



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **WATER SAVING DEVICE FOR ABLUTIONS**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Mechanical Engineering Technology (Automotive Technology) (Hons.)

by

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## DECLARATION

I hereby, declared this report entitled “Water Saving Device for Ablutions” is the results of my own research except as cited in references.

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## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor Degree of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

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(Mr. MOHD FARID BIN ISMAIL)

## **ABSTRACT**

Nozzle is a cylindrical or round spout at the end of a pipe, hose, or tube, used to control a jet of gas or liquid. The objective of this project is to build a water saving device during ablution process by using SolidWorks software and to ensure water usage during ablution process much better. Sometimes, the usage of water wasted during ablutions process is in critical conditions. This device is important to prevent the wasting of water during ablutions that could be insanely worse in the future. Furthermore, the water saving device can be the good device as well as it functions to ensure the water is saved. This water saving device are already exist in the global market, however it still have some problems in terms of the sizing and the application of the device for the usage at normal faucet at mosque, hospitality and any other buildings. The development of product water saving device for ablutions was successfully designed and can be used in daily life application. All concept that has been created through research before is brought together to form a completed product design which is suited to be used for ablutions process. Besides that, there was no problem arise during development of product according to the design plan.

## ABSTRAK

Muncung ialah silinder atau muncung bulat pada akhir paip, hos, atau tiub, digunakan untuk mengawal gas atau jet cecair. Objektif projek ini adalah untuk membina sebuah peranti penjimatan air semasa proses wuduk menggunakan perisian SolidWorks dan untuk memastikan penggunaan air semasa proses wuduk lebih baik. Kadang-kadang, penggunaan air semasa proses wuduk adalah suatu pembaziran yang berada dalam keadaan kritikal. Peranti ini adalah penting untuk mengelakkan pembaziran air semasa berwuduk, yang boleh menjadi lebih teruk pada masa akan datang. Tambahan pula, peranti penjimatan air boleh menjadi alat yang baik dan ia berfungsi untuk memastikan air yang digunakan tidak membazir. Peranti penjimatan air sudah wujud dalam pasaran global, tetapi ia masih mempunyai beberapa masalah dari segi saiz dan penggunaan peranti ini untuk digunakan dalam paip biasa di masjid, perhotelan dan mana-mana bangunan lain. Pembangunan peranti penjimatan untuk berwuduk air produk telah berjaya direka dan boleh digunakan dalam aplikasi kehidupan seharian. Semua konsep yang telah dicipta melalui penyelidikan sebelum dibawa bersama-sama untuk membentuk reka bentuk produk yang lengkap dan sesuai untuk digunakan bagi proses mengambil air sembahyang. Selain itu, tidak ada masalah timbul semasa pembangunan produk mengikut pelan reka bentuk.

## **DEDICATIONS**

I acknowledge my sincere indebtedness and gratitude to my parents and my family for their love, support and sacrifice throughout my whole life. Their sacrifice had inspired me from the day I born until what I have become today. From the day I have born, they have taught me about how to learn and write. Without them, I cannot achieve the success; I cannot find an appropriate word that could properly describe my appreciation for their devotion, support and faith in my ability to achieve what I have today. Lastly, I would like to thanks all people which contribute to my bachelor degree project directly or indirectly. I would like to acknowledge their comments and suggestions, which has crucial for the successful completion of this project.

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## **LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE**

BDP	-	Bachelor's Degree Project
FTK	-	Fakulti Teknologi Kejuruteraan
Gal	-	Gallon
H <sub>2</sub> O	-	Water
L	-	Litre
pcd	-	Per Capita Per Day
s	-	Second
UTeM	-	Universiti Teknikal Malaysia Melaka



# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

Chapter 1 is the framework of this project includes brief introduction about the distribution of water on earth, problem statement, objective and scope of this project.

### 1.1 Background of the Study

Water, hydrogen oxide, is a straightforward liquid which shapes the world's streams, lakes, seas and rain, and is the real constituent of the liquids of life forms. As a chemical compound, a water particle contains one oxygen and two hydrogen molecules that are connected by covalent bonds, H<sub>2</sub>O. Water is a fluid at standard ambient temperature and pressure, but it frequently coincides on Earth with its solid state, ice and gaseous state, steam (water vapor). It additionally exists as snow, haze, dew and cloud. (Reimann, 2006).

