

MECHANISM OF REWARD FOR GLASS RECYCLING ACTIVITIES IN
KUANTAN COMMUNITY BASED ON MPK REDEMPTION SYSTEM

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ABSTRACT

This study was conducted within Kuantan municipal council (MPK) and Kuantan community. This system will develop a new concept on rewarding the consumers upon glass recycling program based on MPK redemption system. The aim objective of this study is to develop recycling reward mechanism concept within MPK and consumer. The elements investigated includes identification of the type of reward to be offered by MPK to their consumer, to know which kind of reward selected by customer and to discover consumers' behavior towards glass bottle recycling. Throughout the study, 30 set of questionnaires are develop as a pilot test survey from 30 Ump students and 200 sets of questionnaires are prepared and respondents from selected area which are Sg. Isap village, Bandar Indera Mahkota, Cenderawasih and Kubang Buaya Village will be the sample of this survey. Feedbacks from the survey shows 100 % of respondent of pilot test and survey are answered the questionnaires. Based on the results, it can be concluded that most of consumers are interested with the rewards offered by MPK. Majority of Kuantan community prefer to choose "landscape reward" Its shows the highest rating voter for this reward which is 33%. Then followed by "car parking ticket", 29.5% and "zoo night ticket in Taiping Perak", 25%. The lowest rating voted is "car parking sticker".

ABSTRAK

Kajian ini telah dijalankan di antara majlis perbandaran Kuantan (MPK) dan masyarakat Kuantan. Sistem ini akan melahirkan satu konsep baru dengan memberi ganjaran kepada pengguna apabila mereka mengitar semula kaca berdasarkan sistem penebusan MPK. Objektif utama kajian ini adalah untuk membangunkan semula ganjaran konsep mekanisme dalam MPK dan pengguna. Unsur-unsur yang disiasat termasuk mengenal pasti jenis ganjaran yang akan ditawarkan oleh MPK kepada pengguna mereka, untuk mengetahui yang jenis ganjaran yang dipilih oleh pelanggan dan menggalakkan pengguna terhadap kaca kitar semula botol. Sepanjang kajian ini, 30 set soal selidik perintis kajian telah diedarkan kepada 30 pelajar UMP dan 200 set soal selidik telah disediakan dan responden dari kawasan terpilih iaitu Kampung Sg. Isap , Bandar Indera Mahkota, Cenderawasih dan Kampung Kubang Buaya yang akan menjadi sampel kajian ini. Maklum balas daripada kajian menunjukkan 100% responden ujian perintis dan kajian yang menjawab soal selidik. Berdasarkan keputusan, ia boleh membuat kesimpulan bahawa kebanyakan pengguna yang berminat dengan ganjaran yang ditawarkan oleh MPK. Sebahagian masyarakat Kuantan lebih suka memilih "ganjaran landskap" Ia menunjukkan Kedudukan pengundi tertinggi bagi ganjaran ini yang merupakan 33%. Kemudian diikuti dengan "kereta tempat letak kereta tiket", 29.5% dan "zoo tiket malam di Taiping Perak", 25%. Peratusan terendah mengundi adalah "tempat letak kereta pelek".

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LIST OF ABBREVIATION

MPK	Majlis Perbandaran Kuantan
JPM	Jabatan Perangkaan Malaysia
MSW	Municipal Solid Waste
KK5	Kolej Kediaman 5
UMP	Universiti Malaysia Pahang
FKP	Fakulti Kejuteraan Pembuatan
FKM	Fakulti Kejuteraan Mekanikal
FKEE	Fakulti Kejuteraan Elektrik & Elektronik

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Glass is an ideal material for recycling and in some cases can be used repeatedly without any deterioration in its physical properties. In recent years, the demand for glass bottle containers is increasing resulting increase in the desirability of recycling glass. With all markets, pressure from demand can only fulfill and effective if the processors can ensure that using recycled materials meet their customers' quality requirements. Furthermore, the type of glass available for recycling is not always the type most demanded by the end market. The development of new and alternative markets for recycled glass has further contributed to the development of new technologies.

