

LOW-PRESSURE TURBINE ROTOR CRACK INFLUENCE ON DYNAMIC STATE OF LARGE POWER TURBO-SET – NUMERICAL ANALYSIS

Slawomir Banaszek

Polish Academy of Sciences, The Szewalski Institute of Fluid-Flow Machinery

ul. Fiszera 14, 80-952 Gdansk, Poland

tolek@imp.gda.pl

ABSTRACT

Specialized on-line diagnostic systems are expected to identify defects of different types. Crack is one of the most dangerous defects and it may lead rotating machinery to disaster. It is especially dangerous in a case of critical machines, for instance large power turbo-sets, so that diagnostic systems dedicated to this class of machines need to have a proper knowledge base. Such a base contains diagnostic relations between defects and their symptoms and the system must know diagnostic indicators of particular classes of defects to distinguish each other. Some works show that finding diagnostic indicators of some defects is difficult. Crack influence on the machine dynamic state may be ambiguous and it depends on the slot position, particularly on the correlation between the phase angles of the slot and resultant force acting on a rotor. The paper presents the study of crack influence on 200 MW turbo-set dynamics (rotor is founded on slide bearings). The research was made in a way of computer simulation. The computer code and mathematical model of rotor and its dynamic load are briefly presented. Crack is placed in low-pressure turbine. It is assumed that crack depth is 45% of shaft diameter. Seven different axial positions and four angular positions were taken into account to compare their influence on machine vibration. The possible crack indicators and the possibilities of crack localization are discussed.

Keywords: crack, slide bearings, vibrodiagnostics, vibration, rotor dynamics