

Electrochemical denitrification of shrimp-farm wastewater

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Shrimp-farms are one such fast growing industries. This sector spreads over the coastal belt of North Western province of Sri Lanka contributing to national economy by 2000 million SLR annually. However, wastewater originating from shrimp farms contains excessive amount of nitrate and phosphorous those are becoming a crucial issue for human health, environment and the yield of shrimp farms itself. Currently, there are no proper practices to treat the wastewater arising from shrimp farm industry in Sri Lanka. In this study, the feasibility of developing an electrochemical method to remove nitrate from the shrimp-farm wastewater was studied. The Taguchi method was designed to investigate the effect of controlling parameters such as pH, retention time, current and surface area of electrodes on the removal of nitrate using graphite (C) electrodes with KCl salt bridge. The shrimp-farm wastewater samples collected from sixteen ponds were characterized and treated by applying Taguchi method. The nitrate concentration in the wastewater and the treated water was measured using UV spectrophotometer. The nitrate removal efficiency of nitrate was calculated and analyzed using MINITAB statistical software 18.0 version. Results indicated that the maximum (95 %) nitrate removal efficiency was obtained when the retention time was kept as 2 hours and the pH, current and surface area, about 10, 450 mA at 22.4 V, and 10 cm² respectively. Based on the statistical analysis, the nitrate removal efficiency was highly depend on the controlling factor current and pH. The graphite electrodes were used to remove nitrate due to its simplicity and ability to easy renewing surface for electron exchange for electrochemical oxidation and reduction processes. Thus, the electrochemical method could be an alternative potential method to remove nitrate from the wastewater arising from shrimp farms.

Key Words: Electrochemical method, graphite, Nitrate, shrimp farm wastewater, Taguchi method.