

Analysis of Remanufacturing Practices in the Malaysian Automotive Industry

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Graphical abstract



Abstract

At 605,156 units, Malaysia recorded the highest sales in passenger car market in 2010. It provided a very strong positive impact to the local automotive manufacturers like Proton and Perodua which monopolized approximately 60% of the Total Industry Volume (TIV). However, the global paradigm-shift towards environmental sustainability also played a significant role in ensuring the sector remains strong and competitive. The trend in the global automotive industry today has led to considerations for green design concept cars. Recently, remanufacturing activity is known to be more profitable and able to minimize the negative impacts of end of life vehicle to the environment. Since remanufacturing is a relatively new industry in Malaysia, it is essential to develop and gather good knowledge and information from the appropriate parties such as Proton, Perodua, Honda and Toyota as well as government agencies or enforcement authorities such as MITI & JPJ including small and medium-sized enterprises (SMEs) such as Motor Teknologi & Industri Sdn Bhd (MTI). By using a survey questionnaire as the methodology tool, this study is developed with the hope that ample knowledge and information could be collected and further analyzed. Results from the study would be channelled as a tool to contribute towards research activities in the Malaysian automotive industry with regards to environmental impact from product remanufacturing.

Keywords: Malaysian Automotive Industry; remanufacturing; environmental sustainability; survey

Abstrak

Pada tahun 2010, Malaysia telah mencatatkan hasil jualan tertinggi dalam pasaran kereta penumpang dengan 605,156 unit. Ini menunjukkan impak positif terhadap pengeluaran kereta nasional negara seperti Proton dan Perodua yang memonopoli kira-kira 60% daripada Jumlah Jualan Industri (*Total Industry Volume*) (TIV). Walau bagaimanapun, perkembangan urutan paradigma dunia automotif yang menganjak ke arah kelestarian alam sekitar juga turut memainkan peranan penting dalam memastikan sektor ini terus kukuh dan mampu berdaya saing. Tren untuk industri automotif global masa kini telah membawa kepada aplikasi konsep reka bentuk hijau. Kajian telah menunjukkan bahawa aktiviti pembuatan semula (*remanufacturing*) adalah lebih menguntungkan dan juga boleh mengurangkan kesan negatif terhadap alam sekitar. Namun begitu aktiviti ini masih boleh dianggap baru di Malaysia. Justeru, pengetahuan dan maklumat yang betul, lengkap dan berguna perlu dikumpulkan daripada semua pihak yang terlibat. Oleh itu, dengan menjalankan satu kajian dengan mengambil kira pandangan daripada responden yang sesuai seperti Proton, Perodua, Honda dan Toyota serta agensi-agensi kerajaan seperti MITI & JPJ serta Motor Teknologi & Industri Sdn Bhd (MTI), ia adalah berharap agar pengetahuan dan maklumat yang mencukupi boleh dikumpul dan dianalisis. Hasil analisa tersebut bakal disalurkan dan digunakan bagi menyokong aktiviti-aktiviti penyelidikan industri automotif dalam usaha untuk menghasilkan produk yang mesra alam dan berteraskan teknologi hijau.

Kata kunci: Industri Automotif Malaysia; pembuatan semula; kelestarian alam sekitar; kajiselidik

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1.0 INTRODUCTION

In Malaysia, environmental issues and related conservation practices have long been a never ending story. For example,

environmental pollution problems and followed by industrial waste is the greatest environmental dilemma involving the industry; with issues like the illegal dumping of waste being major news stories from time to time in the newspaper and other

media. In the waste hierarchy, as Figure 1 shows below, the most effective approach in managing waste is at the very top, which is through prevention. In contrast to waste minimization, waste management focuses on processing waste after it is created, concentrating on re-use, recycling, and waste-to-energy conversion. Although in the product recovery hierarchy, reuse had been claimed to be at the highest [1, 2], it also been mentioned that it is necessary for the product to undergo other processes so that it can be 'reused' again. This type of treatment as the technology goes 'greener' is called remanufacturing. Generally, remanufacturing can be defined as a transformation of a used product to an at least OEM original performance specification from the customers' perspective and giving the resultant product a warranty that is at least equal to that of a newly manufactured product [3].

