DIAGNOSTIC MEASUREMENT OF CHOSEN CHARACTERISTICS AT ALMEGA AX-V6 ROBOT

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Abstract

The article discusses about measurement diagnostic at industrial robot ALMEGA AX-V6 and its maintenance. Also contains a problematic, in case of overload limit, which are source of faults and damages directly robot and equipment around. Diagnosis measurement of vibration and noise, should allow monitoring of equipment defects, through a system of preventive maintenance, predictive. Automatic diagnosis of machinery and equipment was made in order to ensure a higher reliability of these and how to obtain a more extended life cycle without the occurrence of defects.

Key words: Vibration, industrial robot, maintenance, accelerometer

INTRODUCTION

The basic objective of monitoring vibration at automated and robotic devices is providing information on the operational and technical condition of equipment to ensure strategic planning and maintenance management. An integral part of this process becomes especially evaluation of the status and behaviour during vibration up to now of time operation. It is necessary to understood that the vibrations at these devices are closely linked to the dynamic loads device, to the status of bearings, gears, misalignment and the cracks of the important components, wear and the like.

Their monitoring and evaluation is a fundamental and crucial technical diagnostics method. Vibrations that are caused by dynamic stress facilities are diagnostic parameter that gives information to determine an objective technical condition of automated and robotic equipment. Early detection of potential failure is simply a prerequisite for strategic planning of remedial measures.

MEASUREMENT PRINCIPLES

The accuracy, repeatability of operations and high reliability are relevant factors to deployment of industrial robot (as one of most important equipment) into industrial operating. Robots work at high speeds, where it is necessary maintains a sufficient dynamic stiffness. That are the reasons for periodic inspection their functionality [1]. As for the methodology of vibration measurement, which can be detected directly on robot, is necessary to choose measurement points closely at the base plate of the anchorage. The reasons for selection these points are following:

- Negative influences from vibration of base plate are transferred into other parts of robot.
- Increasing of vibration values during the operability is reflected first at point for anchorage of base plate in vertical direction. Fig. 1 describes a correct status for anchorage of base plate.

![Fig. 1 Correct status of anchorage of base plate at Almega AX-V6](image1)

- Released status for anchorage of base plate after some time for example by releasing of nuts can be seen at Fig. 2.

![Fig. 2 Released status of anchorage of base plate at Almega AX-V6](image2)

- Point selection directly at screw connection is conditioned that at horizontal direction is captured increasing of vibration values [2]. Specific point is
independent from specific anchorage screw, see Fig. 3.

Fig. 3 Mechanical deformation at anchorage of base plate in horizontal direction

- Point selection in the area of screw connection on the basis of robot is recommended also by ISO standard 2372 [3].

With regards to base plate measurement of vibration is realized:

- after installation of robot,
- after certain time intervals during his operation.

Measurement vibration process is realized during the standard operation of robot. Measurement could be realized with manipulated object, if it is possible. Its weight must be closely to payload of robot [4]. The values of its speed and acceleration should approach the maximum values in order to the measurement results reflect a real character. If these conditions are not met, the risk of failure in the form of increased vibrations in the robot will not occur.

**DIAGNOSTIC MEASUREMENT**

Specific experimental measurements of vibration were realized directly on the robot Almega AX-V6 with object whose weight was 5.5 kg, see Fig. 4. Measuring point in area of screw connection can be seen at Fig. 5.

Accelerometers A1, A2, A3 type AC 102-1A were used for measurement of vibration. For the purpose of transformation of diagnostic signals, the converters types ADASH 3900 were used that are able to convert mechanical value into electric signal [5].

Fig. 5 Measurement point

Information about amplitude that was obtained from accelerometers of vibration and was processed by converter into the value of electric signal can be seen on the Fig. 6. Signal is transmitted through interconnection unit and multifunctional measurement card PCA – 7228A for PCI bus into the computer [6]. This card contains A/D and D/A converters for transformation input signal into a digital form. Then signal is processed in software program ScopeWIN. The device is supplied by DC 21 V [7].

Fig. 6 Schema interconnection for measurement of vibration
RESULTS

Measurement was realized in all three axes directions (axial, vertical and horizontal direction). Program ScopeWIN records a spectrum of vibrations (Fig. 7) in preset time from all three accelerometers for vibrations. Due the most correct result from measurement was chosen vertical direction which was subsequently analyzed by FFT method (Fast Fourier Transformation) [8].

A result from measurement was compared with permitted value of vibration based on classification of robot into the one of four classes according to ISO standard 2372. On the basis of this ISO standard, robots which are installed directly at the floor belong into class 4; the area is marked by red color and marked with letter (D). For this class is maximum allowable value of vibration 1.8 mm/s, see Fig. 8. Automated robotized system is built to verification purpose for behavior of robots designed in more numbers at one workplace [9]. The workplace is built gradually and first phase of solution in present time. Assembling part of workplace will be used for recognition of non-oriented objects through camera system that rapidly increases the possibilities at workplace.

CONCLUSION

Based on the realized measurement of vibration directly on the industrial robot Almega AX-V6, our results belong to the range of normal, so there is any assumption of early onset of a defect on this robot. As for the robot maintenance, some recommendations can be offered, such as regular measurements and evaluations of vibration values at defined time intervals during operational status of the robot. It is also recommended to do next measurements at different suitable measurement points based on ISO standards 2372 and 10816-1 and 10816-3.

References

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