According to (Reimann, 2006) water covers 71% of the Earth's surface. It is basic requirements for every known type of life. On Earth, 96.5% of the planet's covering water is found in oceans and seas, 1.7% in groundwater, 1.7% in glaciers and the ice tops of Antarctica and Greenland, a little division in other large water bodies, and 0.001% in the air as vapor, clouds (shaped of ice and fluid water suspended in air), and precipitation. Only 2.5% of this water is freshwater, and 98.8% of that water is in ice (with the exception of ice in clouds) and groundwater. Under 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and a considerably littler measure of the Earth's freshwater (0.003%) is contained inside

biological bodies and manufactured products. A greater amount of water is found in the world's interior.

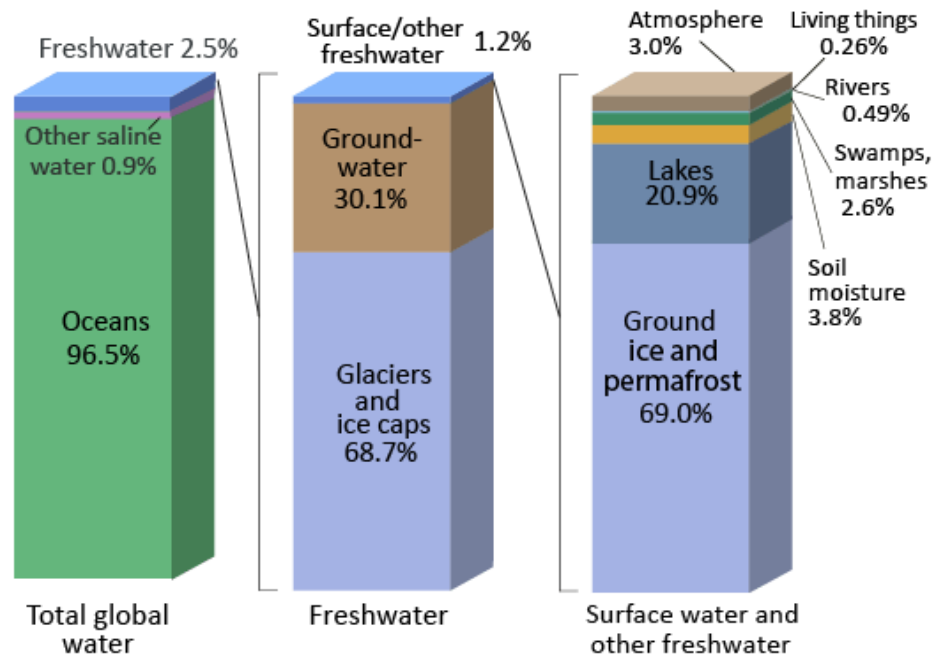


Figure 1.1: Distribution of Earth's Water

(Source: <http://ga.water.usgs.gov/edu/watercycle.html> 2/5/2016)

For a point by point clarification of where Earth's water is, take a data at the information table below. See how of the world's aggregate water supply of around 333 million cubic miles (1,386 million cubic kilometres) of water, more than 96 per cent is saline. Also, of the aggregate freshwater, more than 68 per cent is secured up ice and icy masses. Another 30 per cent of freshwater is in the ground. Accordingly, streams and lakes that supply surface water for human uses just constitute around 22,300 cubic miles (93,100 cubic kilometres), which is around 0.007 per cent of aggregate water, yet waterways are the wellspring of a large portion of the water individuals use.

Water source	Water volume, in cubic miles	Water volume, in cubic kilometers	Percent of freshwater	Percent of total water
Oceans, Seas, & Bays	321,000,000	1,338,000,000	--	96.5
Ice caps, Glaciers, & Permanent Snow	5,773,000	24,064,000	68.6	1.74
Groundwater	5,614,000	23,400,000	--	1.7
Fresh	2,526,000	10,530,000	30.1	0.76
Saline	3,088,000	12,870,000	--	0.93
Soil Moisture	3,959	16,500	0.05	0.001
Ground Ice & Permafrost	71,970	300,000	0.86	0.022
Lakes	42,320	176,400	--	0.013
Fresh	21,830	91,000	0.26	0.007
Saline	20,490	85,400	--	0.007
Atmosphere	3,095	12,900	0.04	0.001
Swamp Water	2,752	11,470	0.03	0.0008
Rivers	509	2,120	0.006	0.0002
Biological Water	269	1,120	0.003	0.0001

