## Dependability Characteristics – Indicators for Maintenance Performance Measurement of Manufacturing Technology

Adam Teringl<sup>1</sup>, Zdeněk Aleš<sup>2</sup>, Václav Legát<sup>2</sup>

<sup>1</sup>NET4GAS, s.r.o., Na Hřebenech II 1718/8, CZ-140 21 Praha 4 – Nusle, Czech Republic, E-mail: adam.ter-ingl@net4gas.cz

<sup>2</sup>Faculty of Engineering, Czech University of Life Sciences Prague, Department for Quality and Dependability of Machines, Kamýcká 129, 165 21 Prague 6 – Suchdol, Czech Republic, E-mail: ales@tf.czu.cz, legat@tf.czu.cz

Authors define general dependability characteristics (reliability, maintainability, supportability and availability) and their measures. Further there is introduced method of data collection which shall be planned taking into account appropriate targets. Dependability data analysis needs clear understanding of an object, its operation, environment and physical attributes to be obtained required dependability measures which are described. These measures can be used as indicators for measuring maintenance impacts on reliability and maintainability. Data collection and its evaluation help to monitor the impact of maintenance on these indicators. Dependency between non-fulfillment of preventive maintenance and failure intensity including maintenance costs are also evaluated.

Keywords: Maintenance, Reliability, Availability, Preventive maintenance, Fulfillment of maintenance

## Acknowledgement

Paper was created with the grant support – CZU IGA 2015 - 31190/1312/313117 - Operation quality and energy consumption of rotary cutter.

## References

- [1] SUGIER, J., ANDERS, G. J. (2013). Modelling and evaluation of deterioration process with maintenance activities. In: *Eksploatacja i Niezawodnosc Maintenance and Reliability*; 15 (4): pp. 305–311. ISSN 1507-2711
- [2] ZHANG, CH., WANG, S. (2013). Solid lubricated bearings performance degradation assessment: A fuzzy self-organizing map method. In: *Eksploatacja i Niezawodnosc Maintenance and Reliability*; 15 (4): pp. 397–402. ISSN 1507-2711
- [3] KUMAR, J., KADYAN, M. S., MALIK, S. CH. (2012). Cost analysis a two-unit colt standby system subject to degradation, inspection and priority. In: *Eksploatacja i Niezawodnosc Maintenance and Reliability*; 14 (4): pp. 278–283. ISSN 1507-2711
- [4] ZHOU, Y., MA, L., MATHEW, J., SUN, Y., WOLFF, R. (2009). Asset life prediction multiple degradation indicators and failure events: a continuous space model approach. In: *Eksploatacja i Niezawodnosc Maintenance and Reliability*; 11 (4): pp. 72–81. ISSN 1507-2711
- [5] STASIAK-BETLEJEWSKA R. (2012). Value engineering as the way of quality problems solving in the steel construction management In: *Manufacturing Technology*, Vol. 12, No. 4, pp 242 247
- [6] IEC 60050-192:2014 International Electrotechnical Vocabulary Part 192: Dependability
- [7] IEC 60300-3-2:2004 *Dependability management* Part 3-2: Application guide Collection of dependability data from the field
- [8] IEC 61703/Ed2: Mathematical expressions for reliability, availability, maintainability and maintenance support terms
- [9] EN 15341 Maintenance Maintenance Key Performance Indicators
- [10] WESSA, P. (2013). *Maximum-likelihood Weibull Distribution Fitting (v1.0.3) in Free Statistics Software (v1.1.23-r7)*, Office for Research Development and Education, URL http://www.wessa.net/rwasp\_fitdistrweibull.wasp/
- [11] LEGÁT, V. a kol. (2013). Management a inženýrství údržby, Professional Publishing, Praha, ISBN 978-80-7431-
- [12] ALEŠ, Z., PEXA, M., PETERKA, B., HOLEK, M. (2010). Compressor maintenance supported by tribodiagnostics. In: *Manufacturing Technology*, Vol. 10, No. 10, pp. 87-93. ISSN 1213-2489
- [13] MAYER, K., PEXA, M., PAVLŮ, J. (2012). Impact of technical diagnostics interval on machinery maintenance. In: *Manufacturing Technology*, Vol. 12, No. 12, pp. 42-46. ISSN 1213-2489

## Paper number: M201579

Copyright © 2015. Published by Manufacturing Technology. All rights reserved.