

## Entrepreneur India

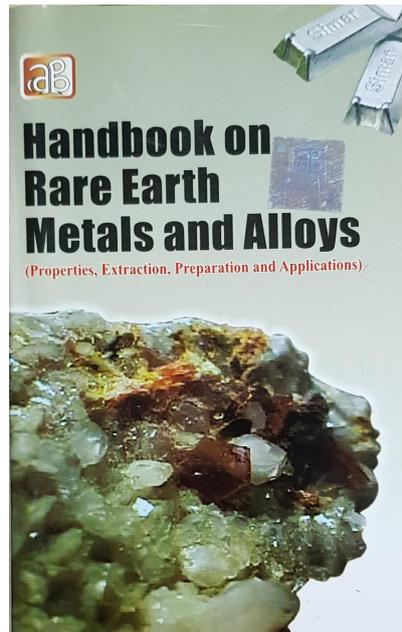
106-E, Kamla Nagar, New Delhi-110007, India.

Tel: 91-11-23843955, +91 9097075054

Mobile: +91-9097075054

Email: npcs.ei@gmail.com, info@entrepreneurindia.co

Website: www.entrepreneurIndia.co



## Handbook on Recycling and Disposal of Hospital Waste Municipal Solid Waste Biomedical Waste Plastic Waste

<b>Code</b>	NI313
<b>Format</b>	paperback
<b>Indian Price</b>	₹1275
<b>US Price</b>	\$125
<b>Pages</b>	544
<b>ISBN</b>	9789381039878
<b>Publisher</b>	NIIR PROJECT CONSULTANCY SERVICES

### Description

## Handbook on Recycling and Disposal of

- Hospital Waste
- Municipal Solid Waste
- Biomedical Waste
- Plastic Waste

(Also Known as Medical, Municipal and Plastic Waste Management Handbook)

Waste can be almost anything, including food, leaves, newspapers, bottles, construction debris, and chemicals from a factory, candy wrappers, disposable diapers, old cars, or radioactive materials. People have always produced waste, but as industry and technology have evolved and the human population has grown, waste management has become increasingly complex. Waste recycling involves the collection of waste materials and the separation and clean-up of those materials. Recycling waste means that fewer new products and consumables need to be produced, saving raw materials and reducing energy consumption.

Waste reduction and recycling are very important elements of the local waste management framework. They help both to conserve natural resources and to reduce demand for valuable landfill space. The waste recycling services has become the one of the fastest growing industry. The growth of the waste recycling services is driven by the technology development for waste recycling.

The waste management market is expected to be worth US\$ 13.62 billion by 2025. Indian municipal solid waste (MSW) management market is expected to grow at a CAGR of 7.14% by 2025. India has planned to achieve a capacity of 2.9 million hospital beds by 2025 which will help bio medical waste management market to grow at a CAGR of 8.41%.

The concern for bio medical waste management has been felt globally with the rise in infectious diseases and indiscriminate disposal of waste. It is to be understood that management of bio medical waste is an integral part of health care. There is a clear need for the current approach of waste disposal in India that is focussed on municipalities and uses high energy/high technology, to move more towards waste processing and waste recycling (that involves public private partnerships, aiming for eventual waste minimization driven at the community level, and using low energy/low technology resources).

This book basically deals with characterization of Medical Waste, Medical Waste Data

Collection Activities, Medical Waste Treatment Effectiveness, Gas Sterilization, Municipal Solid Waste, Bio-Medical Waste, Hospital Waste Incineration, Production, Use, and Disposal of Plastics and Plastic Products, Medical Waste Reuse, Recycling and Reduction, Disposal on Land, municipal and plastic waste management, Plastic Waste, incineration and number of recycling methods.

The book is highly recommended to new entrepreneurs, existing units who wants to get more information of Waste Disposal & Recycling.

