INDUSTRIAL SOLID WASTES

A D Patwardhan

The Energy and Resources Institute

INDUSTRIAL
SOLID WASTES

INDUSTRIAL SOLID WASTES

A D Patwardhan

The Energy and Resources Institute

ISBN 978-81-7993-502-6

Suggested citation
Patwardhan A. D. 2013. *Industrial Solid Wastes*. New Delhi: TERI

Published by
The Energy and Resources Institute (TERI)
TERI Press
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi – 110 003

Tel. 2468 2100 or 4150 4900
Fax 2468 2144 or 2468 2145
India +91 • Delhi (0) 11
E-mail teripress@teri.res.in
Web www.teriin.org

Printed in India

Foreword

I have known Dr A D Patwardhan for over four decades. He is an outstanding researcher, teacher, and practising engineer. I attended a few of his lectures at various places across India, particularly at NEERI (CSIR), Nagpur. It has always been a pleasure to listen to his expositions. He has designed several wastewater treatment plants in India and, therefore, his immense experience in design aspects of environmental engineering systems is reflected in this book. Dr Patwardhan's teachings are rational and always accompanied by practical applications.

Dr Patwardhan's present book on solid waste management in the Indian context is a welcome addition. There are few books on this topic available in the Indian market and I am sure that this book will be a boon to students, teachers, researchers, and practising engineers. I would like to add that the present book is a companion to his earlier book, *Industrial Wastewater Treatment*, which has received an overwhelming response from all stakeholders in India.

Dr Patwardhan has arranged all sections in the present book scientifically, covering the entire gambit of solid waste management. He has referred to varied references, particularly from conferences, symposia, seminars, handbooks, and manuals on environmental waste management. In addition, he has also listed some books for further reading for the benefit of the readers. He has amply illustrated the treatment and disposal of all types of solid wastes in this book.

In short, the author's comprehensive work will be immensely useful to students, researchers, and practising engineers involved in the study of industrial solid wastes.

I strongly recommend this book to all stakeholders and I am sure that it will be a joyful read to all as it was for me.

S N Kaul
Director, Academics, Mulshi Group of Institutes, Pune
Former Acting Director, NEERI (CSIR) Nagpur
Principal, MIT College of Engineering, Pune

Preface

Solid wastes in the form of sludges, unused raw materials, unreacted chemical agents, packing materials, dead animals from the quality control sections of the pharmaceutical industry, agricultural residues, fruit peelings and rinds from the food processing industry, paunch manure, hooves, bones, horns, and feathers from the meat processing industry, fly ash and bottom ash from thermal power stations, spent fuel from nuclear power stations, de-oiled cakes from edible and inedible oil processors, cotton dust from the textile industry, suint and lanolin from wool scouring, bagasse, rejected beet and lime mud from sugar mills, mine wastes and extraction of ferrous and non-ferrous metals from ores are some of the highly polluting products of modern industries. Although construction and demolition of buildings have added significantly to the problem of handling, treatment, and disposal of building materials from demolished structures, there is great scope for recovery and reuse of recyclable materials from demolished structures. Effective application of the three R's (reuse, recycle, and recover) will help the fourth R (reduce) the exploitation of our limited natural resources—air, water, and soil. An added benefit is the reduction of environmental pollution.

This book is an attempt to place before the reader various methods used by scientists and engineers in achieving the goal of clean production with minimum damage to the environment. I have referred to a number of periodicals, proceedings of conferences, symposia, seminars, training courses, handbooks and manuals on water and wastewater treatment, and other sources of information. I have acknowledged all of them.

It is hoped that this reference book will be found useful by engineers, consultants, scientists, and teaching faculties of educational institutes concerned with the subject of environmental pollution control. All suggestions to improve the quality of the book are welcome.

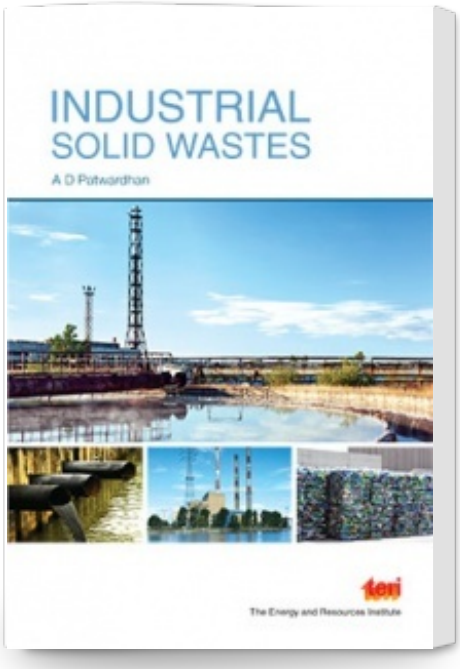
Acknowledgements

I sincerely thank The Synthetic and Art Silk Mills' Research Association (SASMIRA), Mumbai, for providing useful information on silk wastes. I am also thankful to Shri Kunal Golwalkar, Consultant, for providing information on plasma technology and to M/s Reva Enviro Control Systems, Nagpur, for permission to use data on bagasse utilization for gas production.

Special mention must be made of Dr D R Ranade, Acting Director, and his colleagues at the Agharkar Research Institute (ARI), Pune, for permitting me to use their library facility and providing with useful reading materials.

I am grateful to my family members for their patience and understanding during the preparation of the manuscript. My colleagues and friends at the Veermata Jijabai Technological Institute (VJTI), Mumbai, encouraged me to complete this book. Special thanks to all of them.

Industrial Solid Wastes



Publisher : TERI Press ISBN : 9788179935026 Author : A D Patwardhan