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Catalytic Performance of Cow-Dung Sludge in Water Treatment Mitigation & Conversion of Ammonia Nitrogen into Nitrate

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Introduction: Ammonia pollution in water has become a significant concern for environmentalists, chemists, and biologists due to the health hazards. There is a necessity for an appropriate technology that can accelerate nitrification by which ammonia nitrogen can be converted to stable compound/s such that its adverse effects could be neutralized. Mere aeration in wastewater to stabilize biological oxygen demand (BOD) and nitrification takes an extended time [1,2].

Materials and methods: Cow dung sludge (composted) was used to treat wastewater to evaluate ammonia-nitrogen mitigation. Municipally Treated Sewage Effluent (MTSE) samples were put in one-litre beakers/ jars having an initial ammonia nitrogen content of 34.78 mg/L. Ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen, along with other parameters, were tested after the 2nd, 4th, 6th, and 8th day of the experiment when treated with 0.0 g/L (Control Sample); 1 g/L, 5 g/L (cow-dung) respectively.

Results and discussion: It is reported depletion of ammonia-nitrogen to about 0.00 mg/L ammonia (NH_3) as N after 6 - 8 days. Ammonia-nitrogen (NH_3) transformed to 17.8, 0.18, 0.09 mg/L nitrite as-N on 8th day. It was converted to 21.8, 110.1, and 133.5 mg/L nitrate as-NO_3, respectively, after 8 days of treatment. The Jar Test apparatus reported the results at 35 rounds per minute (RPM) and a temperature of 32°C.

Conclusion: On the basis of the experimental studies, the addition of the cow dung sludge slurry and a few additional modifications in the existing infrastructure of the conventional sewage treatment plant have been proposed to give better final effluent quality free from ammonia and nitrite pollution. The proposed design of a modified sewage treatment plant working on the activated sludge process is shown in the figure below. Here, Hydraulic Retention Time (HRT) in the Flocculator chamber with RPM 35 is recommended as eight days for the biological oxidation of ammonia nitrogen (NH_3-N into Nitrate (NO_3).

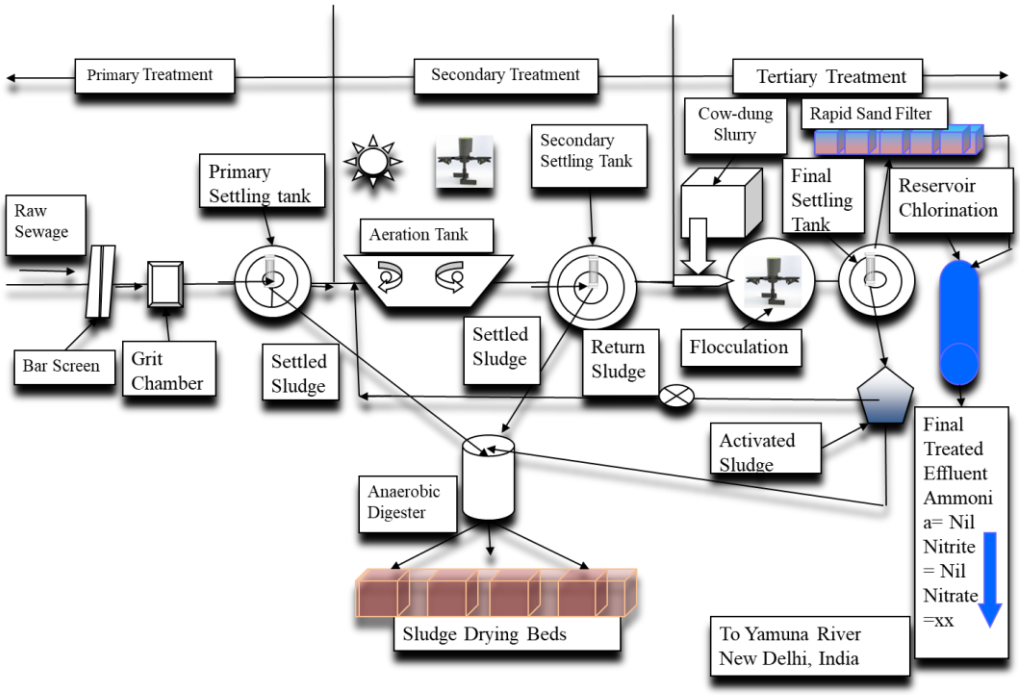

Figure: Proposed sewage treatment design for Activated Sludge Process with Tertiary Treatment Units

References

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