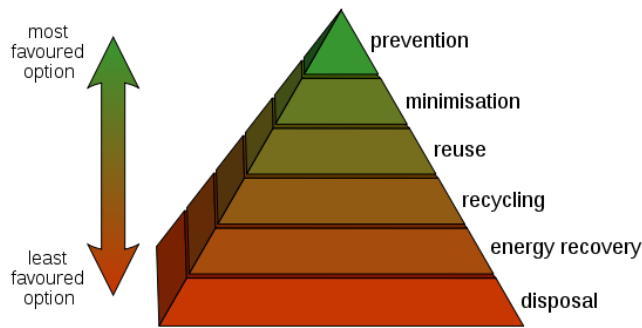


Figure 1 Waste Hierarchy [greengrowth.org]

Recently, sustainability had appeared to be the keyword in the manufacturing industry, to be considered from the development-concept, environmentally sound production processes until environmental-preservation recovery options of the product. A constant and continuous endeavor to create awareness and increase the knowledge among the consumer level up to manufacturers had been implemented through various strategies. These consideration have led up to the ideas such as putting into university syllabus education by introducing 'Design for Environment' subject, organizing an international conference in green environment sustainability, releasing a specific roadshow and distribution of booklet or brochures [4]. Design for Recycling (DfR), Design for Disassembly (DfD) and Design for Remanufacturing (DfReman) are among the methodology of recovery strategies [5] that had been put in effort in order to enhance the environmental performance and to move "beyond compliance" as the environment legislation is set in most countries lately.

1.1 Malaysian Automotive Industries

In Malaysia, manufacturing turned up to be one of the most influenced industries, thus the development of green environment initiatives has been laid down in the most efficient and effective ways to cater the environmental issues from the manufacturing point of view. Observation has been made that among the Malaysian manufacturing sector, the automotive industry showed rapid development of which certainly gives big impact towards the economic growth and indirectly contribute to a significant growth of other related industries [6].

The idea of building the Malaysian automotive industry had been initiated by Tun Mahathir Mohamad, Malaysia's fourth Prime Minister. The first Malaysian carmaker, Perusahaan Otomobil Nasional Berhad or Proton was established on 7 May 1983 as a joint venture with Mitsubishi Motors Corporation

(MMC). The Proton's first model, called the Proton Saga, was launched on 9 July 1985. It was followed by the second national car manufacturer, Perusahaan Otomobil Kedua Sdn Bhd or Perodua, which launched its manufacturing plant on 1 August 1994. Although during that initial time, the national automobile market was only 50,000 units a year, but based on the sales result in passenger car market in 2010, Perodua and Proton had conquered by 57.2 % of the Total Industry Volume (TIV) with the amount of 524,915 units. (See Table 1).

With increasing amount of buying power, means the manufacturing of cars also rose. It is related with large volume of mass production requirements and a properly programmed production-assembly process. However, as the general 'direction-shift' towards environmental sustainability, manufacturers are forced to manufacture environmental-friendly conscious product such as imposing the use of green and cleaner technologies, introduction of zero-emissions engines as well as the recycling or refurbishing of used products [6]. These are the hurdles that need to be overcome by the Malaysian automotive industries to become more competitive in the world market.

