

Productivity Theory for Industrial Automated Lines

Abstract

The basic attributes of any industrial machines and systems are productivity rate and quality of products. Attributes of productivity are related to the theory of reliability let alone the theory of efficiency of machines. Publications in area of productivity of the industrial systems enable to write the productivity theory for the industrial machines and systems. This theory shows the links between productivity, reliability, technological and technical parameters and the structure of machines with complex designs. Automated production lines are considered industrial systems for the collection of serial and parallel stations arranged according to a certain structure that depends on a technological process of machining parts. Manufacturers require correct and clear mathematical models to calculate the productivity of the automated lines with high accuracy.

The mathematical models for productivity rate of industrial systems with complex design define their structures according to the level of output. This paper presents an analytical approach to the productivity rate of automated lines with stations and mechanisms that display different failure rates and processing times. The typical designs of industrial automated lines are considered by three types of structure: multi-station 's automated line of serial, parallel action and serial-parallel action. All designs can be presented using linear, circular and rotary arrangements. The analytical equations allow for the output of the automated lines to be modeled with different failure rates for the stations and mechanisms yielding results close to the actual productivity values.

Keywords; Automation; Design; Failure analysis; Industry; Machining; Manufacture; Mathematical model; Reliability theory

