



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Information Requirement for Mould and Die Process Planning Activities

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Manufacturing Engineering (Manufacturing Process)

By

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May 2007

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JUDUL: INFORMATION REQUIREMENT FOR MOULD AND DIE PROCESS PLANNING
ACTIVITIES

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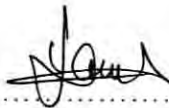
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ABSTRACT

As the competition in manufacturing industry has becoming more complex, manufacturers should try to shorten time-to-market and introduce new product as soon as possible to win market share. This project discusses about information requirement for Mould and Die process planning activities in manufacturing industry. Hence the design of the information system has to be performed taking into consideration all the functions and entities that operate within mould manufacturing. The objectives of this study are to define generic functional and information requirements for Injection mould process planning activities, and to design and develop a database management system based on the Injection mould process planning information model that has been developed. This project utilizes IDEF (Integrated computer-aided manufacturing DEFinition) as the main modeling method. IDEF₀ was used to model functional flow and IDEF_{1x} was used to model the information flow of the company selection. The database management system that was selected to develop the application system is Microsoft Access 2000 and the interface of the system used was Visual Basic Application for Microsoft Access. Although a designing and developing database management system is not an easy task, this project manages to achieve all of the objectives. The study can be used as reference for further study.

ABSTRAK

Oleh kerana persaingan dalam industri pembuatan menjadi semakin kompleks, para pengusaha patut memendekkan masa untuk memasarkan dan memperkenalkan produk baru secepat mungkin untuk merebut peluang pasaran. Projek ini membincangkan keperluan maklumat untuk aktiviti proses perancangan dalam industri pembuatan acuan. Oleh itu rekabentuk sistem maklumat hendaklah dilaksanakan dengan mengambil kira semua fungsi dan entiti yang dilaksanakan dalam pembuatan acuan. Objektif projek ini ialah menakrifkan generik fungsi dan maklumat yang diperlukan dalam aktiviti proses perancangan acuan suntikan dan merekabentuk dan membangunkan satu sistem pangkalan data berdasarkan model maklumat proses acuan suntikan yang telah dibangunkan. Projek ini menggunakan IDEF (Integrated computer-aided manufacturing DEFinition) sebagai kaedah utama untuk membuat model. IDEF0 digunakan untuk membentuk model aliran fungsi dan IDEF1x digunakan untuk membentuk model aliran maklumat syarikat yang telah dipilih. Sistem pengurusan pangkalan data yang telah dipilih untuk membangunkan sistem aplikasi ialah Microsoft Access 2000 dan sistem untuk antara muka menggunakan Visual Basic Application untuk Microsoft Access. Walaupun merekabentuk dan membangunkan pengurusan pangkalan data bukanlah suatu tugas yang mudah, projek ini telah menguruskan untuk mencapai semua objektif. Kajian ini boleh digunakan sebagai rujukan untuk kajian yang akan datang.

DEDICATION

The memory of;

Mohd Nasir bin Che Salleh
Halimahton binti Ahmad

For your love and passionate for values of education since I'm still a little kid. You will always in my heart.

To my special person;

Mohd Abdul Syukor bin Jaafar

For your patience whose always tested during writes this project. Your love, support and understanding are part of this research.

ACKNOWLEDGEMENTS

In the name of Allah, the most gracious and the most merciful.

Thanks a lot for giving me this strength and opportunity to complete this research study. I am grateful to have the support and motivation from many people throughout completing this study and I would like to take it this opportunity to thank those who are either directly or indirectly involved during the process this study is conducted.

Most immediately, a special gratitude goes to my Project Supervisor, Mr. Mohd Hafidz Fadzli bin Md. Fauadi of Universiti Teknikal Malaysia Melaka, Ayer Keroh Melaka for his precious advice, time, contributions, comments, and guidance in every stage of this project. My utmost gratitude also goes out to all lecturers from the Faculty of Manufacturing Engineering for being a very nice and effective lecturer to me and thus, making this study easier to be completed. As for the Manager of Technical Centre Department at MAC Technology (M) Sdn. Bhd, Mr. Mazlan bin Hanafi, thank you for all cooperation and help the throughout the entire duration of the training.

My token of appreciation also goes to my beloved family members who never failed to be there for their love, support, and prayers. Last but not least, I would like to thank all my friends, especially my classmates for their never ending supports. May ALLAH bless to all of you.

Thank you very much.

Siti Saudah binti Mohd Nasir

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April 2007 10th

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

CAD	-	Computer Aided Design
CAM	-	Computer Aided Manufacturing
CNC	-	Computer Numerical Control
DBMS	-	Database Management System
ECM	-	Electro-Chemical Machining
EDM	-	Electric Discharge Machining
HSM	-	High Speed Machining
HW	-	Hardware
MLT	-	Manufacturing Lead Time
MRP	-	Material Requirements Planning
MTO	-	Make to Order
NC	-	Numerical Control
OO	-	Object-Oriented Database
QA	-	Quality Assurance
SMEs	-	Small Medium Enterprise
SW	-	Software
WIP	-	Work-In Progress
MAC	-	Moulding Assembly Ceramic
FMEA	-	Failure Mode Effective Analysis

CHAPTER 1

INTRODUCTION

1.1 Background

The mould and die designer must balance the constraints imposed by the various processes involved in producing a part to achieve the most cost effective solution. Reliance on the experience and expertise of an individual is now giving way to scientific design principles based on an understanding of polymer behavior. (J Gosden, 1983). The complexity associated with scheduling for job shops derives from the nature of the environment generally characteristic of job shops. Job shops typically produce a large number of different products, each of which may have unique manufacturing requirements. It is not unusual for a large job shop to maintain a database of such manufacturing requirements for several thousand regularly produced items. A database is usually stored within a computer and a special program it is a database manager or database management system (DBMS) that provides an interface between users and the data itself. (Timings & Tooley, 2001).