## Content

### 1. Characterization of Medical Waste

#### 1. INTRODUCTION AND OVERVIEW

#### 2. MEDICAL WASTE GENERATION

Methodology

Summary of Preliminary Results

#### 3. MEDICAL WASTE DATA COLLECTION ACTIVITIES

Transporter Notification

Results

Transporter Periodic Reports

On-Site Incinerators

### 2. Medical Waste Treatment Effectiveness

#### 1. INCINERATION

Factors Affecting Effectiveness

Medical Waste Treatment Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

#### 2. STEAM STERILIZATION

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

#### 3. GAS STERILIZATION

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

#### 4. CHEMICAL DISINFECTION

Factors Affecting Effectiveness

Quality assurance and Quality Control Procedures

Maintenance and Operator Training

## 5. THERMAL INACTIVATION

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

## 6. IRRADIATION

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

## 7. MICROWAVE TREATMENT

Factors Impacting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

## 8. GRINDING AND SHREDDING

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

## 9. COMPACTION

Factors Affecting Effectiveness

Quality Assurance and Quality Control Procedures

Maintenance and Operator Training

## 3. Medical Waste Handling Methods

### 1. INTRODUCTION

### 2. CURRENT PRACTICES

Handling and packaging practices

For Off-Site Incineration

Medical Waste Handling Materials

For Landfill Disposal

For On-site Treatment or Disposal

For Sewer and Ocean Disposal

### 3. STANDARDS IMPLEMENTED BY THE RULE

Segregation

Packaging

Labeling

Marking

Storage

Transport

## 4. EVOLVING HANDLING AND MANAGEMENT TECHNIQUES 19

Handling

Compaction

## 5. METHODS TO EVALUATE MEDICAL WASTE HANDLING

### 4. Medical Waste Reuse, Recycling and Reduction

1. RECYCLING AND REUSE
2. SOURCE REDUCTION
3. GENERATION RATES
4. AGENCY ACTION
5. Infectious Waste Characterization
  1. DEFINITION OF INFECTIOUS WASTE
  2. TYPES OF INFECTIOUS WASTE
    1. Isolation Wastes
    2. Cultures and Stocks of Infectious Agents and Associated Biologicals
    3. Human Blood and Blood Products
    4. Pathological Wastes
    5. Contaminated Sharps
    6. Contaminated Animal Carcasses, Body Parts, and Bedding
  3. MISCELLANEOUS CONTAMINATED WASTES - (OPTIONAL CATEGORY)
    6. Infectious Waste Management
      1. INTRODUCTION
      2. SELECTION OF WASTE MANAGEMENT OPTIONS
      3. INFECTIOUS WASTE MANAGEMENT PLAN
        1. Designation of Infectious Waste
        2. Segregation of Infectious Waste
        3. Packaging of Infectious Waste
        4. Storage of Infectious Waste
        5. Transport of Infectious Waste (on- and off-site)
        6. Treatment of Infectious Waste
        7. Disposal of Treated Wastes
        8. Contingency Planning
        9. Staff Training
      7. Treatment of Infectious Waste
        1. INTRODUCTION
        1. Monitoring
        2. Steam Sterilization
        3. Incineration
        4. Thermal inactivation
        5. Gas/Vapour Sterilization
        6. Chemical Disinfection
        7. Sterilization by Irradiation
        8. Other Treatment Methods
    8. Medical Waste
      1. CYTOTOXIC CHEMICALS
      2. HAZARDOUS CHEMICALS
      3. PATHOGENS