In Kuantan glass is the most recycled household items based on the data given by Kuantan Municipal Council (MPK) (Figure 1.1). Figure 1.2 shows the amount of glass collected at MPK Glass Collection centre (Glass recycling program) per month from May 2009 to April 2010. Based on the figure 1.2 the glass collected at the residential area is the highest followed by schools and then restaurant/hotels. Glass recycling awareness in Kuantan is still low. Many of the used glass bottle end up at landfill or Alam Flora rubbish tank. All the glass that ended at Alam Flora or land fill will be contaminated and are not suitable to recycle as glass container or glass bottle.

Mixed glass cannot be used to make new containers because colour purity is essential. It must go to alternative uses such as a road laying material; glasphalt. Glasphalt contains about 30% recycled glass and it has been estimated that

approximately 14 million used glass bottles is made for Other uses include fibre glass manufacture and material wool insulation.

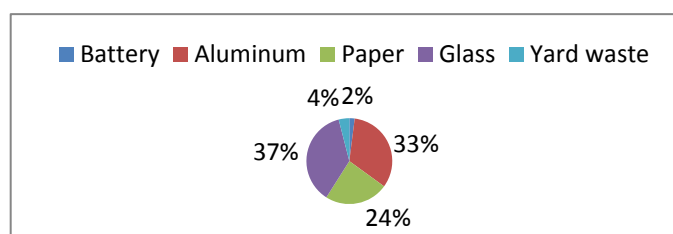


Figure 1.1: Recycled household item in Kuantan

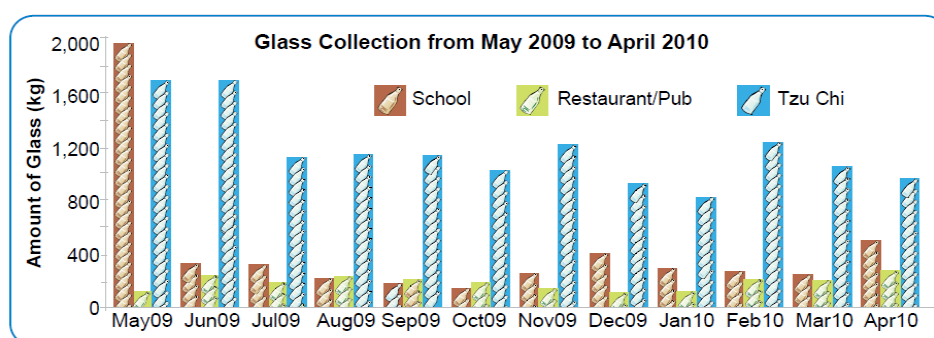


Figure 1.2: Glass collection from May 2009 to April 2010

Based on the Figure 1.2, 20 tonnes of glass were being collected throughout the programme or 1.7 tonnes of glass is collected per month for this programme. Recently, in 2011 the amount of glass collected by the MPK Glass Collection Centre is continue to drop drastically especially from schools and residential area. The purpose of this project is to maximize the amount of glass bottle collection through optimizing a new design system of collection in the supply chain (consumer, Municipal council and recycling agents) that is more efficient. This system will ensures that, glass bottles will not be wasted at landfill or Alam Flora rubbish tank which will lead to contamination to the glass and will prohibit the glass from being recycled to glass container such as bottles.

Figure 1.3 shows the flow of conventional glass bottle collection system done by municipal council (MPK). Consumers such as pubs, school and residential area

collected their used bottle glass in provided bin, then MPK lorry comes to pick the provided bins to the customer every once a week. The collected glass bottle is placed in a container and then is crushed for recycling purposes. Consumer voluntarily recycles the bottle without gaining any reward for them. Based on previous study done by Mr Perwira Putra Bin Iskandar, he had confirm by the survey that reward mechanism system is needed in order to promote recycling glass. Figure 1.4 shows the total of respondents are prefer to have reward as a great motivation for recycling glass.

