



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF EASY AND QUICK PLUG IN PLASTIC
WALL TILES**

This report submitted in accordance with requirement of the UniversitiTeknikal
Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering
(Manufacturing Process) (Hons.)

by

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This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

ABSTRAK

Matlamat utama projek ini adalah untuk mengkaji “Pembangunan Palam Mudah dan Cepat dalam Jubin Dinding Plastik”. Aplikasi ini membantu memudahkan kerja pemasangan jubin dengan mudah. Terdapat beberapa kelemahan pada alat pemasangan kekal. Sebagai contoh, retak, kos pemasangan yang tinggi, memerlukan kemahiran pekerja mahir dan meninggalkan kesan kecacatan kekal pada dinding. Idea penghasilan jubin plastik daripada HDPE tercetus akibat kesan pembuangan botol yang semakin meningkat setiap tahun. Botol kitar semula yang boleh digunakan biasanya botol bahan pencuci dan minyak. Botol-botol tersebut akan dihancurkan dalam mesin penghancuran sebelum digunakan. Seterusnya hasil botol yang telah dihancurkan akan dimasukkan didalam acuan jubin Mesin Tekan Panas pada suhu 180°C. Masa yang diperlukan bagi satu jubin adalah 20 minit ; 10 minit pra pemanasan dan 10 minit proses penekanan. Proses penyejukan pula selama 20 minit. Bagi penghasilan plat, ia menggunakan plat keluli lembut. Kaedah pemotongan menggunakan Mesin Pemotongan Laser. Seterusnya proses simulasi dilakukan menggunakan SolidWorks bagi proses pengesahan. Analisa daripada proses pengesahan akan menentukan berapa jumlah pin yang diperlukan mengikut kadar tekanan yang bersesuaian bagi satu jubin. Seterusnya proses pemasangan lengkap jubin dan plat keluli lembut akan dilakukan.

ABSTRACT

The main goal of this project is to study "Development of Easy and Quick Plug in Plastic Wall Tiles". This application helps simplify the installation of tiles with ease. There are some weaknesses in the permanent installation. For example, crack, high installation costs, requires skill skilled workers and leave permanent effects on the wall. The idea of HDPE plastic tile production triggered by the effects of the bottles is growing every year. Recycled bottles that can be used is usually bottle of detergent and oil. The bottles will be crushed in the crushing machine before use. Next she has crushed the bottle will be included in the reference tile Heat Press Machine at 180C. The time required for one tile is 20 minutes; 10 minutes and 10 minutes of pre-heating suppression process. The cooling process for 20 minutes. For plate production, it uses mild steel plate. Cutting method using Laser Cutting Machine. The next process is done using SolidWorks simulation for the verification process. Data analysis from the verification process will decide the pin total need for one tiles according to the total value of stress. The next process is assembly part between recycled plastic wall tiles and mild steel plate.

DEDICATION

First and foremost, this dedication is for my father, Mr. Mustapa bin Mat Nor and my mother, Khuzaimah binti Abu Yamin who always pray for my safety and success, who always gave me a motivation to continue my studies. Thank you to my family for always be my side no matter what happen. Without their blessing, maybe I'm not here. To my supervisor, Dr. Raja Izamshah bin Raja Abdullah, thank you for all the guidance and advice that you gave. To all the technician in the FKP laboratory, thank you for the times and sweat. I am so bless and congratulations to myself. I did it !

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LIST OF ABBREVIATIONS, SYMBOLS AND SPECIALIZED NOMENCLATURE

HDPE	-	High Density Polyethylene
FKP	-	Fakulti Kejuruteraan Pembuatan
UTeM	-	Universiti Teknikal Malaysia Melaka
LDPE	-	Low Density Polyethylene
PP	-	Polypropylene
SIRIM	-	Standards and Industrial Research Institute of Malaysia
QFD	-	Quality Function Deployment
CATIA	-	Computer Aided Three-Dimensional Interactive Application

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The title of this project is a development of easy and quick plug in plastic wall tiles. The goal of this project is to find a best impermanent adhesive for a plastic wall tiles.

