Characterization and removal of phenolic compounds from condensate-oil refinery wastewater

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\textbf{ABSTRACT}

Phenols are present in discharge effluents of many heavy industries such as refineries. The refinery at Emirates National Oil Company (ENOC), UAE, processes condensate oil and produces wastewater that is treated at the refinery wastewater treatment plant (ENOC-RWTP). Characterization of phenol level at ENOC-RWTP and assessment of the effectiveness of employed pollution control technologies in reducing phenol level at the treatment plant have been conducted in this study. It was found that the main sources of total phenols in the received waste streams at ENOC-RWTP are the tank water drain (average 11.8 mg/l), the desalter effluent (average 1.4 mg/l), and the neutralized spent caustic (average 234 mg/l) waste streams. However, there are large fluctuations from the average phenol level within each waste stream. Also, the level of total phenols and its derivatives (substituted phenols) in these streams vary significantly with straight phenol, combined m- and p-cresols, o-cresol, tri- and tetra-chlorophenols and to a lesser extent 4-chloro-3-methylphenol are common among these streams. The study further showed that the sequencing batch reactor system employed at the plant was effective in the removal of total phenols from the waste streams, with an average removal efficiency of about 98%. Meanwhile, the employed activated carbon bed has an additional removal capacity in reducing the level of total phenols to the regulatory discharge limit, with an average removal efficiency of 30%. It was further found that statistically significant relationships exist between the level of total phenols in the discharged treated effluent and the levels of the chemical oxygen demand, biochemical oxygen demand, and sulfides.

\textbf{Keywords:} Phenolic compounds; Oil refinery; Wastewater; SBR; Pollution; Removal; Characterization

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