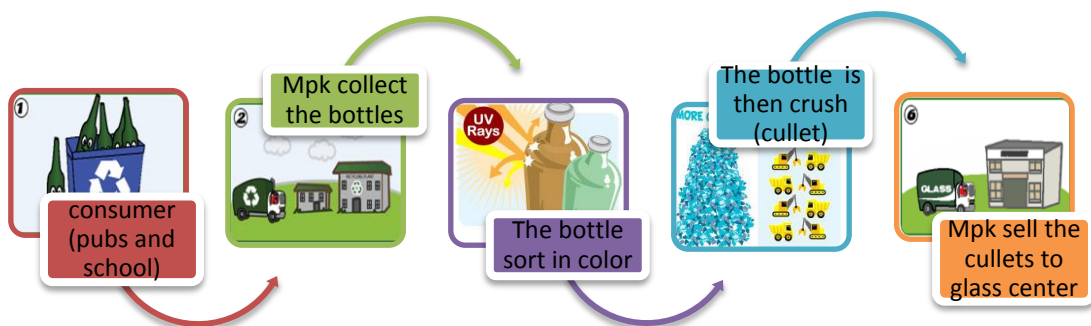


Figure 1.3 : MPK conventional glass bottle collection system



Figure 1.4 : Reward is great motivation for recycling

Figure 1.5 shows the illustration of previous study suggestion to implement the way to improved recycling glass performance by develop reward mechanism concept into the recycling glass system. Thus, this study will further extend by identify what kind of rewards to be offered from MPK to their consumer. Then To know which kind of reward selected by customer. Therefore it will encourage consumer toward recycling glass.

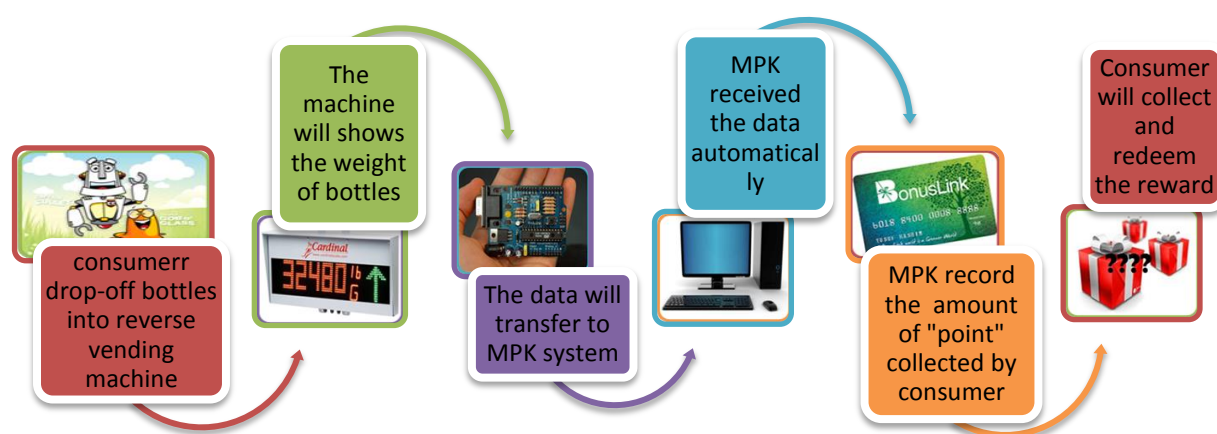


Figure 1.5 : New bottle glass recycling system illustration

Table 1.1 shows the details about previous study and future study of this project. Therefore, this study will improve the recycling activity by encourage people in Kuantan to participate recycling glass program.