1.2 Problem Statements

Competition in manufacturing industry has becoming stiffer from day to day. The impact of information technology has made the competition becoming more complex. Therefore, to win market share, manufacturers should try to shorten time-to-market and introduce new product as soon as possible. One of the important manufacturing sectors is the mould-making sector. Mould

making is a very competitive industry. Mould making processes have the characteristic of job shop type of industry where orders are in limited quantity, no two orders are the same, production process is very slow and could be very complex. The complexity is due to the variety of parts, materials, machines, machining operations, process routes that are different for each product.

Therefore, all of the information should be managed as efficient as possible. Commercial DBMS can provide a database to contain information for all functions needed. However, the problem faced by SMEs is that those systems are not available cheaply. Therefore, there is a need to come up with information system to assist companies who need to manage information for mould making.

1.3 Project Objectives

The objectives of this project are:

- (a) To define generic functional and information requirements for Mould and Die Process Planning Activities.
- (b) To design and develop a database management system based on the Mould and Die Process Planning information model that has been developed.

1.4 Project Scopes

The scopes of this project are as follow:

- (a) The system will be a PC-based system which may work in a network

- (b) The point of view of this study starts from the system level to the information level. Therefore, it will consider all of the information requirements for Mould and Die Process Planning.
- (c) Mould making processes will be modeled using case study company especially for injection mould making.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Mould and Dies

2.1.1 Mould

According to researcher Rowe (2001), mould is the shape and in most cases, the final on parts. Most injection moulds are comprised of two halves a cavity (also called the female of a mould) and core (also called the male half). In general moulds are separate into two to permit the part to be extracted. This is because the shape of a part must be such that it will not be locked into the mould. For example, sides of objects typically cannot be parallel with the direction of draw (the direction in which the core and cavity separate from each other). While the core and cavity are usually highly machined mould also consist of many other parts that required little or no machining or shaping, such as pins, bushings, and etc. most moulds are produced through either traditional machining or electro discharge machining (EDM), although rapid prototyping and tooling techniques are gaining a foothold. Basically, the quality of mould is depends on the quality of the moulded part, which is taken care during the moulding process, and upon details of the design of the part itself.

Mould for Expanded Polystyrene foam are traditionally aluminum sand cast but, because of the many stages involved in making a sand mould example

pattern design, core making, and sand conditions, sand-casting is not always the most cost-effective solution. (Lye *et al.*, 1996).

2.1.2 Dies

The die is made from plasters or cements that have a very high crushing strength (15,000 psi or more). The die has an internal air system which, when activated on the press, releases the ware from the die. This is referred to by many as an air-release die. The release is actually caused by interaction between air and water within the die. [http://www.the art of die making.htm](http://www.theartofdiecasting.com/).

Forming dies are typically manufactured by tool and die makers and put into production after mounting into a press. The die is a metal block that is used for forming materials like sheet metal and plastic.

Dies may be classified as male and female; they may also be classified by their size. Small dies generally are those that have a surface area of 10^3 mm^2 – 10^4 mm^2 (2in^2 – 15in^2), whereas large dies have surface areas of 1 m^2 (9 ft^2) and large, such as those used for press working automotive body panels.

Dies of various sizes and shapes can be cast from steels, cast irons, and nonferrous alloys. The processes used range from sand casting (for large dies weighing many tons) to shell moulding (for small dies). Several die materials, such as tool and die steels, high – speed steels, and carbides. Cast steels are generally preferred for dies for large workpieces, because of their strength and toughness and because of the ease with which their composition, grain size, and properties can be controlled and modified. (Kalpakjian & Schmid, 2001).

2.2 Components of Injection Mould

Injection mould is constructed using a series of components including various plates, pins, bushings, pillars, ejector systems, and many other items used for many purposes. Figure 2.1 shows some of the basic of items and where they are located in the mould.

Table 2.1:- Function of Mould Base Components

No.	Component	Function of Mould Base Parts
1.	Top Clamping Plate	Hold the stationary part of the mould to the stationary platen of the injection machine.
2.	Locating Ring or Sprue Bushing Retainer Ring	Fits into a counterbore in the top clamping plate and is used to locate the mould on the platen of the press so the nozzle and sprue bushing are aligned.
3.	Cavity Retainer Plate (Front Cavity Plate)	Part of the stationary section of the mould into which the leader or guide pins are mounted. Also used to hold core, cavity blocks, and sprue bushing.
4.	Core Retainer Plate (Rear Core Plate)	Top plate of the movable section of the mould. Forms the parting line of the mould with cavity retainer plate. Used to hold the leader pin bushings as well as core and cavity.
5.	Support Plate (Back up Plate)	Mounted behind the core retainer plate to keep this plate from bending under the high pressure used in injection molding.
6.	Bottom Clamping Plate	Holds the moving portion of the mould to the movable platen of the injection machine.
7.	Parallels (Rails)	Mounted on the bottom clamping plate under the support platen to form a space which allows the ejector bar to move when the piece parts are ejected.
8.	Ejector Retainer Plate	Counterbored for the heads of the ejector pins,