CHAPTER I

INTRODUCTION

1.1 General

Mixing is perhaps the most universal of production systems in the chemical process and allied industrials. It is of vital importance in the mining , food, petroleum, chemicals, pharmaceuticals, pulp and paper, powder industrial and industrial waste treatment. Both heat and mass transfer are greatly influenced by mixing. In fact, mixing is an integral part of all chemical processing. In spite of this, mixing has proved intractable to a rigid theoretical analysis. Thus in comparison with the more theoretically developed chemical engineering operation, mixing is still regarded as something of an art.

The mixing of similar property, fully miscible of liquids in a turbulent flow, such as in a stirred tank, is easily achieved and presents no real difficult even on an industrial scale. A much more difficult problem is when the materials to be mixed have very large density / viscosity differences. The additional effects of buoyancy and viscous forces increase the mixing time much beyond its usual value for similar properties liquids. These mixing problems occur in a variety of industrial, e.g. soft drinks production, master batch mixing of polymer, detergent dilution and blending of gasoline fraction / blending of lubricating oils.

There is very little work reported in the literature where either the theoretical or the experimental aspects of mixing time in blending of different viscosity. A survey of technical literature on this problem have been published, especially about requirement of mixing time in blending of difference viscosity and density, Smith and Schoenmakers (1988), Rielly and Burmester (1994), Ahmad, Latto and Baird (1985), Saito, Arai, and Kamivano (1990), Takahashi, Yokota, Furukawa and Harada (1994) are representative investigated for agitated vessels. However, a detailed analysis indicated that there exists a wide divergence of theories results and conclusion.

In lubricating oil blending process (Figure 1.1); mixing time is very important for obtaining homogeneous lubricating oil solution. The problem in process is that the lubricant additive having high viscosity is rather difficult to dissolve in mineral oil as foaming occurs and a long blending time is needed. So, the rate of homogeneity have, significant, been affected on performance and power consumption in the production of lubricating oil product.

1.2 Lubricating oils

The good quality of lubricating oils are contained basic oils and additives as described below:-

1.2.1 Base oils (Facchians and Vinci, 1990)

Several types of base oils are available for formulating lubricating oils :

- Napthenic low VI (0-50 VI)
- Conventionally refined HVI paraffinic (80-110 VI)
- Hydrotreated HVI paraffinic (80-110 VI)
- Synthetic (100-166 VI)

The high viscosity index associated with paraffinic oils is generally preferred for premium quality industrial gear oil applications because of the tolerance for wide temperature range. Maintenance of a continuos lubricant film is also important to the load carrying capabilities of lubricants and very low viscosity could lead to failures in field service. The desired viscosity can usually be obtained by combining a heavy bright stock with a light neutral oil in the proper ratios. The same additives may show a different response in different base stocks.

Synthetic lubricants are receiving attention where temperature extremes demand a high viscosity index and thermal stability. Principle classes of synthetic lubricants crude 1) Polyolefins, 2) Diesters, 3) Polyglycols, 4) Halogenated hydrocarbons, 5) Phosphate esters, and 6) Silicone type polymers. The polyolefins and esters appear to be receiving the greatest attention for industrial gear applications. The viscosity of the oil must allow the formulation of an adequate protective film under the existing conditions of load, speed and temperature. Low viscosity gear oils are usually chosen for high speed operations where contact periods between teeth or meshing gears are minimal and where loading is light. Heavier oils are suitable to low speed/high load operations where contact periods are longer.

1.2.2 Additives

Lubricant additive is a material which imparts a new of desirable property not originally present in the fluid or reinforces a desirable properties already possessed in some degree by the fluid. Additives used in formulating industrial gear oils can be divided into two general classes : chemically inert additives; i.e. viscosity index improves (VI), pour point depressants, foam inhibitors and demulsifiers. : chemically active additives; i.e. extreme-pressure agents, friction modifiers, oxidation inhibitors and rust inhibitors .

1.3 Objective for this study

The purpose of this work is intended to study in lubricating oils as described below :-

1. To study the influence of mixing conditions on blending of

lubricating oils.

2. To determine the required mixing time.

3. To optimize the mixing conditions for improve process performance or productivity.

1.3.1 Scope of work

1. To study the mixing conditions on standard configuration flat bottom cylindrical tanks. The major interested parameter were.

Diameter of tank : 12, 25, 36 cm.

