DEVELOPMENT OF SCHEDULING SYSTEM FOR STAMPING DIE PRODUCTION USING SIMULATION DISPATCH APPROACH

By

CHEW CHEE LEONG

Thesis Submitted to the School of Graduate Studies,
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Fulfilment of the Requirements for the Degree of Master of Science

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To my beloved parents

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

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Chairperson: Associate Professor Napsiah bt. Ismail, Ph.D.

Faculty: Engineering

Scheduling has been a major challenging subject in operation management of manufacturing organization. In competitive market, customers need better, cheaper and faster product. For job shop system, such as the metal stamping die fabrication, products are custom-made or one-of-its-kind, and very low inventories are kept. Hence quantitative approach such as finite-capacity scheduling is expected to improve the capability of on-time delivery.

Research in scheduling optimization is vast and many theories have been developed and their approaches were studied. For industrial application, there is a number of finite capacity scheduling software that could produce detailed assignment of jobs to machines. Implementing one of the finite-capacity scheduling software is an option. However, off-the-shelf software is not necessarily fully and instantly applicable in any organization. Although it can be overcome by requesting customized software developed by programming vendor, both of them involve substantial cost and the benefit may not be easily justified.

For other option, this research aims to create a scheduling module developed with common computer package such as spreadsheet. The thesis includes review of scheduling concepts and basic techniques. Approaches in scheduling theories are also investigated. Features of commercial scheduling software are explored and compared briefly. There are basically three steps in the mechanisms of generating finite capacity schedules. They include checking machine available time, checking and selecting the item (individual job) based on priority, and assigning item to machine and update the machine status. A number of interfaces are used for inputting, holding, sorting, segregating, and transferring data, and generating schedules and reports. After necessary job inputs and decisions, the scheduling module is able to produce working calendar for planned machines and later generate their detailed schedules by referring the estimated operation duration of work piece, machine route and dispatch rules. The reports show performance of schedules generated under different dispatch rules. The program has been created based on a set of simplified conditions. For effective practical usage, accuracy of estimated operation durations, ease of data entry and definition of capacity and details of loading requirements can be improved.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PEMBANGUNAN SISTEM PENJADUALAN UNTUK PEMBUATAN ACUAN HENTAMAN DENGAN MENGUNAKAN PENDEKATAN SIMULASI PENGHANTARAN

Oleh

CHEW CHEE LEONG

Jun 2004

Pengerusi: **Profesor Madya Napsiah bt. Ismail, Ph.D.**

Fakulti: **Kejuruteraan**

Penjadualan merupakan suatu subjek utama yang mencabarkan dalam pengurusan operasi untuk organisasi pembuatan. Dalam pasaran yang serba bertanding, pelanggan memerlukan hasil yang lebih baik, murah dan cepat. Untuk kerja yang berbentuk sistem kedai, pembuatan acuan hentaman logam misalnya, hasilan adalah mengikut keperluan pelanggan, ataupun jenis tunggal, dan simpanan barangan pembuatan amat rendah. Oleh itu, pendekatan kuantiti seperti penjadualan muatan terbatas dapat meningkatkan keupayaan penghantaran hasil yang tepat masa.

Terdapat banyak penyelidikan dan teori untuk penjadualan terbaik telah dibangunkan dan pendekatan mereka telah dikaji. Bagi penggunaan industri, terdapat perisian penjadualan muatan terbatas yang boleh menghasilkan penyerahan kerja yang terperinci untuk mesin. Pelaksanaan salah satu daripada perisian penjadualan muatan terbatas yang sedia ada tidak semestinya dapat diguna dengan sepenuh dan segeranya di mana-mana organisasi. Walaupun ia dapat diselesaikan dengan meminta pengaturcaraan mengikut keperluan

sesuatu organisasi pelanggan, cara sebegini menglibatkan perbelanjaan yang besar dan faedahnya tidak mudah dipertimbangkan.

Sebagai pilihan lain, penyelidikan ini bertujuan menghasilkan modul penjadualan dengan pakej komputer umum seperti lembaran kerja. Tesis ini merangkumi sorotan dan teknik-teknik asas penjadualan. Pendekatan teori penjadualan juga dikaji. Sifat perisian penjadualan di pasaran yang terpilih juga dipantau dan dibandingkan secara ringkas. Terdapat tiga langkah dalam mekanisma untuk menghasilkan jadual-jadual muatan terbatas. Ini termasuklah penyemakan mesin yang bersedia, pemeriksaan dan pilihan butir (kerja individu) mengikut keutamaan, dan penyerahan butir ke mesin dan pengemaskinian keadaan mesin. Beberapa perantaraan muka telah digunakan untuk pemasukan, pemegangan, susunan, penyisihan dan pemindahan data, serta pembentukan jadual dan laporan. Selepas butiran kerja dan keputusan yang diperlukan telah dimasukkan, modul penjadualan ini dapat menghasilkan kalendar pekerjaan untuk mesin-mesin yang dirancang. Jadual-jadual terperinci kemudian dibentukkan dengan merujuk kepada ramalan masa operasi setiap butiran kerja, penghalaan mesin dan peraturan penghantaran. Laporan boleh menunjukkan keutamaan jadual-jadual tersebut. Aturcara ini telah dihasilkan dalam keadaan yang diringkaskan. Untuk meningkatkan pelaksanaan praktikal, ramalan masa operasi yang lebih tepat, kemasukan data yang lebih mudah, serta definisi muatan and beban kerja yang lebih menyeluruh boleh dipertimbangkan.

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I certify that an Examination Committee met on 23 June 2004 to conduct the final examination of Chew Chee Leong on his Master of Science thesis entitled "Development of Scheduling System for Stamping Die Production Using Simulation Dispatch Approach" 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:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of Supervisory Committee are as follows:

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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 UPM or other institutions.

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CHEW CHEE LEONG

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