modeling and diagnostics of nonlinear systems. In the paper there is presented the algorithm of the NARX method based diagnostic process, method applicability to structural health monitoring of rotating machinery as well as method experimental verification carried out for data measured on the laboratory test stand.

Keywords: nonlinear system identification, restoring force, rotating machinery diagnostics, blade crack detection, NARX.