

University of Baghdad	
Department	Chemical Engineering
Full Name	Jaafar Jabbar Madlool
Thesis Title	Water Treatment of Main Outfall Drain for Injection in Nasiriyah Oil Field
Year	2014
Abstract	<p>The aim of the present work is to produce water appropriate for injection in Nasiriyah oil field from Main Outfall Drain (MOD). The experimental work in this research consists from three stages (1) coagulation/ flocculation, (2) natural gravity water filter or microfiltration membrane (MF) and (3) nanofiltration membrane (NF) technology. The first stage, coagulation/flocculation process removed the suspended solids from MOD and reduced the turbidity to the demand limits. The variables studied were initial turbidity (11.8 – 100 NTU), coagulant dosage (0 – 55 ppm), speed of the slow mixing step in the jar test apparatus (2nd step) (20 – 40 rpm), time of 2nd step (20 – 40 min), and settling time (10 – 50 min).</p> <p>Turbidity increases by increasing initial turbidity and decreases by increasing the coagulant dosage, speed and time of 2nd step and settling time until reaching the optimum for them at the minimum turbidity, then any increasing of the coagulant dosage, speed and time of 2nd step will increase the turbidity, while any increasing of settling time will do no effect on turbidity. The optimum dosage for alum was 35, 40 and 50 ppm. While, for ferric chloride it was 15, 20 and 30 ppm and for polyelectrolyte 4, 8 and 10 ppm for 11.8, 30 and 100 NTU initial turbidity respectively. The optimum speed of 2nd step was 25 rpm for each of alum (35 ppm), ferric chloride (15 ppm) and polyelectrolyte (4 ppm). While the optimum time of 2nd step was 30 min for each of alum (35 ppm), ferric chloride (15 ppm) and polyelectrolyte (4 ppm) and settling time was 30 min for each of alum (35 ppm), ferric chloride (15 ppm) and polyelectrolyte (4 ppm).</p> <p>The second stage, natural gravity water filter or microfiltration MF was used to ensure that the particle size was in the demand limits (less than 10 μm) and reduce the turbidity and the total suspended solids (TSS) to the demand limits (5 NTU and 3 – 3.5 mg/l). It was found that turbidity and TSS increases by increasing the inlet turbidity and TSS and the results were arranged progressively as the following: Natural gravity water filter \rightarrow 5 μm MF \rightarrow 1 μm MF.</p> <p>The final stage, nanofiltration NF membrane technology was used to remove sulphate from MOD. The variables studied were feed concentration (1800 – 9630 mg/l) and operating temperature (27 – 37 $^{\circ}\text{C}$). Also concentrate recirculation was used to obtain high recovery percentage of water can be injected. It was found that product flow rate increases by increasing temperature and decreases by increasing salts concentration in feed. Also it was found that salts concentration in product increases by increasing feed concentration and temperature. Rejection percentages were (94.475 – 95.631 %), (88.088 – 90.714 %), (83.33 – 93.2 %), (85.116 – 92.727 %) and (65.385 –</p>

	<p>72.727%)for sulphate, total hardness (TH), Ca^{2+}, Mg^{2+} respectively and recovery percentage of product water was(11.429 – 38.143 %)for polyamide membrane (TFC) case of concentrate recirculation, feed concentration, pe concentration and volume of permeate increases with increasing in operating time and 12.69 liter of water valid for injection in oil field was recovered from 25 liter feed after 180 minute.</p>
--	---

