

## Chapter I

### Introduction

The detergent industry has developed very rapidly since the middle of this century by the innovation of a new surfactant based on petrochemicals and is still growing worldwide. Especially in "newly developed" countries, particularly in Asia, there has been a continued high-growth rate in the amount of both production and consumption of soap and detergent.

The main function of detergent is to remove soil which adhered to various kinds of solid substrate, in a simple and safe way. In order to avoid damaging the soiled substrate, it is most advantageous to introduce surfactants into detergents. Therefore, detergents, which have been developed to meet the multiple needs in consideration of the properties of solid surface, the kind of soil and the usage, are classified by their use into laundry detergents, dishwashing detergents, household cleaners, shampoo, etc.

In laundry detergent, by their appearance, they can be divided into powder, liquid and paste. Liquid detergents which is classified by the type of soil and usage, are light duty liquid detergent for the light soil in fabric substrate and heavy duty liquid detergent for heavy soil in fabric substrate.

Heavy duty liquid detergents (HDL) were first introduced in the US market and after 1984 the products very rapidly prevailed in the USA, which amounted to nearly 40% of the total heavy duty detergent market in 1989. [1] Heavy duty liquid detergents can be divided by formulation to non-built formula and built formula. Non-built formula contain a totally soluble builder, citric acid, nitrilo triacetic acid, and maleic acid copolymers which can be easily prepared to stable homogeneous mixture but high cost of raw material used. Built formula which contain a partially soluble builder, sodium tripolyphosphate or zeolite, have some problem concerning the incorporation of a builder into a liquid detergent composition and the ability to form a stable homogeneous mixture. This problem is significantly reduced by the development of formulation and mixing process in the Chemical Engineering knowledge.

Many studies of heavy duty liquid detergent built formula are concentrated on the formulation. Mixing system for preparation of homogeneous this liquid detergent is the major interest of this research work .

The purposes of these experiments were to study the condition or mixing system effecting the preparation of homogeneous heavy duty liquid detergent built formula of Thai patent No. 1137 [2]. Parameters effecting mixing system are as follow.

1. Effect of mixing sequence in incorporating a builder into liquid detergent composition.
2. Effect of impeller types in the preparation of the homogeneous liquid composition
3. Effect of temperature on viscosity of liquid detergent composition.
4. Effect of mixing tank system , comparision of standard tank configuration and Agi-homomixer tank configuration.

The effects of the parameters on the mixing system can be observed directly in the mixing process for the incorporation of liquid detergent composition . The finished product are kept in storage under various conditions and stability odor , color , viscosity and separation are determined at various intervals. Chemical properties , physical properties and performance of liquid detergent mixture of this study were compared with the heavy duty liquid detergent built formula available in the market.