TOWARDS ZERO DISCHARGE of Palm Oil Mill Effluent

Editors
Norhaniza Yusof
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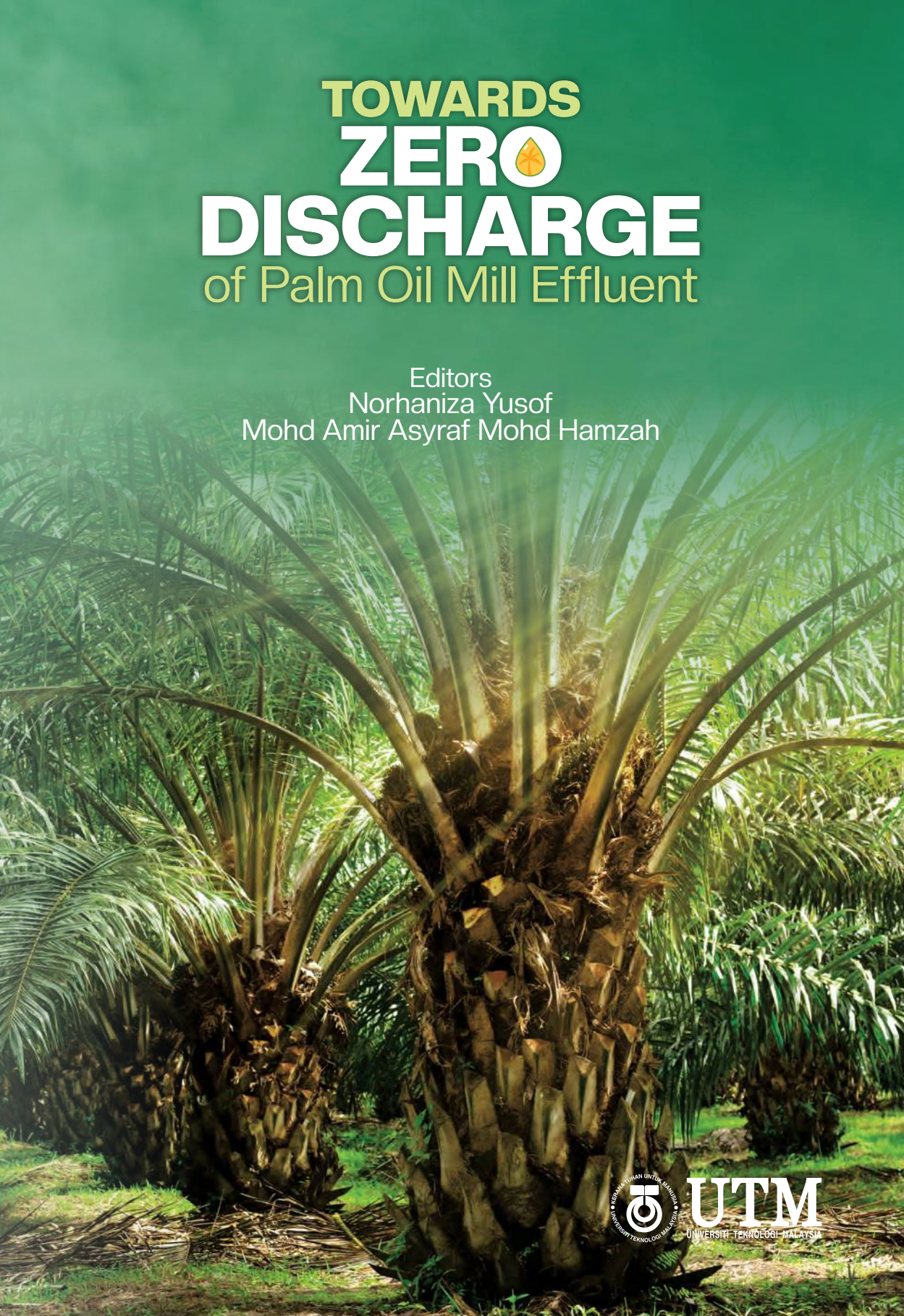

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Palm oil mill effluent (POME) is a highly polluting by-product generated from the processing of palm oil. It contains a significant amount of organic and inorganic matter, making it a major environmental concern due to its high biochemical oxygen demand (BOD) and chemical oxygen demand (COD). The untreated discharge of POME can lead to severe water pollution, soil contamination, and greenhouse gas emissions, posing risks to both the environment and human health. As Malaysia is among the 193 member states who adopting Sustainable Development Agenda, the treatment strategy of POME should not be to limit the contamination level but to adopt various innovating strategies to recapture, reuse and recycle the POME into various usable products, creating a circular economy from POME, ending up with zero discharge of POME and achieving clean water and sanitation (SDG6).