#### 4. TOXIC METALS

#### 5. RADIOACTIVE MATERIALS

#### 9. Hospital Incineration Systems

##### 1. INTRODUCTION

##### 2. FUNDAMENTAL CONCEPTS RELATED TO HOSPITAL WASTE INCINERATION

###### 1. Chemical Reactions

###### 2. Stoichiometric Combustion Air

###### 3. Thermochemical Relations

###### 4. Volumetric Gas Flows

###### 5. The Combustion Process

##### 3. HOSPITAL WASTE CHARACTERISTICS

##### 4. TYPES OF HOSPITAL WASTE INCINERATOR SYSTEMS

###### 1. Introduction

###### 2. Multiple-chamber incinerators

###### 1. Principle of Combustion and Air Distribution

###### 2. Mode of Operation

###### 3. Waste Feed Charging Systems

###### 4. Ash Removal Systems

###### 5. Use of Multiple-Chamber Incinerators for Incinerating Hospital Wastes

###### 3. Controlled-Air Incinerators

###### 1. Principle of Controlled Air Incineration

###### 2. Batch/Controlled-Air incinerators

###### 3. Intermittent-Duty, Controlled Air Incinerators

###### 4. Continuous-Duty, Controlled Air incinerators

###### 4. Rotary Kilns

###### 1. Principle of Operation

###### 2. Mode of Operation

###### 3. Charging System

###### 4. Ash Removal

###### 5. Auxilliary Equipment

###### 1. Waste Heat Boilers

###### 2. Auxiliary Waste Liquid Infection

#### 10. Bio-Medical Waste

##### 1. INTRODUCTION

###### 1. Linkage of Bio-medical Waste Management with Municipal Waste Management

##### 2. ASSESSMENT OF CURRENT SITUATION

###### 1. Waste Generation

###### (i) Health Care Establishments

###### (ii). Whole Town/City

###### 2. Current Practices

###### 3. Allocation of Responsibilities

### 3. BASIC ISSUES

1. Management Issues of Bio-medical Waste Management
2. Current Issues in Management of Health Care Waste

### 4. LEGAL ASPECTS AND ENVIRONMENTAL CONCERN

1. Bio-medical Waste (Management and Handling) Rules, 1998  
Scope and application of the Rules

Environmental Concern

### 5. WASTE IDENTIFICATION AND WASTE CONTROL PROGRAM FOR THE HEALTH CARE ESTABLISHMENTS

1. Identification of Various Components of the Waste Generated
2. An Exercise in Waste Control Programme

### 6. WASTE STORAGE

1. Recommended Labelling and Colour Coding
2. Segregated Storage in Separate Containers (at the Point of Generation)
3. Certification

### 4. COMMON/INTERMEDIATE STORAGE AREA

5. Parking Lot for Collection Vehicles

### 7. HANDLING AND TRANSPORTATION

1. Collection of Waste Inside the Hospital/Health Care Establishment
2. Transportation of Segregated Waste Inside the Premises
3. Collection and Transportation of Waste for Small Units
4. Transportation of Waste Outside

### 8. WASTE TREATMENT AND DISPOSAL : THE RULES AND THE AVAILABLE OPTIONS

Transportation of Waste Outside

1. Incineration
2. Autoclave Treatment
3. Hydroclave Treatment
4. Microwave Treatment
5. Chemical Disinfection
6. Sanitary and Secured Landfilling
7. General Waste

### 9. COMMON TREATMENT/DISPOSAL FACILITY

1. Establishment of the Facility
2. Tie Up of Health Care Set Ups
3. Private Sector Participation

### 10. OPERATION AND MAINTENANCE

### 11. OCCUPATIONAL HAZARDS AND SAFETY MEASURES

1. Occupational Hazards
2. Safety Measures for the Medical and Para-medical Staff
3. Safety Measures for Cleaning and Transportation Staff

### 12. FINANCIAL ASPECTS

### 13. TRAINING AND MOTIVATION

#### 1. Training Modules for Different Levels of Staff

(i) Medical and laboratory personnel:

(ii) Para-medical personnel:

(iii) Sweepers, cleaning staff, guards etc.:

(iv) Administrative and management staff:

