CHAPTER 1
PROJECT BACKGROUND

1.1 Background of Study

Chemicals have the ability to react when exposed to other chemicals or certain physical conditions. The reactive properties of chemicals vary widely and they play a vital role in the production of many chemical, materials, pharmaceutical, and food products we use daily (OSHA, 2010).

Many materials used in industrial facilities can pose chemical reactivity hazards Conventional management systems frequently do not adequately address the unique behavior of materials that may react to cause excessive temperature or pressure excursions or toxic or corrosive emissions (EPA, 2005).

Although accidents attributable to chemical reactivity are less frequent compared to fires and explosions, the consequences are dramatic, destructive, and often injurious to personnel. When working with chemicals, the potential for unwanted, unexpected, and hazardous reactions must always be recognized (Crowl and Louvar, 2001).

There are many mitigation methods that have been develop throughout the year starting from Stull (1974), with his Reaction Hazard Index (RHI): a rating system to establish the relative potential hazards of specific chemicals. Nowadays, there are two powerful tools that are used to identify chemical reactivity hazard: Chemical Reactivity Matrix Chemical and Reactivity Worksheet/Spreadsheet develop by

According to *Quigley et al.,* (2006), those two method have its own individual flaws but if combine the flaws will dramatically minimize. By this combination method, it will be possible to get a more accurate result on the hazards related to chemical reactivity.

1.2 Problem Statement

1.2.1 Problem Identification

A chemical reactivity hazard is a situation with the potential for an uncontrolled chemical reaction that can result directly or indirectly in serious harm to people, property and environment.

Process safety management (PSM) is used to prevent and mitigate chemical reactivity hazards. Under the OSHA's PSM Regulation, 29 CFR 1910.119 requirements, it stated that the need of information on reactivity data (cover under the Process Safety Information (PSI) element).

In PETRONAS, under the PSI element, Chemical Reactivity Matrix (CRM) is a requirement under the section of Hazards and Materials. This proves that CRM is essential to mitigate chemical reactivity hazard.

Chemical Reactivity Matrix is a matrix that consists of:

- Chemicals/materials that are used in a process area
- Result of potential mixing (reaction)
- Explanation on the potential reaction

For constructing the CRM, one of the useful tools is the Chemical Reactivity Hazard System (CRHS) software. This program is use to find out about the reactivity of substances or mixtures of substances (reactivity is the tendency of substances to undergo chemical change). It also produces the suitable hazard code for the chemical reaction that occurs.

It includes:

- a database of reactivity information for common hazardous chemicals;
- a way to virtually "mix" chemicals--like the chemicals in the derailed tank cars above--to find out what dangers could arise from accidental mixing.

The database includes information about the Chemical Abstracts Service Registry number or CAS number, name of the chemical, the formula and also some description about the chemical.

1.2.2 Significance of the project

This project can essential to the industry as the process safety is an integral part of process and development consideration. More and more companies in the industry are getting to realize that chemical reactivity hazards are a major treat not only to the employees, environment but also to the reputation of the companies as it pose major treat and significant loses.

1.3 Objective

The objectives of this study are:

- To develop a stand-alone application able to give prediction of hazards of selected chemical mixture.
- To test the develop application with a real case study from the industry.
- To validate and verify the develop application with other establish tools.

1.4 Scope of Study

The study is mainly to develop software using Visual Basic programming language. The software is able to identify the hazard of the chemicals. This project will be using the database that has been collected from different resources such as material safety data sheet (MSDS), Qualitative Risk Analysis (QRA) Study Input on Material and chemical list. This software will be using the database that has been collected to virtually mix the chemical and identify the reactivity when the chemicals react with each other.