IMPROVING FLEXIBILITY IN MANUFACTURING USING A FAMILY ORDERING SYSTEM FOR LONG LEAD TIME COMPONENT

By

OOI, CHEE KEONG

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Doctor of Philosophy

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DEDICATION

To my dear wife for her support and encouragement

To my children, Caelyn and Cayson for their love and support

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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OOI CHEE KEONG
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Chairman: Associate Professor Megat Mohamad Hamdan Megat Ahmad, PhD

Faculty: Engineering

Most manufacturers face challenges from inaccurate forecast, regular plan changes, back log and capacity problems. As a result, their purchasers rely heavily on the material suppliers to provide greater flexibility in the event of production schedule changes. Oftentimes, manufacturers attempt to push material forecast risks to the material suppliers. In order to overcome the risks taken to achieve flexible manufacturing or supply chain management, this study will address the issues and methods to accommodate production schedule changes in a short time-frame.

The literature review seems to indicate that little attention has been paid by researchers to solve the flexibility issue from the material handling point of view. Most of the researchers only focus on machine, routing, and process flexibility. Product and volume flexibility issues are rarely studied. This is mainly because manufacturing flexibility is very much dependent on a very good supply chain management from material vendors.

The objective of this study is to introduce innovative ideas to improve the level of manufacturing flexibility by using a Family Ordering System (FOS) for long lead time parts. The study result has shown that the long lead time for unique parts are within the range of three to five percent of total parts order, and the cost of unique parts with long lead time is within zero to one percent. Therefore, by carrying the extra inventory of the unique parts which amount to a very small percentage of the total parts order in terms of long lead time and cost, the Family Ordering Method provides the improvement of manufacturing flexibility by ordering the long lead time parts based on family grouping methodology.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

MEMPERBAIKI TAHAP KEFLEKSIBELAN PERKILANGAN DENGAN MENGGUNAKAN PENEMPAHAN SECARA FAMILI UNTUK PESANAN KOMPONEN YANG MEMPUNYAI MASA LEAD YANG PANJANG

Oleh

OOI CHEE KEONG

Mac 2005

Pengerusi: Profesor Madya Megat Mohamad Hamdan Megat Ahmad, PhD

Fakulti: Kejuruteraan

Kabanyakan pengilang mengalami persaingan daripada ramalan yang tidak tepat, perubahan perancangan yang kerap, tunggakan dan masalah keupayaan. Sebagai akibat itu juga, pembeli telah cuba memaksa pembekal bahan supaya bersifat lebih fleksibel atau lebih bertolak ansur jika berlakunya perubahan jadual pengeluaran. Untuk mengurangkan risiko pengilang, biasanya, peranan memikul tanggungjawab ini dialihkan terus kepada pembekal bahan. Oleh itu, risiko yang tinggi ditanggung oleh pembekal apabila mereka memberi masa lead (masa antara bermulanya dan berakhirnya proses pengeluaran) yang lebih pendek berbanding dengan masa lead pesanan bahan yang sebenar kepada pelanggannya.

Tinjauan semula kepustakaan seolah-olah menunjukkan bahawa tidak banyak penyelidik yang telah cuba menyelesaikan isu kefleksibelan dari aspek pengurusan bahan.

Kebanyakan daripada penyelidik hanya memfokus kepada kefleksibelan mesin, perancangan tertib pengeluaran dan proses. Isu kefleksibelan produk dan jumlah produk jarang dikaji. Hal ini demikian kerana kefleksibelan bergantung dengan banyaknya kepada pengurusan rangkaian pembekalan daripada penjual bahan.

Objektif kajian ini ialah menyelidik idea-idea yang inovatif untuk meningkatkan kefleksibelan perkilangan untuk membuktikan bahawa "Family Ordering System" (FOS) dapat memperbaiki tahap kefleksibelan perkilangan. Keputusan kajian ini telah menunjukkan bahawa masa lead yang panjang bagi komponen unik adalah diantara tiga hingga lima peratus, dan kos masa lead yang panjang bagi komponen unik juga diantara sifar hingga satu peratus daripada jumlah pesanan komponen. Dengan menyimpan lebihan stok bagi komponen yang unik yang merupakan sebahagian yang kecil dari jumlah persanan stok komponen, FOS membekalkan kefleksibelan perubahan model dengan pesanan komponen yang mempunyai masa lead yang panjang berasaskan methodologi penggumpulan secara famili.

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I also wish to express my sincere appreciation to the company that I work in, for providing me with the data for my study. To uphold the confidentiality of the data, I rename the company ABC Industries Limited. ABC Industries Ltd is a Japanese company which is currently the leading manufacturer for consumer electronic products. The company is a multinational corporation that has manufacturing plants in Malaysia as well as worldwide.

I deeply thank my beloved wife, Selina, who persevered at odd hours in the morning, helping me with editing work and provide constructive criticism. My appreciation also goes to my beloved daughter and son, Caelyn and Cayson for providing me comic relief and unconditional love. Last, but not least, I would like to dedicate this thesis to my beloved children.

I certify that an Examination Committee has met on 26th March 2005 to conduct the final examination of Ooi Chee Keong on his Doctor of Philosophy thesis entitled "Improving Flexibility in Manufacturing Using a Family Ordering System for Long Lead Time Component" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

Mohd Sapuan Salit, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Chairman)

Abdel Magid S. Hamouda, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Wong Shaw Voon, PhD
Faculty of Engineering
Universiti Putra Malaysia
(Internal Examiner)

Mohamed Shariff Nabi Baksh, PhD
Professor
Faculty of Engineering
Universiti Technologi Malaysia
(External Examiner)

_____
GULAM RUSUL RAHMAT ALI, PhD
Professor/Deputy Dean,
School of Graduate Studies,
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfillment of the requirements for the degree of Doctor of Philosophy. The members of the Supervisor Committee are as Follows:

Megat Mohamad Hamdan Megat Ahmad, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Chairman)

Napsiah Ismail, PhD
Faculty of Engineering
Universiti Putra Malaysia
(Member)

Shamsuddin Sulaiman, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Member)

Ir. Md Yusof Ismail, PhD
Associate Professor
Faculty of Engineering
Universiti Putra Malaysia
(Member)

AINI IDERIS, PhD
Professor/Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Putra Malaysia or other institutions.

OOI CHEE KEONG

Date: 11th April 2005

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