# DESIGN AND ANALYSIS OF PLASTIC INJECTION MOULD FOR HOLDER CASING

**By**

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**Thesis Submitted to the School of Graduate Studies, University Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science**

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**Chairman: Associate Professor Shamsuddin Sulaiman, Ph.D.**

**Faculty: Engineering**

The plastic industry involving manufacturing and injection moulding has high growth potential, this is because most of the products today are made from plastic material. The aim of this project is to design a plastic injection mould for producing a holder casing for card or highway toll ticket. This work is concerned with the design, analysis and simulation of the plastic injection mould.

The plastic part was designed into two different types of product, but for the same usage function. One part is using clip function and another part is using stick function.

In the design section, computer software Pro-Engineer (Pro/E) is used to produce the detail design in 3-dimension (3D) view, the two products are designed into two changeable insert to produce two different types of plastic product and assembly into one mould base.

Pro/Manufacturing software is used to develop the programming to run the CNC (Computer Numerical Control) machine. By using ICAM (Intelligent Computer Aided Manufacturing) software to convert the programming from computer code.

Moldflow Plastics Insight (MPI) was used to analyse the mould for the design. This software shows how the molten plastic entering the mould during injection process and also the possible defects that might occur. This step normally will eliminate the rework cost and time as all the possible errors are being eliminated before it actually occurs in actual production process. The rework cost is a major problem to the mould making industries.

In fabrication process, Computer Numerical Control (CNC), milling, drilling, grinding and Electrode Discharge Machining (EDM) machines were used to machine the mould components.

Quality of the mould and injected product depend on the selection of the machines used as well as the processing conditions such as melt temperature, mould temperature and injection pressure.

As a conclusion the objective of the project to create a plastic product, analysis by using MPI and create a three plates mould by using slide core insert has been achieved.

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

**REKABENTUK DAN ANALISIS UNTUK ACUAN BAGI BEKAS MELETAK KAD DENGAN MENGGUNA PRODUK SUNTIKAN PLASTIK**

Oleh

**WONG CHOON TAT**

**Julai 2004**

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Pada masa kini, industri plastik dalam pembuatan dan acuan suntikan adalah merupakan satu industri yang mempunyai potensi pertumbuhan yang tinggi, ini adalah disebabkan, kebanyakan produk hari ini adalah diperbuat daripada bahan plastik. Matlamat utama projek ini adalah merekabentuk satu acuan suntikan plastik untuk kegunaan meletak kad atau tol tiket lebuhraya. Projek ini dibahagi kepada tiga bahagian iaitu: bahagian rekabentuk, bahagian simulasi dan bahagian analisa.

Plastik produk ini direkabentuk kepada dua bentuk yang berlainan tetapi mempunyai fungsi yang sama. laitu satu produk menggunakan fungsi klip dan satu produk lagi menggunakan fungsi lekat untuk meletak Touch n' Go kad atau tol tiket lebuhraya.

Dibahagian rekabentuk, perisian komputer yang digunakan untuk merakabentuk produk dalam 3 dimensi (3D) dan acuan ialah Pro/Engineer (Pro/E) dan dua plastik produk yang berlainan akan direkabentuk dalam

insert yang boleh ditukar-tukar di dalam satu acuan untuk menghasilkan dua produk yang berlainan.

Pro/Manufacturing (Pro/MFG) daripada perisian komputer Pro/E digunakan untuk menjanakan beberapa kod kawalan berangka untuk proses pemesinan. Perisian ICAM digunakan untuk menukarkan kod komputer kepada kod mesin yang dapat dibaca oleh Kawalan Berangka Berkomputer (CNC)

Analisa terhadap pengaliran cecair plastik dijalankan dengan mengunakan perisian Moldflow plastics insight (MPI). Kaedah ini digunakan untuk mendapatkan idea dan kecacatan bagaimana cecair plastik disuntik dan bertindak kepada acuan yang direka. Kaedah ini menjimatkan kos dimana kerja-kerja pegubahsuaian tidak lagi diperlukan kerana segala masalah yang mungkin timbul telah diselesaikan terlebih dahulu sebelum kerja-kerja pemesinan dijalankan.

Pada bahagian kerja-kerja pemesinan, beberapa jenis mesin untuk membentuk acuan digunakan seperti mesin Kawalan Berangka Berkomputer (CNC)', mesin pengisar, mesin gerudi dan mesin elektrod discas (EDM) untuk menghasilkan acuan.

Mutu acuan dan produk selepas suntikan yang dihasilkan adalah berdasarkan kepada pemilihan bahan-bahan dan cara-cara pemesinan yang

digunakan dan juga cara pemprosesan seperti suhu lebur, suhu acuan dan tekanan suntikan untuk menghasilkan produk suntikan tersebut.

Sebagai kesimpulan matlamat utama projek ini untuk merekabentuk plastik produk, analisa dengan menggunakan Moldflow Plastic Insight (MPI) and merekabentuk acuan tiga keping dan acuan gelonsong sudah tercapai dan berjaya.

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*WONG CHOON TAT*

I certify that an Examination Committee met on 12th July 2004 to conduct the final examination of Wong Choon Tat on his Master of Science thesis entitled " Design and Analysis of Plastic Injection Mould for holder casing" in accordance with Universiti Pertanian Malaysia (Higher Degree) regulation Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination 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 if it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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WONG CHOON TAT

Date: 31 October 2004

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