Table 1 Market Sales Review January- December 2010 [8]

MARKET POSITION M BY MAKER			
RANKING	MANUFACTURER	TOTAL	SHARE
1	Perodua	188, 641	31.2%
2	Proton	157,274,	26.0%
3	Toyota	91, 559	15.1%
4	Honda	44,483	7.4%
5	Nissan	34,701	5.7%
6	Mitsubishi	11,899	2.0%
7	Naza	9,362	1.5%
8	Others (Suzuki, Isuzu, Inokom, Mercedes, Mazda, Hyundai, etc)	67,237	11.1%
TOTAL		605,156	100.0%

2.0 METHODOLOGY

As the automotive sector is one of the first industries to practice remanufacturing [7], this research is based on remanufacturing as the strategy tool for recovery option in order to support eco-design concept to preserve the environment. A survey questionnaire is used to gauge how well the 'remanufacturing' activities are being understood and implemented by the Malaysian automotive industry. The questions are designed so that the professionals' point of view regarding remanufacturing in the Malaysian automotive industry could be gathered and on top of that, some very valuable experience and opinions could also be shared. The outcome of this survey is aimed to contribute towards research activities of the Malaysian automotive industry with regards of the environmental impact of product 'remanufacturing'.

The survey was addressed to three main groups of respondents which are the government related agencies, the manufacturers and validators. It consists of two parts. Part A describes the category of group of respondent, familiarization towards relevant standards and legislation, the considered element when buying vehicle (by ranking) and also a type-paragraph question regarding the End-of-Life Vehicle (ELV) Policy with regards to the Malaysian automotive industry.

Part B of the questionnaire is focused on measuring how well the concept of remanufacturing is being understood and at what level it is being implemented in the manufacturer's organization. Besides, it also focused on inquiring respondent's opinion and assessment for remanufacturing procedures and activities as one of the recovery option for implementing the environmental friendly policy for automotive industry in Malaysia.

3.0 RESULT S AND DISCUSSION

From the results, Table 2 shows the percentage of each group of respondents. With 74% response from the industry, the survey was successful in obtaining feedback from the manufacturers' perspective. Also, it should be noted that the 6% response from the government related agencies and 20% from the enforcement authorities may have an impact on the whole idea of the remanufacturing future in Malaysia.

Table 2 Percentage of respondent by group of category

Profession Category	Quantity	Percentage (%)
- Government related agencies	2	6
- Manufacturers	26	74
- Enforcement authorities	7	20
TOTAL	35	100.0%

Based on the survey result also, with the percentage of 89% and 95% respectively, most respondents agree that an environmental-friendly vehicle needs to be designed to cope with the increasing trend and awareness in environmental accountability in Malaysia as well as the consideration to implement the End-Of-Life Vehicle (ELV) policy. (Refer to Figure 2 and Figure 3). Despite the positive feedback, the awareness and level of knowledge and implementation in the manufacturers' organizations are rather low. This could be seen from the answers provided by the respondents in the ranked type questions. With 5 options to choose; which are fuel efficiency (FE), safety feature, exterior and interior design, selling price and environmental impact element, nearly 43% of the respondents put selling price as the most priority element, and a large percentage of 56% goes to environmental impact as the least important consideration when buying a new vehicle. By using Microsoft Excel for analysed the survey questionnaire, this result led to the insight which shows that most of the respondents still neglect the environmental impact element when buying a new vehicle. (Figure 4).

