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Mathematical models for the productivity rate of automated lines with different failure rates for stations and mechanisms

Abstract

Automated lines with complex structures consist of stations and mechanisms with different levels of reliability. Most of the publications that present mathematical models for productivity of multi-station automated lines are based on simplifications that enable researchers to derive the approximate equations of productivity. This simplification is accepted in a form in which all stations in the automated lines are characterised by one level of reliability and the balancing of technological processes on the stations is conducted evenly. This approach yields simplified mathematical models for the productivity rate of the automated lines, but the results of these calculations are different from the actual productivity. Manufacturers require robust and clear mathematical models that enable them to calculate and predict productivity of the automated lines with high accuracy. High accuracy of mathematical model of prediction yield is important to meet customer demand. Profit of a company would decrease due to inaccurate prediction of production which does not meet demand. This paper presents an analytical approach to the productivity rate of automated lines with stations and mechanisms that each display different failure rates and processing times. The mathematical models allow for the output of the automated lines to be modelled with different failure rates for the stations and mechanisms and yields results that are close to the actual productivity values.

Keywords; Automated lines; Productivity; Reliability