#### 2. Incentives and Motivation

#### 3. Awareness Generation

### 14. PLANNING ELEMENTS

#### 1. Planning Inside the Health Care Establishment Premises

#### 2. Planning Outside the Health Care Establishment

#### 3. Relation to Overall Town Planning

#### 4. Examples

### 15. MANAGEMENT ASPECTS

#### 1. Organisational Set Up 104

#### 2. Administration and Managerial Aspects 105

### 16. ANIMAL WASTE 105

#### 11. Air Pollution Control

#### 1. INTRODUCTION 108

#### 2. POLLUTANT FORMATION AND GENERATION 108

#### 3. CONTROL STRATEGIES 109

#### 1. Controlling Feed Material

#### 2. Combustion Control 111

#### 3. Add-On Air Pollution Control Systems

#### 1. Wet Scrubbers

#### 2. Fabric Filters

#### 3. Dry Scrubbers

#### 12. Waste Minimization Options

Description of Techniques

Better Operating Practices

Chemotherapy and Antineoplastic Wastes

Formaldehyde Wastes

Instal Reverse Osmosis (RO) Water Supply Equipment

Determine Minimum Effective Cleaning Procedures

Reuse/Recycle Waste Solutions

Proper Waste Management

Photographic Chemical Waste

Store Materials Properly

Recycle Spoiled Photographic Film and Paper

Test Expired Material for Usefulness

Extend Processing Bath Life

Use Squeegees  
Use Countercurrent Washing  
Recover Silver and Recycle Spent Chemicals  
Radionuclides  
Solvents  
Material Substitution  
Improved Laboratory Techniques  
Recycle Solvents  
Mercury  
Electronic Sensing Devices  
Proper Spill Clean Up  
Recycle/Reuse  
Waste Anesthetic Gases  
Toxics, Corrosives, and Miscellaneous Chemicals  
Ethylene Oxide  
Use of Recyclable Drums  
Proper Material Handling  
Material Substitution

### 13. Vermiculturing

#### 1. INTRODUCTION

#### 2. INTRODUCTION TO VERMICOMPOSTING

Reduction of particle size

Vermicomposting

Different stages and methods

#### 3. THE INORA PROCESS

The biological means

Selection of biological methods

Bisanitization or accelerated aerobiosis

The biogas plants

The earthworm

#### 4. ASSESSMENT

Environmental assessment

Water

Gases

Pollutants

Aesthetics

Financial assessment

#### 5. QUALITY AND STABILITY FACTORS IN COMPOSTING

Introduction

Appropriate standards

Raw versus composted waste

Identification

## 5. CONCLUSION

## 14. Municipal waste water treatment and energy recovery

### 1. INTRODUCTION

### 2. THE GANGA ACTION PLAN

### 3. INDO-DUTCH ENVIRONMENTAL PROJECT

### INTEGRATED APPROACH

### UASB SYSTEM -A CLEAN TECHNOLOGY

Advantages of UASB over traditional aerobic processes

Technical aspects

Energy recovery from municipal sewage

Technology options for municipal waste water treatment

Case-studies

5 mld UASB treatment plant at Kanpur

Energy savings and biogas generation

Conclusions

Recommendations

14 mld UASB treatment plant at Mirzapur

Energy recovery

Financial aspects

## 15. Principles of Municipal Solid Waste Management

### 1. INTRODUCTION

Solid Waste Generation

Environmental Impact of Solid Waste Disposal on Land

Objective of Solid Waste Management

### 2. PRINCIPLES OF MUNICIPAL SOLID WASTE MANAGEMENT

Waste Reduction

Effective Management of Solid Waste

Functional Elements of Municipal Solid Waste Management

### 3. HIERARCHY OF WASTE MANAGEMENT OPTIONS

### 4. WASTE MINIMISATION

### 5. RESOURCE RECOVERY THROUGH MATERIAL RECYCLING

Sorting at Source

Centralised Sorting

Sorting Prior to Waste Processing or Landfilling

### 6. RESOURCE RECOVERY THROUGH WASTE PROCESSING

Biological Processes

Thermal Processes

Other Processes

### 7. WASTE TRANSFORMATION (WITHOUT RESOURCE RECOVERY) PRIOR TO DISPOSAL

Mechanical Transformation

Thermal Transformation

Other Methods

8. DISPOSAL ON LAND

9. COMPONENTS OF MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM

10. LINKAGES BETWEEN MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM AND OTHER TYPES OF WASTES GENERATED IN AN URBAN CENTRE

