Application of Microwave Heating in the Demulsification of Crude Oil Emulsions

Abstract- In recent times the formation of pre-processing water-in-crude emulsions in petroleum industries has led to some inherent challenges such as the reduction in the efficiency of oil recovery, high cost of operation and corrosion in pipes. Traditional ways of pulverizing the emulsions using heat and chemical approaches have many disadvantageous from both economic and environmental points of view. Microwave irradiation is an efficient method for the demulsification of the water-in-oil (W/O) emulsion, encountered in refinery industries. The microwave technology is a cost-effective way of emulsifying water-in-crude-oil emulsion. Two methods were used for conducting the demulsification performance test, i.e. chemical and microwave. The method of chemical demulsification using octylamine was found to be the best water separation efficiency achieved at 2.5 vol.% Octylamine with (35-65%) W/O emulsion, the separation touched to 90% within 3 days and the greatest oil separation efficiency attained at 2.5 vol.% Octylamine at the same ratio of W/O emulsion, the separation reached 91% within 3 days. The demulsification process efficiency increased by microwave, where the water separation rate reached to (100%) at 4 minutes with (35-65%) W/O emulsion. Light crude oils were used. The fundamental principles of formation, formulation and breaking of O/W emulsions in the microwave heating process were adequately elucidated using some physicochemical characterization techniques This further helps in the development of a cost-effective method of demulsifying the W/O emulsion. Water-in-crude oil emulsions of volume percentage ranges, i.e. (25-75%) and (35-65%) were adopted.

Keywords- Crude oil; demulsification; chemical; W/O emulsion