

A method for assessing productivity in unbuffered assembly processes

Abstract

Purpose – The purpose of this paper is to study and perform a system analysis of car assembly line processes, to show productivity losses and their causes, and to derive a mathematical model of the productivity rate of the assembly line.

Design/methodology/approach – The paper performs productivity calculations based on data obtained from the assembly processes of a car cabin and shows the losses of productivity and their causes. The equations of the assembly line productivity rate and the optimal number of assembly stations are derived by the criterion of maximum productivity.

Findings – The paper provides a productivity diagram that illustrates various productivity losses and their associated causes together with the output of car assembly processes. The diagram is based on proposed mathematical calculations. It is a derived analytical model of the productivity rate of the assembly line as a function of the assembly technology, number of stations, reliability of machine and mechanisms, as well as managerial and organizational factors.

Research limitations/implications – Solutions to decrease the productivity losses of the assembly line are given based on the results of the study and analysis of the assembly processes in real industrial environments.

Practical implications – The paper includes implications of the methodology used in the investigation of the productivity of the assembly line, and the equation of the productivity rate, which allows for the calculation of maximum productivity and the optimal number of assembly stations.

Originality/value – The paper presents a method of analysis of the productivity and a mathematical model for calculating the productivity rate of the assembly line. The results of the research are obtained from a real industrial environment.

Keywords: Automotive industry, Assembly lines, Productivity rate, System analysis, Assembly process.

