

### *Abstract*

Base lubricating oil is produced from crude oil refining and mixed with a certain amount of additives to improve its properties. This lubricating oil loses its efficiency after using an engine, therefore, it must be replaced with fresh oil. The used oil can't be disposed into the environment because it contains contaminants and metal. The main aim of this study was to recover the base oil from the used oil by using batch solvent extraction followed by adsorption method.

There are many affecting variables that have been examined in the solvent extraction process, such as: solvent/used oil ratio, temperature, mixing speed and the solvent type. A statistical method (central composite design (CCD)) was used in the solvent extraction process in order to study the effect of each variable on the amount of percent sludge removal (Sludge%), as well as, to describe the effect of interaction between these variables, the optimum condition in extraction process were: solvent/ used oil ratio = 2.4 and 3.12 vol/vol, Temperature = 54 and 18 °C and Mixing speed = 569 and 739 rpm for 1-butanol and MEK respectively.

In the clay adsorption process, the variables that have been investigated were clay / extract oil ratio, temperature, contact time and the type of clay. The best conditions in the adsorption process were: Clay/ extract oil ratio = 15 wt/vol%, Temperature = 120 °C and Contact time = 90 and 120 minutes for bentonite and attapulgite, respectively.

Finally, all tests were measured for recovering base oil to compare it with the Iraqi standard base oil type 60 Stock.