Figure 1.2: Estimate of Water Distribution

(Source: <http://ga.water.usgs.gov/edu/watercycle.html> 2/5/2016)

State	2014					2015				
	Domestic		Non-Domestic		TOTAL	Domestic		Non-Domestic		TOTAL
	MLD	%	MLD	%	MLD	MLD	%	MLD	%	MLD
Johor	823	67.8	391	32.2	1,215	811	64.4	448	35.6	1,259
Kedah	510	73.2	187	26.8	697	511	72.8	191	27.2	702
Kelantan	154	68.3	71	31.7	225	159	68.6	73	31.4	231
Labuan	17	35.8	31	64.2	48	17	35.2	32	64.8	49
Melaka	196	52.1	180	47.9	376	202	52.0	186	48.0	388
N. Sembilan	259	54.4	217	45.6	476	276	55.9	217	44.1	493
Pulau Pinang	483	59.4	330	40.6	813	483	59.5	329	40.5	813
Pahang	303	58.4	216	41.6	520	309	58.2	223	41.8	532
Perak	623	72.5	236	27.5	858	628	71.5	250	28.5	878
Perlis	81	84.5	15	15.5	95	81	84.2	15	15.8	96
Sabah	330	57.1	248	42.9	577	315	57.1	237	42.9	552
Sarawak	469	57.9	341	42.1	810	478	56.5	368	43.5	846
Selangor	1,779	58.4	1,268	41.6	3,048	1,862	58.6	1,316	41.4	3,178
Terengganu	241	57.7	176	42.3	417	246	57.5	182	42.5	428
<b>MALAYSIA</b>	<b>6,267</b>	<b>61.6</b>	<b>3,909</b>	<b>38.4</b>	<b>10,176</b>	<b>6,378</b>	<b>61.1</b>	<b>4,067</b>	<b>38.9</b>	<b>10,445</b>

Figure 1.3: Water consumption in Malaysia for the year of 2014-2015

(Source: <http://www.span.gov.my/index.php/en/statistic/water-statistic/water-consumption-2016> 2/5/2016)

Figure 1.3 shows the water consumption in Malaysia for the year of 2014-2015. For the consumption of water in the state of Melaka it shows an increasing for domestic and non-domestic consumption of water.

Al Quran has stated that water was the beginning of the source of life, and from here we are as beings that have been given by God's wisdom mind can figure out the excess water and so can use these resources to a level that is more beneficial to all parties. And from water we made every living thing. (Surah Al-Anbiyak: 30). In other view, Allah has mentioned in Al-Quran that “Verily spendthrifts are brothers of Satan, and Satan is ever ungrateful to his Lord.” (Surah Al-Isra’, verse 27).

Water is viewed as a purifier in many religions. Water is commonly used in ritual washing (ablution) include Christianity, Hinduism, Islam, Judaism, the Rastafarians development, Shinto, Taoism, and Wicca. In Islam, the five daily prayers should be done by finishing washing certain parts of the body using clean water (wudu’), unless water is inaccessible for Muslims they can do Tayammum. In addition, a ritual bath in pure water is performed for the dead in many religions including Islam and Judaism.

In order to maintain the quantity of water, human nowadays need to reduce their used of water in daily live. Then the water saving device need to be produced to ensure there is no more waste water during ablutions process.

## **1.2 Problem Statement**

Water is important for Muslims during ablutions process for doing their prayers. After doing several surveys at Surau FTK Factory 3, during ablutions process mostly Muslims will open the pipe until its limit to get more water and this will causes waste of water. Besides that, these situations are effect on increasing of water bill at UTeM.

It was narrated that the Prophet Muhammad S.A.W crossed Saad while performing ablution, then he asked: “Why are you extravagance like this, O Saad?” Saad asked: “Is the ablution also no term extravagance?” He said: “True , even though you are in a flowing river.” (Narrated by Ahmad R.A.). Actually the ablutions process followed by Islam is to make sure the all surface of skin is cover by water and by using not too much water. It is just to remove the dirty on skin before prayers.