As we know, nowadays there has several types of tiles in the industry. Plastic is one of best materials which is cheap and recyclable items. Pick one types of plastics such as HDPE. HDPE plastic has several properties that make it ideal as a packaging and manufacturing product. It's stronger than standard polyethylene, acts as an effective barrier against moisture and remains solid at room temperature. It resists insects, rot and other chemicals. It is easily recyclable and can be used again. Recycled HDPE creates no harmful emissions during its production or during its use by the consumer. Also, HDPE leaks no toxic chemicals into the soil or water.

Same goes to the types of installation of plastic wall tiles. Usually contractor will used cement and grouting as adhesive. Cement is a permanent adhesive. It can be exchanged depends on the user but it will take a higher cost, time and man power. As we know, cement is a cheap materials but when jump into an installation or maintenance every year the cost will be increased. The tiles can't recyclable.

In this project, it will focus on to find a best impermanent adhesive materials for plastic wall tiles which is help in reduce cost, time and manpower.

The idea of this project is actually come from the concept of impermanent plastic wall tiles. In the modern era, mostly houses are usually that used are tile either in bathroom, hall room, kitchen and other. There are few types and characteristics of tiles that commonly used such as ceramic tiles, homogeneous tile, glazed tiles, and rectified tile.

The most tiles that used by the people are ceramic tile but in this project we will only focus on plastic tiles. The recycle plastic wall tiles are eco-friendly option. Other than that, plastic also have a defect such as flammable. Usually, people are used cement during installation process. Cement is very easy to find and cheap. Cement is a mixture of

So that the idea to use impermanent adhesive for plastic wall tiles are generated. The impermanent adhesive are very easy to use, quick in time and can be recyclable. Other than that, impermanent adhesive can be reuse depends on the user.

According to Joseph Lewitin (Flooring Expert, 2015) the drawbacks of using concrete cement for the flooring is an environmentally unfriendly. While using an existing concrete slab as floor, there is no uses of new materials. The manufacture of concrete for a new floor have a negative ecological impact. It is requires a significant expenditure of energy and carbon dioxide in order to manufacture. The major problems is it can't be reuse or recyclable.

MongoCT (2014), being cement based, they are very exposed to damage from acids. They are easily stain and it looks terrible after a year.

O. Zimbili, W. Salim, and M. Ndambuki (2014) the purposes of using ceramics is a waste. Ceramic materials, which include brick walls, ceramic tiles and all other ceramic products, contribute the highest percentage of wastes within the Construction & Demolition (C&D) wastes.



Figure 1.1: Failure of Cement

Meanwhile, from as early as the late 15th century saw the introduction of Wall Panelling. At the beginning of the 16th Century a new domestic structure started to evolve. Comfort began to spread. Aided by the printing press which distributed the new designs of Buildings in and Living in Europe. Wall Panelling & Oak Panelling were much sought after for their insulation properties. Protecting the home owners from nasty draughts and cold. From more printing publications more ornate panelling was then developed throughout the Centurys from Stuart Interiors, Georgian and Victorian.

Bosieries Panelling (intricately carved wood panelling) were popular in the 17th and 18th century French Interior Design and the Palace of Versailles has many fine examples.



Figure 1.2 : Decorative Panels on The walls.

1.2 Problem statement

On 16th century, the tile is used for decorative building and most of wall tile made by ceramic (Malaysian Standard, 1981). Generally, to develop the ceramic tile requires very high costs and brittle (Malaysian Standard, 1983). It also required a long time period and difficult to install. To purposes a problems which is to fix a tiles at walls easily and quick in time.

The problem faced with the current adhesive is the permanent adhesive. The problem faced by many thermoplastics such as polyethylene, polypropylene, polyvinyl chloride and polycarbonate most products that made by this material often flammable (Hilado, 1998). The material need mixed by a fire retardant agent to resist heat (Frank Pitts, 2000). Another problems faced by the ceramic tiles is cracking. While install the ceramic tiles it needs to handle with care. While it is broken, it cannot be used anymore.

