

**TO DEVELOP THE PRODUCTION PROCESS FLOW LAYOUT FOR
CASTING PROCESS**

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KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

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**NATIONAL TECHNICAL UNIVERSITY COLLEGE OF
MALAYSIA**

**To Develop the Production Process
Flow Layout for Casting Process**

Thesis submitted in accordance with the requirements of the
National Technical University College of Malaysia for the Degree of
Bachelor of Engineering (Honours) Manufacturing (Process)

By

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Faculty of Manufacturing Engineering

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I hereby, declare this thesis entitled “To Develop Production Process Flow For Casting Process- T- Pipe” is the results of my own research except as cited in the reference.

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APPROVAL

This thesis submitted to the senate of KUTKM and has been accepted as fulfilment of the requirement for the degree of Bachelor of Engineering (Honours) Manufacturing (Process). The members of the supervisory committee are as follows:

A handwritten signature in black ink, appearing to be 'M. W.', is written above a horizontal dotted line. The signature is fluid and cursive.

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ABSTRACT

As been stated for the thesis title of “Develop the production process flow layout for casting process” this thesis will introduce on how to develop the production process for the casting process and determine various factors in order to develop the production. The help of simulation tool can accomplish this task and the simulation tool that was used for this project is using DELMIA QUEST software. DELMIA QUEST is a complete 3D digital factory environment for process flow simulation and analysis, accuracy, and profitability analysis. Quest’s software is flexible, object-based, discrete event simulation environment combined with powerful visualization and robust import/export capabilities and makes it the engineering and management solution of choice for process flow simulation and analysis. Quest Advanced extends the power of QUEST by providing an intelligent, efficient and automatic Design of Experiments process. Based on sophisticated algorithms and search techniques, QUEST Advanced provides decision makers the best results — quickly and easily. For these thesis 3 layout concept will be created and selection of the best layout will be determine.

ABSTRACT

Thesis ini di buat adalah bertujuan memenuhi syarat untuk mendapatkan pengijazahan. Tajuk thesis adalah membangun satu pembuatan produk dengan menggunakan proses tuangan. Didalam thesis ini menerangkan tentang teori tuangan menggunakan tuangan pasir dan juga faktor- faktor berkaitan dalam membangunkan produksi tuangan. Dengan menggunakan alat gambaran ia dapat mencari faktor- faktor penting yang dapat di jadikan asas untuk membangunkan produksi tuangan. Disini alat program gambaran yang di gunakan adalah QUEST. Alat ini dapat memberitahu tentang peratus efektif produksi yang dijalankan. Ia dapat di lakukan dengan mengambil kira peratus penggunaan mesin- mesin dan juga proses yang telah di jalankan. Ia perlulah di analisis dan di kaji supaya dapat mengatasi masalah atau kekurangan yang ada di dalam produksi tersebut. Di dalam thesis ini akan memberitahu produksi yang boleh di gunakan dengan mengeluarkan 3 konsep produksi. Dengan mengambilkira tahap pengeluaran sejumlah 1000 produk dapat di hasilkan untuk satu bulan.

DEDICATION

To

Father, Mother And Younger Brother.

Fiancé, Azuriana Anuar.

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

| | | |
|------|---|-----------------------|
| STO1 | - | Warehouse |
| M | - | Mould |
| INS | - | Inspection |
| Bffr | - | Buffer |
| HT | - | Heat Treatment Center |
| STO2 | - | Storage Part |
| MM | - | Furnace Machine |
| FIN | - | Finishing |
| RP | - | Remove Product |
| PT | - | Process Time |

CHAPTER 1

INTRODUCTION

1.1 Production Layout Defining

There is various type of product, which is made of sand casting, and the method of making the product can be found in many ways. However, in Malaysia, none of these methods being used to produced the product and if there are, only involve a small producing of product. So because of the limitation and problem, this thesis can be attracted to improved and develop a manual regarding to the method of sand casting so that it can be a reference to produced one production line using a sand casting.

It can be also used as a guideline to our local manufacturing company in order to produce the product using this method. It because many content must be consider for create the production layout to maintain the production to get the best result in create the product. It like the using the cycle- time and the flexibility in produce the part or product.

In produce the product with using casting process the manner must be consider to ensure the product can produce in mass production is using the time, the total moulds, connection between moulds and the concept for production layout.

There is other factor must be taken into consideration such as the distance for workspace, machine and worker, distance between departments in production layout and used the workers.

A production line is a set of sequential operations established in a factory whereby materials are put through a refining process to produce an end-product that is suitable for onward consumption; or components are assembled to make a finished article.

