

A SIMULATION STUDY IN AN AUTOMOTIVE PART MANUFACTURING
COMPANY

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DEDICATION

To my family and friends.

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ABSTRACT

Productivity improvement plays an important role in determining whether a company can survive in the future based on customer demands that it can fulfil. In this respect, simulation can be utilised as a what-if analysis tool to decide which productivity improvement strategies to be adopted. This thesis presents a simulation of the current performance of outputs and profits using WITNESS simulation software. The main objective of this project is to demonstrate the use of simulation in analyzing the existing production floor performance and in evaluating various alternatives to overcome the existing problem. This project is conducted in an automotive part manufacturing company located in Kawasan Perindustrian Nilai, Negeri Sembilan. The production line involved in this project is the main assembly line K2 while the product involved in this study is the rear door frame. First, a simulation study on the existing production line is carried out to evaluate the production floor performance. Results of the study revealed that the current production floor was suffering from product scheduling problems. From here, a total of 8 dispatching rules were proposed and they were simulated to determine their effect on the production performance. Kruskal – Wallis nonparametric test was conducted and the results showed a significant difference between each of the rules. This test is chosen because the numbers of experiments conducted are too small and not suitable to be tested using parametric test. To further supplement the finding, one way ANOVA test with multiple comparisons was conducted to select the best result. The results again showed a significant difference between each rule and the best alternative to improve the existing production line is the shortest processing time rule with a productivity increment of 10.27%.

ABSTRAK

Peningkatan produktiviti pengeluaran sesebuah kilang memainkan peranan penting dalam menentukan keupayaannya bersaing di masa hadapan berdasarkan kemampuannya memenuhi pesanan dari para pelanggan. Dalam konteks ini, simulasi sering digunakan sebagai satu kaedah bagi menentukan peningkatan produktiviti yang harus dipilih. Tesis ini membincangkan kajian simulasi produk pengeluaran menggunakan perisian simulasi *WITNESS*. Objektif utama projek ini adalah untuk mengkaji prestasi susun atur mesin pengeluaran yang terdapat di sebuah kilang pembuat komponen automotif dan pada masa yang sama, mengkaji pelbagai alternatif yang telah dicadangkan untuk meningkatkan produktiviti pengeluaran. Kajian ini dilakukan di sebuah kilang menghasilkan komponen automotif yang terletak di Kawasan Perindustrian Nilai, Negeri Sembilan Darul Khusus. Kajian ini melibatkan model pengeluaran K2 dan produk yang terlibat adalah bingkai tingkap pintu kereta belakang. Kajian ini bermula dengan mengkaji prestasi model pengeluaran semasa yang terdapat di kilang berkenaan. Keputusan kajian menunjukkan bahawa model kajian menghadapi masalah penjadualan produk yang akan dihasilkan. Berdasarkan keputusan kajian tersebut, lapan kaedah penjadualan produk dicadangkan dan ianya dinilai menggunakan kaedah simulasi yang samadengan model pengeluaran semasa. Ujian Kruskal Wallis dilakukan terhadap keputusan yang diperolehi dan keputusan yang diperolehi menunjukkan bahawa terdapat sedikit perbezaan diantara lapan kaedah penjadualan yang dicadangkan berbanding model pengeluaran semasa. Ujian ini dipilih kerana bilangan sampel kajian yang sedikit dan tidak memungkinkan ianya diuji dengan kaedah parametrik. Walaupun bilangan sampel adalah kecil, ujian ANOVA satu hala dengan pelbagai faktor dijalankan bagi memilih penjadualan produk yang menghasilkan keputusan terbaik. Keputusan ujian sekali lagi menunjukkan terdapat sedikit perbezaan diantara kumpulan – kumpulan penjadualan berbanding model pengeluaran semasa. Kaedah penjadualan terbaik adalah masa pemrosesan tetingkat (SPT) dengan peningkatan produktiviti pengeluaran sebanyak 10.27 %.

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LIST OF ABBREVIATIONS

ANOVA	-	Analysis of Variance
B Pillar	-	Back Pillar
CIM	-	Computer Integrated Manufacturing
CNC	-	Computer Numerical Controller
C Pillar	-	Center Pillar
DES	-	Discrete Event Simulation
DummyMC	-	Dummy Machine
D18D	-	Myvi model
GX 41	-	Waja model
K Door	-	Kancil model
LAB	-	Lower back pain
LH/RH	-	Left Hand / Right Hand
PER	-	Power, Engineering, Railway Department
PRN's	-	Pseudorandom Numbers
RBN	-	Rotary, Bending and Notching
R Pillar	-	Roof Pillar
SBN	-	Stretching, Bending and Notching
TRM	-	Tiara Replacement Model (Savvy)
UECTDs	-	Upper Extremity Cumulative Trauma Disorder
WIP	-	Work in Process / Work in Progress

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