The adhesive to stick the ceramic tiles is using cement. In order to use the cement, it requires a specific skills to handle with it. Even though the wage for others to do it is very expensive. The materials also very expensive compared to other alternatives. It takes a long period of time for mounting a ceramic tiles completely.



Figure 1.3 Ceramic tiles with cement failures.

Other than that, silicon glue is using in mounting a tiles. There have a disadvantages of silicon glue. Mostly silicon glue is using in bathroom tiles. This is where the failure glue occurs. When it is used as a sealant, silicone poses a problem to the user when it comes to maintenance of exterior materials, which are sealed using silicon products. Nothing can stick on the sealant, so the sealed surface cannot be repainted or stained. When the sealant is completely cured, it is also difficult to remove. While other sealants dissolve easily in several solvents, silicon sealants are hard to dissolve.

This poses a problem to the maintenance of surfaces where silicon sealants have been used. The long-term strength of adhesive bonding is affected by various physical and chemical actions which are in the environment, actions such as ultraviolet light, chemical attacks on the environment, the presence of moisture.

There are adhesives that are not altered against ultraviolet light while others break down in front of this radiation. The solution to this problem is to select an adhesive according to the environmental conditions in later work; this will allow us to perform a series of accelerated aging tests in order to observe the goodness of the adhesive bond.



Figure 1.4: Failures of silicon glue

Most tile failures can be attributed to incorrect installation. The next adhesive of tiles is using mounting screw. Screw is a type of fastener and typically made of metal. Some screw thread is mention as male and female.

The most common form of screw is cylindrical form. There have a thread on the body and one head consists of flat or round head. Screw can be rotate through in stationary object or a threaded collar such as nut. The screw failure is fatigue failure which is influence by a variety of factors such as factors, temperature, compressive loads, etc.

The effects of fatigue is cracking and the next will damage the tolerant design. The user need to inspect the part periodically for cracks and replace the part frequently. Other than that, the tiles designs using mounting screw is not suitable and will damage the beauty of tiles. In term of safety for kids, screw is not safety due to their physical characteristics which is piercing.



Figure 1.5 : Examples of the uses screws.

1.4 Objective of Study

Based on the problems and challenges current techniques to install tiles, this project is obtained. The main objectives of this project is:

- a) To design an effective method for mounting plastic wall tiles by using method QFD.
- b) To fabricate and validate the effectiveness of the selected design.

1.5 Scope of the Study

The project studies for this final year project only cover one station in FKP laboratory. In this study mostly used the hot stamping machine at laboratory. Other than that, the machine that used for mixed both materials is Internal Mixture or Haake machine. Meanwhile, for crushing the fire retardant material and recycled HDPE plastic bottle it will use the crushing machine available at FKP laboratory. Apart from that, the assembly part which is contains tiles and frame mounting at FKP laboratory. Finite Element Analysis (FEA) is used to determine the strength of the concept.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section contains the literature review of the project which is identified with the objectives and scope of the project. This section also will consider an about material of High Density Polyethylene (HDPE) and the proper step of concept selection that involves. This project also proceed with the conceptual design and the best will be select according to the product specification.

2.2 High Density Polyethylene (HDPE)

Koerner (1992), state warm plastic material is viscoelastic, which implies that the mechanical properties mirror the thick fluid and a flexible strong without a moment's delay. Be that as it may, when versatile burdens are forced, it demonstrates the activity of thick stream (which disperse vitality) and the flexible removal (ie put away vitality). The versatile properties of materials rely on upon the time, temperature and rate of distortion. In any case, push and strain testing typically be utilized as to portray (short term) mechanical properties of plastics.

As indicated by Lester H, near the nineteenth century, Hans von Pechmann as German physicist that time in ether while working noticed a discover a methane structure. In 1990, polymethylene was distinguished by Bamberger E. Tschirner F. likewise as German physicist where a very close to polyethylene. Around 30 years after the fact, American scientific expert at E.I. du Pont de Nemours and Company, Inc., Carl Shipp Marvel was created a misuse of high-thickness, by subjecting ethylene to a high measure of weight.