CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, piping system is one of the important features in either home of industrial user. It is essential for transporting fluid from a point to another point. For example, for home user, piping systems functioning as carrier for the water from the damp to every home. Whereas, for industrial user, the fluid that is carried are from different type such as water, gas, oil and many more. But due to many reasons, leaks may occur in the pipelines. Leak in piping systems is a major operational problem around the world. Leaks result to loss in the fluid through the flow and this will automatically affect the economy of the user. In addition, if the fluid consist of fluid that is dangerous and have potential risk to the health, this will be a problematic issue that needed quick action. Leaks may occur due to poor quality and defective pipe materials, pipe breaks resulting from poor workmanship, operational errors such as excessive pressure, closing or opening valves rapidly, corrosion, leaking fittings and accidental or deliberate damage to fixtures (Stafford and Williams, 1996). Detecting, locating and repairing these leaks become a hard task. In many cases, leakage receives little or no attention from consumers and there is often no leakage management program until an emergency occurs or when there is shortage. Different methods for leak detection have been developed. Generally, the traditional methods give low recognition efficiency, high false rates and poor localization accuracy. Although the leaks can be detected but the location of the leaks cannot be identified. So to overcome that problems, many method has been develop such as mass balance, volume balance, pig based monitoring systems and many more. All this method will be explain in chapter 2. Figure 1.1 shows the water volume distribution and loss of fluid in piping system.

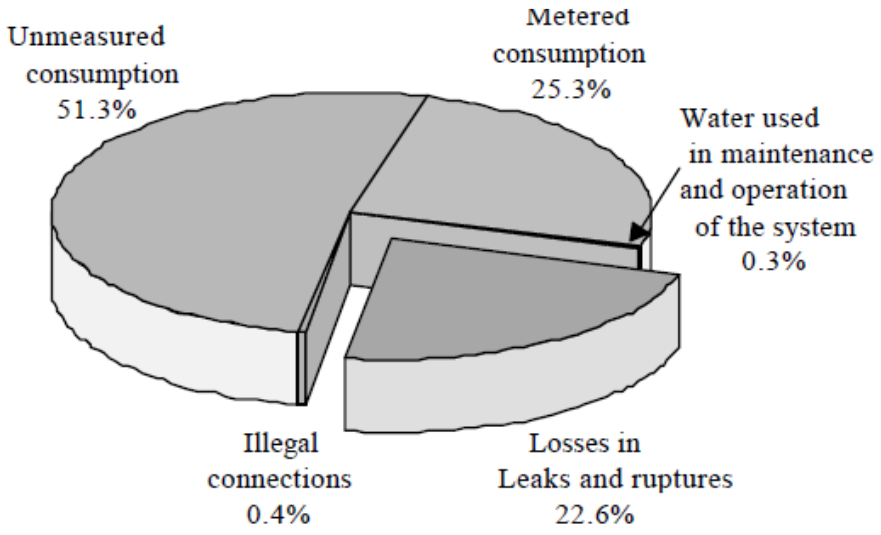

Figure 1.1: Water Volume distribution and loss of fluid in piping system.
(Source: Stafford and Williams, 1996)

1.2 PROBLEM STATEMENT

Pipelines are very important in transporting fluid for many applications and sectors. But due to many reasons, there are many problem arise when this process take place. The Association of Water and Energy Research Malaysia (AWER) expressed concern over findings that an estimated RM1.74 billion in treated water was lost in 2010. This is due to the phenomenon of what is known as non-revenue water (NRW) (www.thesundaily.my). NRW can be defined as the water that has been produced but lost or disappeared before it reaches the customer or the user. Furthermore, a recent media statement from Suruhanjaya Perkhidmatan Air Malaysia (SPAN) shows that the level of NRW in Malaysia for 2010 range from 15% to 55% which is different for every states depending on the amount of the user (www.span.gov.my).

There are many reasons which affect the level of the NRW such as aging factor of the pipe. For example, it is estimated that 40% of 50000km of the pipe networks were laid 40 to 60 years ago or even earlier. Furthermore, the poor maintenance of the pipe networks makes the problem become a huge issue. This is usually cause by the lacked of funding for asset replacement and maintenance which

lead to leaking or any other problems which could increase the level of NRW in Malaysia. All of this problem will grow considerably over the coming years and if there is no action taken, this will be a huge issue to Malaysia.

The specific problem statements are as follow:

- How the leakage in the pipe can be identified
- How the location of the leaks in the pipe can be located.

1.3 OBJECTIVE

This project is basically related to the pipe leakage detection.
The objectives of this project are:

- To build test rig for transient test
- To utilize the signal processing using wavelet and cepstrum analysis
- To identify and locate the leaks in the pipelines

1.4 SCOPE

The scopes of this project are different material is use which is medium density polyethylene (MDPE) and galvanized iron (GI). The second scope is to design the experimental leakage detection test rig. The third scope is to perform the experimental laboratory experiment and measurement. The last scope is to analyze the data collected by using wavelet and cepstrum analysis.