11. MATERIALS FLOW CHART FOR MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM (1000 t.p.d. WASTE GENERATION)

16. Composition and Quantity of Solid Waste

1. INTRODUCTION

Terminology and Classification

Variations in Composition and Characteristics

2. DEFINITIONS AND CLASSIFICATION OF SOLID WASTES

Definitions

(i) Domestic/Residential Waste:

(ii) Municipal Waste:

(iii) Commercial Waste:

(iv) Institutional Waste:

(v) Garbage:

(vi) Rubbish:

(vii) Ashes:

(viii) Bulky Wastes:

(ix) Street Sweeping:

(x) Dead Animals:

(xi) Construction and Demolition Wastes:

(xii) Industrial Wastes:

(xiii) Hazardous Wastes:

(xiv) Sewage Wastes:

Classification

3. COMPOSITION, CHARACTERISTICS AND QUANTITIES

Need for Analysis

Field Investigations

Number of Samples to be Collected

Collection of Samples of Solid Waste

Composition and Characteristics

Characteristics of Municipal Solid Waste in Indian Urban Centres

Per Capita Quantity of Municipal Solid Waste in Indian Urban Centres

Estimation of Future Per Capita Waste Quantity

Relation between Gross National Product (GNP) and Municipal Solid Waste Generation

Rate of Increase liased on Experience in Other Cities

Seasonal Variations

## Physical Characteristics

### Density

### Bulk Density Measurement

1. Material and apparatus:
2. Moisture Content
3. Size of Waste Constituents
4. Calorific Value

## Chemical Characteristics

### Classification

- (i) Lipids:
- (ii) Carbohydrates:
- (iii) Proteins:
- (iv) Natural Fibres:
- (v) Synthetic Organic Materials (Plastic):
- (vi) Non-combustibles:

## 4. CONCLUSION

### 17. Slaughter House Waste and Dead Animals

#### 1. INTRODUCTION

#### 2. MAGNITUDE OF THE PROBLEM

#### 3. CLASSIFICATION

#### 4. OPERATIONS DURING SLAUGHTERING OF ANIMALS

##### Present Scenario

##### Slaughtering

##### Bleeding

##### Dressing

##### Evisceration

#### 5. MEASURES PROPOSED TO IMPROVE THE SLAUGHTER HOUSE WASTE MANAGEMENT

##### Liquid Waste/Effluent

##### Collection of Blood

##### Improved Method of Dressing

##### Evisceration

##### Safe Disposal of Waste Products

##### Odours Control

##### Modernisation of Slaughter House

##### Curbing Activities of Illegal Slaughtering of Animals

##### Provision of Dry Rendering Plants

## 6. CONCLUSION

### 18. Industrial Solid Waste

#### 1. INTRODUCTION

#### 2. THE PROBLEMS

### 3. INDUSTRIAL SOLID WASTE

#### 4. DESCRIPTION OF IMPORTANT INDUSTRIAL SOLID WASTE

Coal Ash

Integrated Iron & Steel Plant Slag

Phosphogypsum

Red Mud

Lime Mud

Waste Sludge and Residues

Potential Reuse of Solid Wastes

#### 5. WASTE MANAGEMENT APPROACH

Prevention-A Waste Minimisation Approach

Inventory Management and Improved Operations

Waste Management at Source

#### 6. AREA OF APPLICATION OF SOME IMPORTANT INDUSTRIAL WASTES

#### 7. CURRENT PRACTICE OF INDUSTRIAL SOLID WASTE MANAGEMENT

Collection and Transport of Wastes

Storage & Transportation

Disposal of Industrial Solid Waste

#### 8. HEALTH CONSEQUENCES OF POOR INDUSTRIAL WASTE DISPOSAL

#### 9. COLLECTION, STORAGE TREATMENT & DISPOSAL OF WASTES

Waste Segregation

Collection, Storage and Transport

Combined Treatment Facilities

Disposal Methods

Landfills?

