ABSTRACT

A Study on the Characteristics, Pollution Prevention and Control Processes of Produced Water

Roopnarine Mungal

This thesis deals with an investigation of current treatment and control processes in operation throughout Petrotrin's producing fields, followed by setting up and implementing an environmental monitoring programme to identify and quantify the major contaminants in the produced waters. The programme was designed so that data could be used for determination of impact on the environment, assist in pollution abatement technology selection and meaningful setting of regulatory standards.

An environmental monitoring programme was implemented at seventeen effluent discharge site to monitor the contaminant levels in the effluent waters and at points upstream and downstream of the points of discharge in the waterway waters. Parameters studied on a monthly basis included pH, temperature, total suspended solids, salinity, dissolved oxygen, mineral oil and grease and sulphide

content. Parameters studied quarterly included nutrients, polynuclear aromatic hydrocarbons (PAH's), trace heavy metals and chemical oxygen demand (COD).

Detailed analysis of the produced water indicated that measurable oil and grease contents were in the free, emulsified and dissolved form. The levels of dissolved oil and grease in the effluents at most of the installations were substantial. For example, ten (10) installations showed levels above 200 mg/L, while three (3) had levels between 100 - 200 mg/L. The remaining four (4) sites have levels below 100 mg/L. The implication of these results is that it is impossible for most of the current treatment and control processes to meet regulatory discharge limits that recommend a maximum average of 50 mg/L based on oil and grease. Further research revealed that substantial reduction of the oil and grease contents in the effluent can be achieved by secondary treatment processes (chemical addition followed by induced air/gas flotation - IGF) giving up to 93 % reduction and tertiary processes (activated carbon and air stripping) giving reductions up to 42 %. Three approaches for setting standards for the discharge of produced water for the island's unique environment were evaluated and presented. A management plan for produced water generated in Petrotrin operations is also presented in this thesis.

Keywords: Roopnarine Mungal; produced water; monitoring programme and management plan.