Thus, the solution for this problem is by build the water saving device during ablutions process. At the end of this project work the vision is to ensure there is no more waste of water during ablution process.

### **1.3 Project Objective**

Based on the background and problem statement stated above, the objectives of this project are stated below:

1. To design water saving device during ablution process by using SolidWorks software.
2. To ensure water usage during ablution process much better.

### **1.4 Scope of Project**

In order to achieve the objective of this project, several scopes have been identified:

1. Design concept of a faucet that can be used in making this water saving device for ablutions process.
2. The material that must be used in the making of this project.
3. This project will undergo machining and fabricating process.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

Literature review purpose for this study is to review other research related to the study conducted in order to get the right idea and concept. Literature review also use in this study to obtain problem statement and to gain best and suitable methodology. With two thirds of the world's surface secured by water and the human body comprising of 75 per cent of it, it is apparently clear that water is one of the prime components in charge of life on earth.

The scarcity of water in Malaysia can be cause by many factors such as climate change. The Malaysian climate is strongly dominated by the Southeast Asia Maritime Continent monsoon – an important component of the larger Asia-Australia monsoon system. The southwest monsoon, characterized by low level south-westerly winds, commences in May and usually lasts between 3-4 months up to August. On the other hand, the northeast monsoon is dominated by north-easterly winds that cross over the South China Sea.(F T Tangang et al., 2012). This phenomena usually occur between November to February every year and this will make the region that involve in this phenomena get strong pulses of wind known as cold surge penetrates. One of the reasons this climate change occurs is by El Nino phenomena. On inter annual time scales, the El Nino – Southern Oscillation (EN SO) largely influences the climate variability over Malaysia and the greater Southeast Asian region.(Fredolin T. Tangang & Juneng, 2004). El Nino phenomena in Malaysia have become worst nowadays. For example, the rivers and dam become shallow and the land become dry this will cause unbalance ecosystem in Malaysia. To encounter this

problem, we should save our water usage at home or any other place to keep our fresh water enough during the El Nino phenomena.

Besides that in Al-Quran, Allah has mentioned that intend to save is very important in Islam. It was said in Al-Quran:

“Verily spendthrifts are brothers of Satan, and Satan is ever ungrateful to his Lord.” (Surah al - Isra ‘, verse 27).

Water saving device is the key to solve this problem and this paper will focus on study of faucets. A faucet is a device for delivering water from a plumbing system. It can consist of the following components: spout, handle(s), lift rod, cartridge, aerator, mixing chamber, and water inlets. When the handle is turned on, the valve opens and controls the water flow adjustment under any water or temperature condition. The faucet body is usually made of brass, though die-cast zinc and chrome-plated plastic are also used.

## **2.1 Faucets**

A faucet is a device that allows water flow out from the plumbing system. Major component in this device is spout, handle, and lift rod, cartridge, aerator, mixing chamber, and water inlets. At the point when the handle is turned on, the valve opens and controls the water stream modification under any water or temperature condition. The faucet body is usually made of brass, though die-cast zinc and chrome-plated plastic are also used. The greater parts of residential faucets are single or double control cartridge faucets.

Faucets run an average of eight minutes per capita per day (pcd), based on water use data collected from 1,188 residences (according to a study by the American Water Works Association Research Foundation, 1999). In daily pcd use indoor water use was at 69 gal (261 L), with faucet use third highest at 11 gal (41.6 L) pcd. Faucet use was strongly related to household size. The addition of teens and

adults increases water use. Faucet use is also negatively related to the number of persons working outside the home and is lower for those who have an automatic dishwasher.



Figure 2.1: Faucet

(Source: [http://www.moen.com/fina/\\_/N-1z141rc](http://www.moen.com/fina/_/N-1z141rc) 31/7/2011)

There are four common types of faucets valve that are ball faucets, disc faucets, compression faucets, and cartridge faucets.

### 2.1.1 Ball Faucets

Ball faucets are quite common and also quite easy to identify. You can figure out if a faucet is a ball faucet very quickly by looking at its handle or handles. If a faucet has one handle with a ball at the base that it rotates around, it is a ball faucet. Ball faucets are an older design. Because of this, they leak more often than many other models.