Type of impeller : Six bladed disc turbine

Diameter of impeller : related with standard configuration tank as below :-

4.0 cm. for 12 cm. of tank diameter

8.3 cm. for 25 cm. of tank diameter

12 cm. for 36 cm. of tank diameter

Position of impeller : 4, 8.3, 12 cm.from bottom of tank

Speed of impeller : 300, 400, 500 rpm

Baffles : without baffles installation

Temperature : 60 ^{o}C

Viscosity of finish lubricating oils @ 100 ^{o}C $\approx$ 12, 14 and 19 cSt.

2. To determine the required mixing time by observing the degree of homogeneity of finished lubricating oils.

3. To evaluate an appropriate mixing conditions for improve process performance and increase the production capacity.

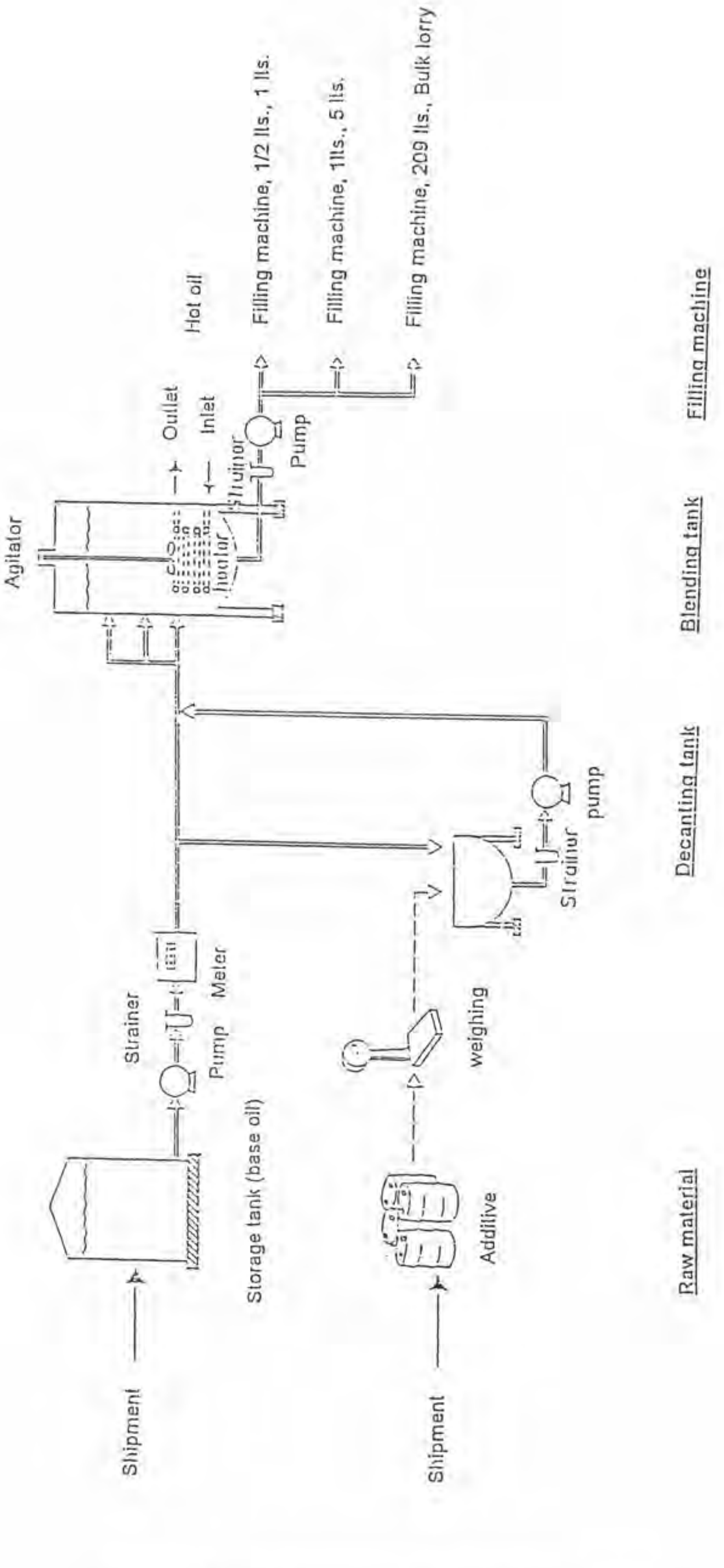

Figure 1.1 Lubricating oil blending process