8. Treatment of Emulsified Oil Wastewater Combined CPI Module and Packed Bed Bi-Polar Electrolytic Process

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As the demand for crude oil and oil product increases, various oil pollution accidents occur during processing and handling the oil and its derivatives, hence making the environment more vulnerable to them. Emulsified oil wastewater, in particular, is relatively hard to treat because of its electrolytic stability. In general the emulsion is water-stable electrochemically in the presence of emulsifier so that the air-floating methods used in the treatment of free or dispersed oils and gravitational oil-water separation techniques such as Corrugated Plate Interceptor and Parallel Plate Interceptor developed by American Petroleum Institute do not appear to be efficient in its treatment.

This study was carried out to design a process for efficient treatment of an emulsified oil wastewater and to determine optimal operation conditions of the treatment process. To accomplish there tasks, a combined system of CPI and bi-polar electrolysis was employed to remove free and dispersed oils, and then to electrochemically remove the emulsified oils.

The removal efficiency of free and dispersed oils was diminished as clearance of the CPI module increased. The optimum clearance was 6 mm and limit velocity was determined as 0.67 ℓ/min. The treatment efficiency was also diminished in accordance with an decrease of the module angle. The maximum angle to be used was 45 degrees when a clearance of 6 mm and flow rate 0.26 ℓ/min was employed. The break point was determined on the basis of electrolysis effects in batch reactor with packed bed bi-polar electrolytic system. This point could be used as an optimum condition in designing the electrolytic process. There was little difference in the electrolysis treatment efficiency showed depending on the kinds of anodes. However, the packed bed electrolysis system was a better efficiency than the non-packed bed. Emulsified oil wastewater removal efficiency decreased as clearance of electrodes increased in the packed bed electrolysis system. Here, the optimum clearance is 55 mm. Under a defined condition of conductivity and current density, the emulsion treatment efficiency was logistically decreased as concentration of the emulsified oil and the influent flow rate of the emulsified oil increased in the treatment system.

This study will contribute to the development of economical electrolytic treatment system of emulsified oil wastewater that utilizes inexpensive packing media.

Key Words : CPI, emulsified oil, oil wastewater treatment, electrochemical, DSA, electrolysis, packed bed bi-polar electrolysis