# BALANCING MACHINE VIBRATION AND IDENTIFICATION OF OIL-FILM BEARING PARAMETERS

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*The paper deals with the modelling of balancing machine vibration and the identification of the stiffness and damping coefficients of oil-film bearings. The real balancing machine consists of a flexible rotor, oil-film bearings and bearing heads on spring elements. The mathematical model enables to calculate eigenvalues, critical revolutions and unbalance vibrations in dependence on the rotational speed. The identification method of the oil-film bearing stiffness and damping matrices is based on the minimization of differences between measured and calculated rotor critical speeds and bearing head displacements in balancing machines. The rotor is excited by attached known trial masses fixed in chosen balancing planes.*

Key words: *vibration, balancing machine, identification, oil-film bearing, stiffness and damping matrices*

## 1. Introduction

Oil-film bearings are useful and necessary in the basic rotating machinery used in power engineering. The specific properties of rotors supported in oil-film bearings are anisotropy of the rotor support, coupled rotor vibration in horizontal and vertical planes and large damping. The forces transmitted by oil-film bearings can broadly be described for small displacements from equilibrium position by linearized stiffness and damping coefficients [1], [2]. The properties of the lubricant, the geometry of the clearance and bending deformation of the journals influence considerably the relation between the forces and the displacements of the journals. The hydrodynamic bearing theory [3] cannot satisfactory respect all mentioned influences particularly in the large range of rotating speeds.

The paper presents the method for identification of stiffness and damping coefficients of oil-film bearings using experiments on the balancing machine SCHENCK with low-pressure rotor of the turbine 220 MW NPP Dukovany in the ŠKODA POWER company [4]. The method is based on minimization of differences between measured and calculated rotor critical speeds and on minimization of differences between measured and calculated displacements of two bearing heads [5]. The methodology of the balancing machine modelling published in [6] and the identification method of the mentioned parameters at a modelling problem published in [7] were used.

## 2. Mathematical model of the balancing machine

We consider an elastic balanced turbine rotor supported in two oil-film bearings of the balancing machine (Fig. 1). The bearing shells are fixed rigidly to the rigid bearing heads

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