Typically, raw materials such as metal ores or agricultural products such as foodstuffs or textile source plants (cotton, flax) require a sequence of treatments to render them useful. For metal, the processes include crushing, smelting and further refining. For

plants, the useful material has to be separated from husks or contaminants and then treated for onward sale. Early production processes were constrained by the availability of a source of energy, with wind mills and water mills providing power for the crude heavy processes and manpower being used for activities requiring more precision.

In earlier centuries, with raw materials, power and people often being in different locations, production was distributed across a number of sites. The concentration of numbers of people in manufactories, and later the factory as exemplified by the cotton mills of Richard Arkwright, started the move towards co-locating individual processes. With the development of the steam engine in the latter half of the 18th century, the production elements became less reliant on the location of the power source, and so the processing of goods moved to either the source of the materials or the location of people to perform the tasks.

Separate processes for different treatment stages were brought into the same building, and the various stages of refining or manufacture were combined. Oliver Evans in the United States brought the stages of the flour milling process together in the 1780s to form what is recognized as the first production line, with the output from one process being fed directly into the next.

With increasing use of steam power, and increasing use of machinery to supplant the use of people, the integrated use of techniques in production lines spurred the industrial revolutions of Europe and the United States. From the processing of raw materials into useful goods, the next step was the concept of the assembly line, as introduced by Eli Whitney. This was taken to the next stage at the Ford Motor Company in 1913, where Henry Ford introduced the innovation of continuously moving the cars being assembled past individual work stations.

1.2 Project Objective

In conducting this project, it must have the objective to achieve.

The objectives for this project are: -

1. To optimize machine and mould utilization in production process flow layout for casting process
2. To establish a production model and develop the flow layout by using simulation layout.
3. Gather the data for the simulation process focusing the equipment to produce the T- pipe part and try to minimize the production time per product.
4. Determine the main factors to create a production process layout and comparison between simulation result and actual data.
5. Propose the new production line in order to produce the product for 1000 parts per month for product T- pipe.

1.3 Project Scope

This thesis will emphasize on the attempts to obtain the best process time for casting production for the T- pipe product.

Process time is the total time that is required in order to produced the part in a period of time that is desired. With the process time, the utilization for each machine and equipment for producing the T- pipe part can be shown and determine. Next, by using the process time, simulation can be performs in order to set a new layout and utilization of the equipment so that the casting process can be optimize and can achieve the production target.

Comparison is made between the simulation layout and the actual data from the industries so that the various factors that are important in order to optimizing the production layout can be achieved. This will ensure that the product target can be accomplished.

1.4 Methodology

The important thing for finished this project is must have the methodology. It for makes easier this project being success. The consideration of develop production process flow layout must have:

1. Find the literature review for production process.
2. Do the simulation study.
3. Find the machine and equipment for casting process for create the concept for process layout.
4. Search the process for sand casting.

CHAPTER 2

LITERATURE REVIEW

2.1 Developing a Product Line Production Plan

The purpose of a software product line organization is to create products. Organizations adopt a product line approach in order to achieve a number of goals, Clements (2002). These goals include but are not limited to;

- i. Reduced time to market
- ii. Reduced production costs
- iii. Improved quality

A product line organization seeks to achieve these goals through an architecture-centric product development approach that achieves strategic reuse of assets. These assets include but are not limited to:

- i. Domain and requirements models
- ii. The software architecture
- iii. Test plans and test cases
- iv. Reusable software components
- v. Budgets, schedules, and work plans

The production plan for a product line captures the strategy for developing products from the core assets. The production strategy is a key driver of the design of the core assets. The core asset developers create the strategy while the core assets are being created. By defining the product development process, the production strategy specifies the “prescribed manner” of development called for in the definition of a software product

line Clements (2002) The core asset developers are responsible for creating the production plan that will communicate the production strategy to the product developers.

2.2 Factors For Develop The Production Layout

Many factor must be consider in developing the production process flow layout. The factor can be giving the effect to many elements in production process flow. Elements of production are the performance of production, safety requirement, machine performance and labors. This element can control with maintain the lead time, provide the flexibility to changes in demand, utilize the manufacturing equipment, produce reasonable batches to offset set- up cost, maintain the work in process, maintain the low levels of finishing goods, include provision for scrap and rework and utilize direct labor, C.E.R Wainwright (1994).

Another literature about this element for design the facility is capacity requirement for the projected future sales, bottleneck operations of the process used to produce the primary components, space required for each piece of equipment and space requirement to store work- in progress between operations, Emmanuel S. Eneyo and Getrude P. Pannirselvam (1998).

With follow the all element it can make the production process will consistence. It about the consistencies the total output product, production time finish and the cost reduction.