

Impact of Treated Industrial Effluents on Yanbu (Red Sea) Coral Reef and the Coral Recovery in Port Barrier Reef

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The Royal Commission of Yanbu (Saudi Arabia) tried to set up an example to industrialists in the field of pollution control by establishing a respected enforcement and monitoring program; with five areas of concern (air quality, water quality, solid and hazardous waste management, industrial waste water quality and conservation areas management). A natural protection to King Fahd Industrial Port of Yanbu from strong tidal action is contributed by the Port Barrier Reef, whose structure can easily be altered by chemical or thermal pollution. The major role of the monitoring of the coastal ecosystem is the protection of the Yanbu corals from the effluents from three petro-chemical plants, six oil refineries and municipal sewage. All the effluents are pumped into the IWTP through a single inlet. The effluents collected at the common inlet and the treated effluent collected daily from the output were analyzed for 21 chemical parameters to detect their possible violation of Royal Commission (RC) pollution standards. The treated effluents from the industrial waste treatment plant (IWTP) at Yanbu are discharged into Red Sea, along with the industrial cooling water of 10 C higher than ambient level, through a common discharge canal. The last two-years investigation had revealed the high degree of efficiency of IWTP with percentage reduction in chemical concentrations of the following magnitude: Sulfide (43), sulfate (88), Reactive phosphate (88), oil (7), Phenol (18), BOD (11), COD (14), TSS (12), NH₄ (21), Co (59), Cu (31), Fe (18), Mn (70), Zn (39). But few violations of pollutant levels were also detected at the IWTP outlet with the following frequency of occurrence for TSS (3.2%), BOD (1.1%), TDS (21.3%), Sulfide (14%), Sulfate (19%), COD (5%), Oil (3%), Phenol (11%), NH₄ (16%), Fe (0.6%), Zn (0.6%). The concentration of nitrate and nitrites increased considerably in the treated effluent, but were below the pollution limit. The chemical characteristics of the pollutants in the coastal waters in the vicinity of the outfall channel had shown violations for TSS, PO₄ and for the trace metals (Cu, Pb, Co, Cd, Ni, Mn & Zn). The enrichment of PO₄ in the coastal water was attributed to the release of PO₄ from the re-suspended fine sediments from the shipping channel, which were deposited during its construction phase. The impact of excessive sediment and phosphate load on the reduction of coral recruitment and live coral coverage, excessive growth of filamentous algae, changes in population diversity of coral reef fishes such as butterflyfishes and damsel fishes were also highlighted. By the stringent pollution regulatory measures of RC, the coral reefs in the region had shown some signs of improvement, but they are still in an unstable state.