(i) Definitions

Why landfills?

Design:

#### 10. CASE STUDIES

Construction:

Closure & Post Closure:

Incineration

Manifest System

Post Treatment

Back-transport

Monitoring

Record Keeping

#### 11. LEGISLATION FOR MANAGEMENT OF HAZARDOUS WASTE AND CATEGORISATION OF HAZARDOUS WASTE

#### 11. HANDLING OF HAZARDOUS CHEMICALS

#### 12. INDUSTRIAL LOCATION

## 13. MANAGEMENT OF INDUSTRIAL SOLID WASTES COORDINATION (SPCBs & LOCAL BODIES)

### 19. Emerging Processing Technologies

#### 1. INTRODUCTION

#### 2. VERMICOMPOSTING

#### 3. BIOGAS FROM MUNICIPAL SOLID WASTES

#### 4. CONVERSION OF SOLID WASTES TO PROTEIN

#### 5. ALCOHOL FERMENTATION 259

#### 6. PYROLYSIS

#### Plasma Arc Technology/Plasma Pyrolysis Vitrification (PPV)

#### 7. REFUSE DERIVED FUEL

#### 8. HYDROPULPING

#### 9. SLURRY CARB PROCESS

#### 10. TREATMENT FOR RECOVERY OF USEFUL PRODUCTS

#### 11. SUMMARY

### 20. Wastewater and Its Collection

#### 1. ECOSYSTEM APPROACH TO POLLUTION CONTROL

##### Food Chains and Webs

##### Accumulation of Substances in Food Chains and Webs

##### Accumulation of Pollutants in Waterbodies

##### Species Diversity and Ecosystem Stability

##### Nature of Pollutants

##### Effects of Pollutants

##### Control of Pollutants

#### 2. WASTE WATER CHARACTERISTICS

##### Municipal Wastewater

##### Industrial Wastewater

##### Fluctuations In Flow and Composition

#### 3. TYPES OF WASTES AND APPLICABLE RULES

#### 4. PLANNING FOR WASTEWATER COLLECTION

##### Introduction

##### Data Requirements and Surveys

##### On-Site and Off-Site Disposal Systems

##### Sewer Discharge Standards

##### Proportion of Industrial and Domestic Wastes

##### Potential Health Benefits

##### New Approaches in Sewerage System Design

### 21. Principles of Reactor Design

#### 1. REACTION ORDER

#### 2. FLOW PATTERNS OF REACTORS

##### Batch Reactors

Ideal Plug Flow

Ideal Completely Mixed Flow

3. ESTIMATION OF DISPERSION NUMBER, D/UL

Use of Tracer Tests

Use of Empirical Equations

Cells in Series Parallel Arrangements

4. EFFECT OF SHOCK LOADS

5. ESTIMATION OF WASTEWATER TEMPERATURE IN LARGE REACTORS

6. FACTORS AFFECTING CHOICE OF REACTORS

Nature of the Waste

Process Optimization

Other Factors

22. Principles of Biological Treatment

1. MICROBIAL GROWTH RATES

2. TREATMENT KINETICS

3. HANDLING OF SOLIDS

4. SLUDGE AGE AND HYDRAULIC RETENTION TIME

5. FOOD/MICROORGANISMS RATIO

6. BUILD UP OF SOLIDS IN SYSTEM

7. SUBSTRATE REMOVAL EFFICIENCY

8. TEMPERATURE EFFECTS

9. ESTIMATION OF FINAL EFFLUENT BOD

10. OXYGEN REQUIREMENTS

For Facultative and Flow-through Units

For Flow-through Systems with Recycling

11. NUTRIENT REQUIREMENTS

12. PHOSPHORUS REMOVAL

13. NITROGEN REMOVAL

14. CHOICE OF SLUDGE AGE

23. Mechanically Aerated Lagoons

1. TYPES OF AERATED LAGOONS

