



**BUSITEMA
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Pursuing Excellence

**DESIGNING A TYPICAL ACTIVATED SLUDGE PROCESS
PLANT FOR TREATMENT OF DYE HOUSE EFFLUENT: A
CASE STUDY OF RIVATEX LIMITED**

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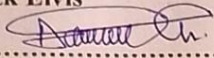
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This final year project report is presented to the department of polymer textile and industrial engineering as a partial requirement for the award of a bachelor of science in Polymer textile and industrial engineering

DECLARATION

We Damba Enock Elvis, Kuloba Samuel and Bisaso Patrick, declare that this research is entirely our own and it has not been submitted to this university or any other organization for funding or as a partial fulfillment of any award for a degree from another university.

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ACKNOWLEDGEMENT

We wish to convey my profound gratitude to the supreme God for endowing us with resilience, intellect and tenacity throughout the course of this research endeavor. The divine guidance we have received has served as an unwavering source of fortitude.

We appreciate our parents and relatives for their steadfast support and encouragement throughout the rigorous phases of our academic pursuit, their love being a crucial motivator.

We are deeply thankful to our dear friends for their companionship and encouragement, which have significantly inspired our scholarly efforts.

Special recognition is given to our esteemed supervisors, Dr. Janani, Mr. Dan and Mr. Joram whose mentorship has been pivotal in guiding this research

We acknowledge the contributions of all individuals involved in the realization of this research proposal, as their support has been essential, for which we are immensely grateful.

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ABSTRACT

This study provides the design of a typical activated sludge process plant meant to treat Rivatex Limited's dye house effluent, a Kenyan textile manufacturing plant. The textile industry, economically significant as it is, has a high risk to the environment due to the discharge of untreated wastewater with toxic pollutants in the form of synthetic dyes. This study fulfills the urgent need for effective solutions for the treatment of wastewater to prevent the environmental and health impacts of dye effluents.

The study begins with a detailed characterization of the effluent, which is found to have extremely high Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), and excessive alkalinity. The study applies Response Surface Methodology (RSM) to identify optimal operational conditions for the activated sludge process, i.e., pH, temperature, and retention time, which significantly enhance the dye degradation and turbidity removal.

The outcomes indicate that at optimal conditions (pH 10.69, temperature 36.33°C, and retention time 7.64 hours), the treatment system offers significant removals of BOD (from 250 to 45 mg/L), COD (from 850 to 297 mg/L), and turbidity (from 508 NTU to 140 NTU). The recycle ratio was found to be 25.5%, i.e., Return Activated Sludge (RAS) to influent flow rate, as crucial to develop a stable microbial community in the bioreactor. Furthermore, Sludge Volume Index (SVI) was found to be 66.67 mL/g, indicating good settleability of sludge. A low SVI is essential to ensure the successful separation of treated water from sludge so that the treatment plant can function optimally.

This research not only provides a viable design for an activated sludge treatment plant but also emphasizes the importance of environmentally friendly wastewater management techniques in the textile sector to align with environmental norms to safeguard public health.

Key words: Textile wastewater treatment, Activated sludge process, Response Surface Methodology, Effluent characterization, Sludge Volume Index, Central Composite Design.

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