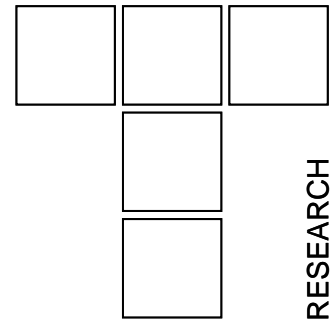


# Defining a theoretical model of wear - caused failure of tool machine elements



*This paper considers production equipment failures caused by wear. A short overview is given on the results of statistically processed data on production equipment failures, gained by observing 20 representative and, from the point of view of failure frequency, problematic machine elements. The goal of this research is to detect the current equipment condition having in mind reliability and create a theoretical base for optimal renewal part stock planning.*

**Keywords:** failure, wear, production equipment, Poisson probability distribution, optimal renewal part stock planning.

## 1. INTRODUCTION

Present day technical development has risen numerous questions concerning complex technical systems operation effectiveness. The basic demand imposed on a technical system is failure-free operation within a required period of time. The problem of reliability is one of the key problems of state-of-the-art tool machines, whether observed as a part of a complex production system or as an independent system. Current trends of tool machine development suggest an increase of automation level, performance improvement (load, operating temperature, pace), flexibility increase and size and mass decrease.

Elements reliability of a machine as a technical system is a probability that the system would successfully (with no failures) serve the purpose, i.e. objective function, within a certain period of time. Depending on a system characteristics and service conditions, in a broader sense reliability implies failure-free operation time, system element life cycle, overhaul convenience and system ability to maintain the quality indicators within the given

limits. As both failure moment and failure-free operation period are random variable, reliability is in a considerable degree based on the probability theory and mathematical statistics, information theory, mass service theory, failure physics and other scientific fields. Evaluation of the attained reliability level and necessity for a continual reliability growth are also closely connected to economical criteria. They occur as basic criteria to be satisfied while solving numerous practical problems of reliability. Having these reasons in mind, optimal reliability values of both system elements and a system as a whole should be considered and defined through all phases of system projecting, production and service.

Tool machines are very complex technical systems whose reliability depends on a large number of elements, subassemblies and assemblies of very machines. The condition of both a machine (operating reliability) and the whole production system is largely defined by the intensity of complex processes of element friction and wear. It is not a rare case in metal-industry in Serbia that tool machine technical system maintenance is undertaken solely if the element/system condition requires it, where the system of preventive maintenance is not in operation. In certain enterprises there is neither a detailed record on equipment element failure nor renewal machine part optimal planning. This paper deals with such cases aiming to suggest possible ways of improving current conditions.

---

*Dr Branko Tadić<sup>1)</sup>, Dr Đorđe Vukelić<sup>2)</sup>,*

*Dr Branislav Jeremić<sup>1)</sup>*

*<sup>1)</sup> Faculty of Mechanical Engineering, University of  
Kragujevac, Sestre Janjić 6,  
34000 Kragujevac, Serbia  
e-mail: btadic@kg.ac.rs*

*<sup>2)</sup> Faculty of Technical Sciences, University of Novi  
Sad, Trg Dositeja Obradovića 6  
21000 Novi Sad, Serbia*