Table 1.1: The Details About Previous Study And Present Study

Item	Previous study	Future study
Title	Design and develop new glass bottle recycling system in Kuantan community	Mechanism of reward for glass recycling activities in kuantan community based on MPK redemption system
Task	Discover the behavior of consumers toward glass recycling in particular	To identify what kind of reward to be offered from MPK to their consumer.-Interview MPK

	<ul style="list-style-type: none"> • Damansara damai (pilot test) 	<ul style="list-style-type: none"> • Kolej Kediaman 5, UMP, Pekan (Pilot test)
	<p>Discover how reward can influence and convince consumer to recycle glass</p> <ul style="list-style-type: none"> • Gambang 	<p>Discover what kind of reward selected by kuantan community.</p> <ul style="list-style-type: none"> • Sungai Isap village • Cenderawasih village • Bandar Indera mahkota • Kubang Buaya village

1.2 PROBLEM STATEMENT

Glass containers such as glass bottle are being consumed for various usages especially for storing sauce and ketchup for various brands. The usage of glass bottle is increasing since the demand for its domestic usage is increasing. The increase in the demand of glass bottle will result in the increase on the production of glass bottle from the manufacturer. In terms of manufacturing the production of glass bottle from recycled glass bottle saves 40% energy than producing from its raw material. However, recently most of the used glass bottle is not being recycled but were littered at landfill and thrown in the garbage bin. This is due to lack of awareness, motivation and effective collection system. This will also lead to big loss to the most valuable source of silica in glass production and promote environmental pollution because glass bottle is not degradable.

1.3 AIM AND OBJECTIVE OF THE STUDY

The aim objective of this study is to develop recycling reward mechanism concept within MPK and consumer. This study is also being done in order to discover the behavior type of reward of consumers interested toward glass recycling in particular.

The aim is supported by subsequent objectives as follow:

- i. To identify what kind of reward to be offered from MPK as a recycling glass redemption.
- ii. To identify the preferred reward chosen by Kuantan community.
- iii. To encourage people (Kuantan community) to participate glass recycling program.

1.4 SCOPE OF STUDY

The scope of study was conducted within Kuantan municipal council and Kuantan community. This study will be focusing on several main areas which are to develop a new concept (reward mechanism system) of glass recycling system within Kuantan community) and MPK, to identify what kind of reward to be offered from MPK to their consumer, to know which kind of reward selected by customer and to discover consumers' behavior towards glass bottle recycling. During the study, the current or conventional glass bottle recycling system is being studied to know the weaknesses and the strength of the current system.

Throughout the study, questionnaires will be prepared and distributed to the Kuantan community at targeted area. The questionnaires will evaluate the behavior of consumers towards glass recycling and to identify target group for the new system.

1.5 SIGNIFICANT OF STUDY

This study is significant to study and develop a new concept (reward mechanism system) of glass recycling system within consumer (Kuantan community), Municipal council (MPK). So that it will encourage kuantan community toward recycling glass.

In addition , this study will also reveal other issue regarding glass recycling such as the behavior of consumers towards glass bottle recycling and which group in the society contributes the most and the least in glass bottle recycling.

1.6 EXPECTED OUTCOMES

This result of this study will prove information on the types of reward that Kuantan people would prefer based on MPK reward system. It is hoped that the results will lead to similar studies on other recyclable material such as paper and plastics. Coherently, it is likely that this study will be able to instill good practice in recycling and can reduce environmental pollution in general. Therefore it will be one small step to achieving green environment in Kuantan.

CHAPTER 2

LITERATURE REVIEW

2.1 GLASS PROPERTIES

The properties of glass provide attributes for many commercial products. As some of these products reach the end of their useful life and are discarded, there is the opportunity to have the material recycled into other useful products. This alternative is preferred over having the material enter a municipal waste stream for landfill disposal. Glass can be re-melted and re-fabricated over and over again without any deterioration of the material properties. Limitations for recycling of glass involve the level of contamination from other.

Categories or colors of glass, as well as from a variety of non glass materials. For successful recycling, glass must be processed to meet the requirements of the glass manufacturing industry. To promote glass recycling, it is crucial to firstly promote recycling itself.