Current POME treatment methods, such as anaerobic digestion and aerobic processes, are necessity to reduce organic load but fail to achieve the aim of zero discharge. Advanced technologies like membrane filtration, advanced oxidation processes and hybrids of biological and physical/chemical treatment systems offer promising solutions. Membrane bioreactor technology is among the promising solutions offering compact setup, shorter hydraulic time and ease of operation. Microbial fuel cells (MFCs) harness microorganisms to generate electricity while treating POME, effectively lowering BOD and COD levels.

Waste-to-wealth initiatives are transforming POME into valuable products. Anaerobic digestion not only produces biogas but also nutrient-rich biofertilizer. POME can also be processed into animal feed, reducing reliance on conventional feedstocks. Additionally, POME can be used to produce adsorbents for water treatment, biopolymers for biodegradable plastics, industrial enzymes, bio-oil, and pyroligneous acid through pyrolysis.

These advancements support sustainability and a circular economy by minimizing waste, reducing environmental impact, and creating economic opportunities. The use of renewable energy and valuable by-products from POME helps lower greenhouse gas emissions and decreases reliance on fossil fuels.

In conclusion, integrating advanced treatment technologies and waste-to-wealth approaches can achieve zero discharge in POME treatment, promoting environmental sustainability and resource recovery in the palm oil industry. Ongoing research and development are essential to enhance these solutions' efficiency and feasibility, contributing to a more sustainable and circular economy.

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PREFACE

Welcome to *Towards Zero Discharge of Palm Oil Mill Effluent*, a book dedicated to tackling one of the most pressing environmental challenges of our time. Palm oil mill effluent (POME) is a highly polluting by-product of palm oil processing, rich in organic and inorganic matter, which leads to high biochemical oxygen demand (BOD) and chemical oxygen demand (COD). Left untreated, POME can severely degrade water and soil quality, harm the aquatic life, and contribute significantly to greenhouse gas emissions.

Traditional POME treatment methods, such as anaerobic digestion and aerobic processes, reduce the organic load but often fall short of achieving zero discharge. This book delves into advanced technologies i.e. membrane technologies that offer promising solutions. Membrane distillation (MD) employs hydrophobic membranes to separate water from contaminants, facilitating nearly complete water recovery and pollution reduction. MFCs, on the other hand, leverage microorganisms to generate electricity while treating POME, effectively lowering BOD and COD levels.

Furthermore, this book explores the transformative potential of waste-to-wealth initiatives. By harnessing anaerobic digestion, we not only produce biogas but also create nutrient-rich biofertiliser. POME can be processed into animal feed, reducing reliance on conventional feedstocks, and can be used to produce adsorbents for water treatment, biopolymers for biodegradable plastics, industrial enzymes, bio-oil, and pyroligneous acid through pyrolysis.

These advancements support sustainability and a circular economy by minimizing waste, reducing environmental impact, and creating economic opportunities. Utilising renewable energy and valuable by-

products from POME helps lower greenhouse gas emissions and reduces our dependence on fossil fuels.

In this book, you will find comprehensive insights into integrating advanced treatment technologies and waste-to-wealth approaches to achieve zero discharge in POME treatment. Whether you are a student, researcher, industry professional, or policymaker, this book offers invaluable knowledge and practical strategies to enhance environmental sustainability and resource recovery in the palm oil industry.

Join us on this journey towards a more sustainable, efficient, and responsible future in manufacturing. Let *Towards Zero Discharge of Palm Oil Mill Effluent* be your guide and companion as you work to shape a better world through innovative and sustainable practices.

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