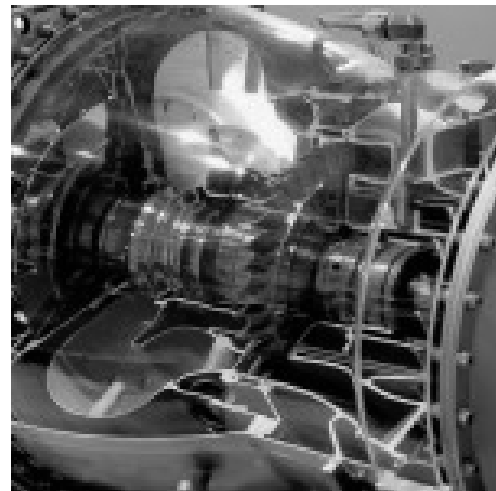
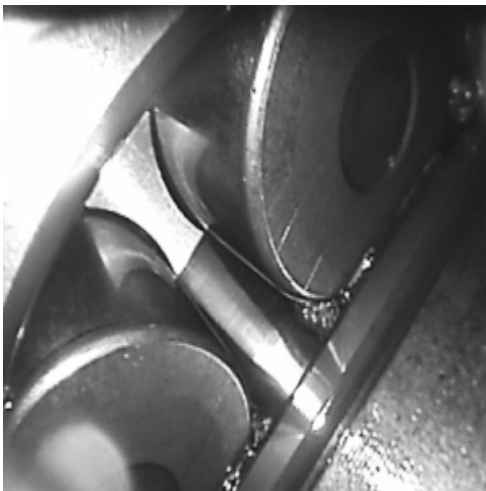


Role of Borescopy in Ensuring the Operability of Turbomachines

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PREFACE

One of the main activities and tasks of service engineering is to ensure operability of machines.

Highly mechanized and automated technological devices with existing functional links between individual constituting elements emphasize the problem of machine downtimes and ensuing costs.

In connection with increasing complexity of machines, their purchase price, maintenance and repair costs, it is an important factor that needs to be addressed both in sphere of production by improving their performance and reliability as well as at the operator by high quality maintenance activities.

It is important to realize that an inseparable part in the lifetime of technological devices is their operation and operational reliability ensuring through maintenance activities after diagnosis of the previous state.

All technological devices must be invented, designed, dimensioned and then operated and all these stages are subjected to management. We can say that the operating stage of technological devices is not only the longest but also the most relevant and most important stage of their lifetime, as these devices become work or production devices and hence they create economic value.

This scientific monograph is focused, in technical diagnostics view, on emphasis of preventive maintenance effect to reliable and safe operation of technological equipment.

Issues of boroscopy, as one of diagnostic methods that allows fast information acquirement of internal parts of technological system of turbo set RB211 - DLE installed in steam-gas cycle facility in the chosen organisation, are described in this monograph. The monograph brings new views onto internal inspection of technological systems from the quality point of view, covering searching possible defects and assessing qualitative attributes of the internal parts of the system. Such qualitative attributes as are for instance shape deviation, material integrity, breaks, cracks, caves can be observed in boroscopy tests directly, in real time.

Solved problems resulted from specific demands of facility operation and reflect state-of-the-art in relevant science field. Procedures proposal, assessing criteria specification and classification of possible damages in the system operation are main parts of the monograph. The system condition is assessed then in the monograph, based on boroscopy tests realised. Conclusions are drawn then and recommendations for next system operation are provided. The results fulfil assumptions as well as technical demands in the area of technical diagnostics. This means reliability and safety of the system assurance, using instruments of autonomous maintenance and inspection,

check and revision actions regarding to adherence of rules and principles of proper technological system operation.

Authors

INTRODUCTION

In present days, technical diagnostics has become not only an independent scientific discipline but principally the key tool for the specification of the monitored object's technical condition.

Therefore, it is logical that not only a multi-parametric approach in technical diagnostics, but also expanding technical and measuring capabilities of various methods of technical diagnostics lead to the fact that also these methods have become relatively independent scientific disciplines.

We can definitely state that towards the end of the 20th century the problem of saving of all forms of energy had become crucial especially in connection with the issues of environmental protection. It is obvious that this is closely related to the question of increasing operational reliability of machines and technological devices.

It is clear that the fundamental requirement on any rotating system or power unit is its maximum reliability which can be expressed in terms of operating savings and also in terms of long lifespan of the machine or device.

The most important tools of maintenance ensuring include the methods of technical diagnostics, which entirely affect the complete contents of maintenance. In practice, technical diagnostics represents the main instrument of control, inspection and revision activities, specifies the necessity and extent of repairs and belongs to the instruments and means of autonomous maintenance, where it evaluates compliance with the principles of correct operation.

Diagnostic methods also include an internal inspection of machines, so called borescopy. Borescopy is a method involving a human eye to inspect, assess and evaluate qualitative marks of products. It is a non-invasive method of visual inspection of interior parts of machines and devices. This method is used to determine functioning and technical condition of interior parts of machines. While all other nondestructive testing methods provide indications that require interpretation, during visual examination qualitative features such as material discontinuities, shape malformations and surface quality defects are directly observable.

Use of this diagnostic monitoring method is especially important in continual 24- hour operation in the energy industry.

Monograph is focused on industrial diagnostics, machine borescopy in a selected organization. It aims to highlight the importance of machine diagnostics quality and their reliability increasing, based on performed borescope inspections of turbomachinery in combined cycle in this selected organization. It provides some recommendations on further operation of technological equipment and also deals with proposal of evaluation procedures and results processing with demonstrable final evaluation.