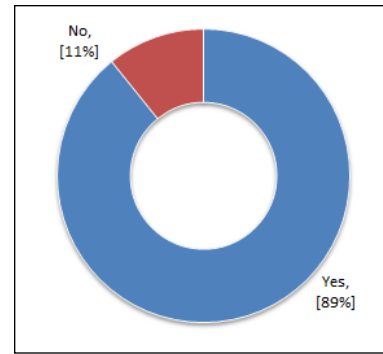


Figure 2 Percentage of respondent that agree on eco-car design & development

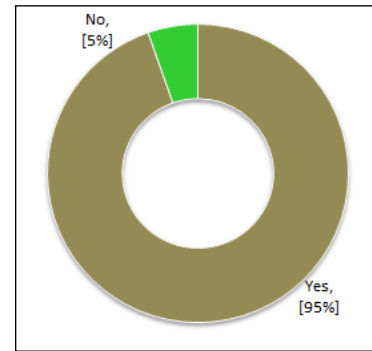


Figure 3 Percentage of respondent that agree on ELV policy implementation

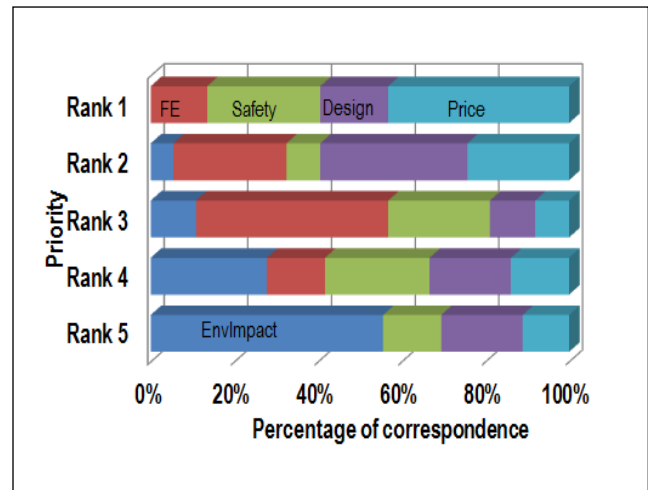


Figure 4 Elements considered when buying a new car – by rank (Rank according to importance; 1 - most important, 5 – least important)

Nevertheless, most of the respondent agreed that products or parts intended for future re-manufacturing should be designed in such a way that it would be able to undergo certain processes in making those products or parts usable to a certain extent even after their originally planned life-cycle. As these additional processes should not have any negative impact on the product specifications, it is important that the design of such characteristics should be done during the initial product development or even way before model concept is established, rather than after the product or parts has been manufactured.

Extra processes after product completion means extra time, which in turn may result with additional investment on more equipment only for the purpose of ‘re-shaping’ the product to a usable state. From the researchers and manufacturer’s point of view, although the activity is important to help reduce the environmental impact their product impose onto, to some extent the allocation of certain amount of their budget need to be included as to plan for expansions of the current production line in coping with the additional processes.

Other than improving the end-of-life recovery option by implementing and inventing various support tool and methodologies by researchers, the government should also play an important role in ensuring proper hearing sessions being implemented to hear the voice of the others, and laying down a concrete groundwork so as to invite as much participation from the industry. Such examples may also include among others, tax rebates for companies implementing the policy in their production, eligibility to being a pioneer status company for a longer period of time, or even to the extent of giving out special perks like R&D grants to all related bodies involved in the activity of remanufacturing throughout the whole supply chain.

With this, it is hoped that other than reducing the overall production cost with less raw material needed to produce them, the industry will also spur in-line with the government directive as well as the researchers’ study and effort, which in the end will ensure the growth sustenance of the nation.

4.0 CONCLUSION

From the survey questionnaire, it can be concluded that most of the major established organizations are following their own policies which either include or omit the need to ensure their daily activities having lesser environmental impact. In most cases, each organization have set very stringent requirements in achieving their mid/long term goals; which in the end shall ensure the best “Quality, Cost, Delivery, Management, Safety and Environment (QCDMSE) experience towards their customers. Although the purpose of re-manufacturing is to extend the life-cycle of parts, it is unfortunately the result of the survey indicated that the re-manufacturing process may give some impact towards the level of quality assurance of the parts itself. Therefore, majority of the respondent agreed that careful yet extensive study needs to be implemented to verify the impact of re-manufacturing towards product quality. In this manner, here again the role of the governmental bodies are important, through the involvement of certification entities in Malaysia like, among others, the Standard and Research Institute of Malaysia (SIRIM) and the Computerized Vehicle Inspection Center, also known as Pusat

Pemeriksaan Kendaraan Berkomputer (PUSPAKOM) in helping out by the means of performing product specification verification at these facilities at the most minimum fee, so as to invite as many participations as possible.

As a summary, even though the subject of remanufacturing is still considered to be at its infancy stage in Malaysia with lack of knowledge and awareness on the subject, it is anticipated that with proper study and clear guidelines, along with close cooperation from the government, the subject can be further explored and nurtured to be a major Gross Domestic Product (GDP) contributor to the nation.

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