CHAPTER 1

GENERAL INTRODUCTION

1.1 Introduction

Complicated mixtures of organic compounds are frequently obtained from synthetic processes. Conventional distillation can be employed to produce several fractions consisting primarily of mixtures of azeotropes. Recovery of these materials in a state of usable purity is very difficult. To accomplish the isolation of the desired product different separation processes must be reviewed.

The Sasol Synthol reactors produce a stream known as stabilized light oil (SLO). This SLO, which is currently further processed and finally used as a petrol blending component, contains significant amounts of α-olefins. Several projects are under way to purify said olefins and beneficiate them to potentially more valuable products such as poly-alpha-olefins and alcohols. Although the stream contains various contaminants such as paraffins, branched and internal olefins, oxygenates[1] have been identified as a major contaminant. The most significant of these is the unsymmetrical n-alkyl methyl ketone. Oxygenates are known to cause inferior products and their removal is therefore mandated. Paraffins are usually not so problematic because they only 'dilute' the stream and can be removed easily after the reaction stage.

If a solvent can be identified which is capable of effecting a separation between the olefin and ketone, there is good reason to expect that it will also facilitate the separation of olefins from other classes of oxygenates (Pierotti, 1959:101).

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[1] Hydrocarbons which contain oxygen atoms, such as ketones, alcohols etc.

Due to the highly complicated nature of the SLO as well as the associated analytical difficulties, initial experimental work is not carried out on the actual SLO mixture.

1.2 Scope of this investigation

While several other separation processes are also considered for the SLO, the purpose of this project was to study the potential of azeotropic and extractive distillation methods for the separation of the chosen binary system 1-octene (the C8 α-olefin) and 2-hexanone (the ketone with which it occurs). A thorough review of the literature was performed to gain an understanding of the fundamental principles of solvent action and to identify important solvent properties. Models and correlations were used to produce a list of potential solvents for further tests and the effects of selected solvents on the relative volatility of the chosen binary system were determined using a vapour liquid equilibrium still. A thorough analysis of the data was made to reveal underlying effects and guidelines for identifying effective solvents. Vapour liquid equilibrium data was also measured for some solvents and separation schemes were synthesized to demonstrate the practical application of the results.

The distillation processes studied here are usually much more economic than other options.

Due to the unique nature of the SLO, little research has been done on this type of stream and significant potential is still untapped.

This project will serve to increase the fundamental understanding of enhanced distillation and to acquire essential expertise in the handling of similar problems.