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FAJAR MARENDRA

GREEN ENERGY CIRCULATION:

THE ROLE OF ANAEROBIC DIGESTION IN A CIRCULAR ECONOMY

Green Energy Circulation: The Role of Anaerobic Digestion in a Circular Economy

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FOREWORD

Gratitude and praise we offer to the Almighty God, for His boundless mercy and blessings, which have enabled the completion of this book, "Green Energy Circulation: The Role of Anaerobic Digestion in a Circular Economy."

Climate change, the energy crisis, and the accumulation of waste represent the monumental challenges of our century. In this context, the circular economy approach and green technology innovations, such as anaerobic digestion, offer tangible opportunities to create a more sustainable world. This book is presented as a contribution to enriching both academic and practical understanding of how biogas, a product of organic waste processing, can become a crucial pillar in the transition towards a circular economy.

It is hoped that the writing of this book will provide a comprehensive overview of the basic concepts, current technologies, environmental and economic benefits, as well as the challenges and future prospects of biogas development.

I would like to extend my deepest gratitude to all parties who have supported the compilation of this book, including colleagues, practitioners, and academics who have been a constant source of inspiration. May this book serve as a beneficial reference for students, researchers, renewable energy practitioners, and anyone concerned with the sustainability of our planet.

Bogor, April 2025

The Author

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Amidst environmental crises, soaring waste levels, and global dependence on fossil fuels, this book emerges as a significant contribution to redefining the path of sustainable development. Green Energy Circulation provides a comprehensive discussion on how Anaerobic Digestion (AD) technology can serve as a strategic solution for advancing the circular economy and transitioning towards a cleaner, more efficient energy system.

Employing a scientific yet accessible approach, the author outlines the fundamental principles of the circular economy, the biochemical mechanisms of the anaerobic process, the potential of biogas and biofertilizer, and how AD technology can transform organic waste into high-value resources. Furthermore, the book presents global case studies from countries like Germany, Sweden, India, and Brazil, which have successfully implemented AD on a massive scale.

The author emphasizes the critical importance of integrating the latest technologies such as the Internet of Things (IoT), artificial intelligence (AI), and circularity-based business models as keys to the successful implementation of AD, from household to industrial scales. Critical issues such as regulatory challenges, financing, public education, and cross-sector collaboration are also discussed in depth.

This book is highly relevant for students, researchers, policymakers, environmental activists, and renewable energy practitioners. With a reflective yet data-driven presentation style, this book not only offers theoretical insights but also provides a practical roadmap for building a resilient and inclusive circular energy ecosystem for the future.

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