Glass is a homogeneous, non-crystalline material. Glass chemistry is typically categorized by its oxide components. Table 2.1 compares oxide components in the principal categories of glass products, which can potentially be recycled. Individual glass producers usually have modest variations from these averages. Different colors are derived from minor ingredient additions.

In most instances, color separation of recycled glass is necessary to avoid color quality concerns upon re-melting. Chemical content differences between glass product categories limit the opportunity to recycle between glass categories.

Table 2.1: Oxide component in Glass categories, %

Oxide	Glass containers	Flat for Automotive & Windows	Fiber Glass		Lighting
			Textile	Wool	
SiO ₂	72.5	70.7	55.0	57.0	76.4
B ₂ O ₃			7.0	5.2	14.6
Al ₂ O ₃	1.5	0.7	14.8	8.0	
CaO	10.0	9.5	20.5	8.1	
MgO	0.5	3.8	0.5	4.2	2.0
Na ₂ O	14.5	13.3	1.0	14.5	5.4

2.2 RECYCLING

Recycling is the process by which waste material are divert from the waste stream. The products are sorted and used to produce new materials to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from land filling) by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production. Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy.

“Recycling terminology is define as use of material in a form of similar to its original use” (Pichtel, 2005). The purpose of recycling demand that the owner of the waste material first separate out the useful fraction so that it can be collected separately from others. Solid waste various components of municipal solid waste can be recycled for manufacturing and subsequent use, significantly paper, steel, aluminum, plastic, glass and yard waste (Tchobanaglou et al., 1993). The materials that been recovered for recycling from MSW is shown in table 2.2.

First, separate rubbish from recyclable and non-recyclable for collection for trash collection to pick up. The easiest way is to send recyclables to the recyclable to the

recycling centers available. Otherwise, sending larger amount and bulky recyclable items to collecting centers and private buy back centers. The rewards from the waste recycling are not exclusively environmental, but economic and esthetic as well.

Table 2.2: Material that have been recovered for recycling from MSW

Recyclable material	Types of material or uses
Aluminum	Soft drink and beer cans
Paper	Newsstand and home-delivered newspaper
Old newspaper(ONP)	Bulk packaging, largest single source of waste of waste paper for recycling
Corrugated cardboard	Computer paper, white ledger paper, and trim cuttings
High-grade paper	Various mixtures of clean paper including newsprint, magazines, white and colored long-fiber paper
Mixed Paper Plastics	Milk jugs, water containers, detergent and cooking oil bottles
PLASTICS	Home landscaping irrigation piping, some food packaging bottles
Polyethylene (PETE/1)	Thin-film packaging and wraps; dry cleaning film bags, others film material
High-density	Closures and labels for bottles and containers, battery casings, bread and cheese wraps
Polyethylene(HDPE/2)	Packaging for electronics component
Polyvinyl chloride (PVC/3)	Multilayered packaging, ketchup and mustard and microwaves bottles plates
Low-density polyethylene (LOPE/H)	
Polypropylene(PP/5)	Various combinations of above products
POLYSTRENE(P5/6)	Clear, green , and brown bottle and containers
Multilayer and Other(7)	Tin cans, white goods, and others metals
Mixed Plastics glass	Aluminum , copper, lead etc

2.3 GLASS RECYCLING

Kirk Othmer, *Glass Recycling* (2005) stated that containers, and all other uses. While the glass container manufacturers can theoretically use all the color sorted cullet collected to make new containers, for many communities, there are significant barriers: These include transportation cost, the problem of both marketing mixed colors, and more recently, having them processed with electromechanical glass sorting equipment. Used and recovered, i.e., post consumer, commercial glass, as well as off-specification glass, suitable for remelting, is referred to as cullet.

The 22% glass recycling rate reflects the percentage of containers actually being recycled into commercial products by manufacturers, not just the amount being collected. This percentage is based on the total number of all jars and bottles sold, not just a specific segment of the container market. Recycled glass (cullet) is not only made into new bottles and jars, but also used for secondary markets such as fiberglass and glasphalt, i.e., paving asphalt utilizing crushed cullet as a grog constituent, replacing stone aggregate. Commercial glass can be recycled when sufficient quantities can economically justify the development of a processing infrastructure. A variety of classification and separation issues must be addressed.

