

**IMPROVEMENT OF ACCURACY LEVEL OF AUTOMOTIVE FRONT  
FENDER SHIELD ASSEMBLY USING PROCESS FAILURE  
MODE AND EFFECT ANALYSIS AND CONTROL  
PLAN TECHNIQUES**

**By**

**KHAIRUL NIZAM BIN MD TOHIT**

Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfilment of the Requirements for the Degree  
of Master of Science

**April 2006**

To my beloved parents and lovely wife.....

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

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**Chairman: Associate Professor Shamsuddin bin Sulaiman, PhD**

**Faculty: Engineering**

Quality of products is the utmost important aspect that needs significant attention in order to fulfill customer's requirements and satisfactions. Quality in the automotive industry can be defined as accuracy percentage of a part compared to the specifications that are fixed by the customer. Low accuracy percentage can contribute to various kinds of negative impacts for example, high rejection rate, increase warranty claim from customer, waste of time and productivity, tarnish company's image and reputation and eventually will affect customer's confidence. Therefore, preventive actions should be identified and implemented to ensure the negative effects that were caused from low quality parts would not happen. In this research, Process Failure Mode and Effect Analysis (PFMEA) and Control Plan techniques will be used as preventive tools to ensure products being produced will be of high quality and at the same time, meet customer's specifications and requirements. Integration of

both techniques will be used as reference to determine the potential failure modes, effects of failures to the process and recommended actions that need to be taken to reduce and eliminate the effects of failures. Each process involved in the manufacturing of products will be analysed by a specialist group consisting of several departments in the organisation, such as Engineering, Production and Product Development. Data analysis based on parts' coordinate in X, Y and Z positions will be performed to determine the root caused of the failures. The data that has been analysed will be tabulated in a table with information, including differences between data collected compared to specifications and directions. Data in Prototype (P0 and P1) stage will be used to prove the effectiveness of the implementation of PFMEA and Control Plan techniques prior to and after both techniques have been applied in the product development process for Front Fender Shield Assembly Left Hand. The integration between PFMEA and Control Plan techniques and minimum target of 85% of accuracy level has been successfully achieved.

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

**PENAMBAHBAIKAN KUALITI PRODUK PADA BAHAGIAN SISI  
HADAPAN KENDERAAN MENGGUNAKAN TEKNIK ANALISIS  
MOD DAN KESAN KEGAGALAN PROSES DAN  
PERANCANGAN KAWALAN**

Oleh

**KHAIRUL NIZAM BIN MD TOHIT**

**April 2006**

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**Kualiti sesuatu produk merupakan elemen terpenting yang perlu diberi perhatian dalam memenuhi kepuasan dan keperluan pelanggan. Kualiti di dalam industri automotif adalah merujuk kepada peratusan ketepatan sesuatu produk berbanding spesifikasi yang telah ditetapkan oleh pelanggan. Peratusan ketepatan yang rendah akan menyumbang kepada peningkatan produk yang tidak boleh digunakan, peningkatan tuntutan jaminan daripada pelanggan, pembaziran dari segi masa dan produktiviti dan mencalar imej serta reputasi dan kepercayaan pelanggan. Oleh itu, langkah-langkah pencegahan awalan perlu dikenalpasti dan dilaksanakan bagi memastikan kesan-kesan negatif yang berpunca daripada produk berkualiti rendah tidak akan berlaku. Dalam perkara ini, Analisis Mod dan Kesan Kegagalan Proses (PFMEA)**

dan Perancangan Kawalan akan digunakan sebagai teknik pencegahan bagi memastikan produk yang dihasilkan mempunyai kualiti yang tinggi dan memenuhi spesifikasi dan keperluan pelanggan. Integrasi diantara kedua-dua teknik akan digunakan sebagai rujukan untuk mengenalpasti mod-mod kegagalan, kesan-kesan mod kegagalan terhadap proses dan langkah-langkah yang perlu diambil bagi mengurangkan risiko mod-mod kegagalan yang berlaku. Setiap proses yang terlibat dalam penghasilan produk akan dianalisa oleh sekumpulan pakar yang terdiri daripada pelbagai jabatan di dalam organisasi seperti Kejuruteraan, Pembuatan dan Pembangunan Produk. Analisis data berdasarkan koordinat produk pada kedudukan X, Y dan Z akan dijalankan bagi mengenalpasti punca sebenar kegagalan produk tersebut berlaku. Data-data yang telah dianalisa akan dikumpulkan di dalam satu jadual yang mengandungi maklumat-maklumat seperti perbezaan data daripada spesifikasi dan arah kegagalan. Data-data daripada peringkat pensampelan (P0 dan P1) akan digunakan bagi membuktikan keberkesanan penggunaan teknik PFMEA dan perancangan kawalan sebelum dan selepas diaplikasikan. Integrasi diantara PFMEA dan perancangan kawalan berserta dengan objektif minimum untuk mencapai 85% ketepatan produk yang dihasilkan telah berjaya dicapai.

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I certify that an Examination Committee has met on 7<sup>th</sup> April 2006 to conduct the final examination of Khairul Nizam bin. Md Tohit on his Master of Science thesis entitled “Improvement of Accuracy Level of Automotive Front Fender Shield Assembly Using Process Failure Mode and Effect Analysis and Control Plan Techniques” 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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## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledge. 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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**KHAIRUL NIZAM BIN MD TOHIT**

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