There are chemical differences between the largest glass product categories, including glass containers; window and automotive glass; electronic glasses, e.g., light bulbs, fluorescent tubes, and TV tubes; fiberglass, including insulating wool and textile types; and home cookware. Typically, only post consumer container and flat glass is recycled commercially. A significant proportion of past cullet recycling has been in the glass container industry.

Other segments, such as insulating fiber glass, are increasing the use of post consumer cullet. Approximately 12.6 million tons of glass containers (41 billion containers) are manufactured in the United States annually. In addition, an estimated 800,000 tons of glass containers are imported annually into the United States. Normally, glass containers are the second largest contributor by weight to a recycling programs, exceeded only by newspapers. In 2003, there were 8,875 curbside

municipal solid waste [MSW] recycling programs, down slightly from 9,700 in 2001. Cullet is one of the four principal ingredients in container glass. From a nonmanufacturing perspective, using cullet conserves landfill space for disposal of non recyclable materials.

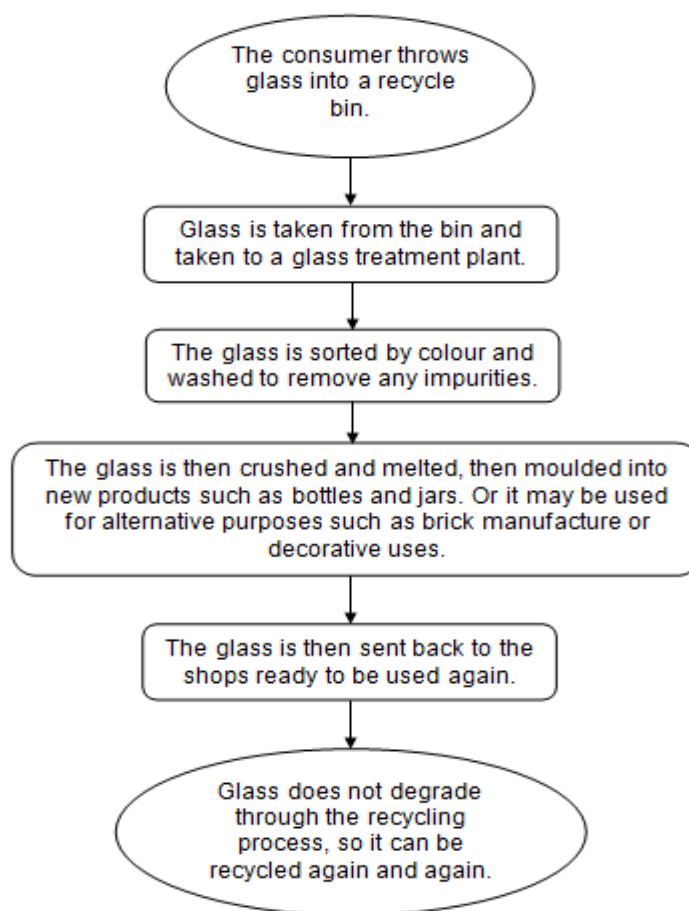


Figure 2.1: Shows the process involve in bottle glass recycling

2.4 OBSTACLES TO PROMOTING PEOPLE CENTERED APPROACHES IN RECYCLING

(Muttamara, 1996; Noehammer & Byer,1997; Van Beukering, Sehker, Gerlagh, & Kumar, 1999; White, Franke, & Hindle, 1995), in their study stated that recycling is generally accepted as a sustainable municipal waste management (MSW) strategy. Several reasons are often advanced for participating and/or promoting recycling in both developed and developing countries. The general consensus among professionals and researchers is that recycling reduces the total amount of waste that is disposed of, and conserves natural resources Two systems of recycling and their