Facultative Aerated Lagoons

Aerobic Flow-through Lagoons

Aerobic Lagoons with Recycling of Solids

2. DESIGN OF FACULTATIVE AERATED LAGOONS

Substrate Removal Rate

Lagoon Mixing Conditions and Efficiency

Lagoon Depth

Solids in Suspension and Power Level

Oxygenation and Power Level

Anaerobic Activity In Facultative Lagoons

Performance

Sludge Accumulation

### 3. DESIGN OF AEROBIC FLOW-THROUGH TYPE LAGOONS

Substrate Removal and Solids Concentration

Detention Time

Solids Concentration

Final Effluent BOD

Oxygen Requirements

Aeration Power and Power Level

### 4. DESIGN OF DUAL-POWERED AERATED LAGOONS

Design Basis

Retention Time

Performance Power Requirement

Sludge Accumulation

### 5. DESIGN OF AEROBIC LAGOONS WITH RECYCLING OF SOLIDS (EXTENDED AERATION LAGOONS)

### 6. CHOICE OF COMBINATIONS AND LAYOUTS OF UASBs, AERATED LAGOONS AND ALGAL PONDS

### 7. OPTIMIZATION TRIALS

### 8. CONSTRUCTION FEATURES

### 24. Power Generation Based on Distillery Spentwash

INTRODUCTION

THE BIOPAQ TECHNOLOGY

Pre-acidification/buffer tank

Sludge disposal

Biogas handling

CASE-STUDY

NEW DEVELOPMENT

Power generation scheme

CONCLUSION

### 25. Production, Use, and Disposal of Plastics and Plastic Products

#### 1. SUMMARY OF KEY FINDINGS

#### 2. TECHNOLOGICAL OVERVIEW

Manufacturing Resins

Incorporating Additives

#### 3. PRODUCTION AND CONSUMPTION STATISTICS

Historical Overview

Domestic Production of Plastics

Import/Export and Domestic Consumption

Economic Profile of the Plastics Industry

Sector Characteristics

Market Conditions and Prices for Commodity Resins

Characteristics of Major Resin Types

Characteristics of Major Additive Types

#### 4. MAJOR END USE MARKETS FOR PLASTICS

Packaging

Building and Construction

Consumer and Institutional Products

Electrical and Electronics

Furniture and Furnishings

Transportation

Adhesives, Inks, and Coatings

#### 5. DISPOSITION OF PLASTICS INTO THE SOLID WASTE STREAM

Plastics in Municipal Solid Waste

Plastics in Building and Construction Wastes

Plastics in Automobile Salvage Residue

Plastics in Litter

5 Plastics in Marine Debris.

26. Impacts of Post-consumer Plastics Waste on the Management of Municipal Solid waste

#### SUMMARY OF KEY FINDINGS

Landfilling

Management Issues

Incineration

Management Issues

Environmental Releases

Litter

#### LANDFILLING

Management Issues

Landfill Capacity

Landfill Integrity

Other Management Issues

Environmental Releases

Leaching of Plastic Polymers

Leaching of Plastics Additives

#### INCINERATION

Introduction

Number, Capacity, and Types of Incinerators

Combustion Properties of Plastics

Plastics Combustion and Pollution Control

Incinerator Management Issues

Excessive Flame Temperature

Products of Incomplete Combustion (PICs)

Formation of Slag

Formation of Corrosive Gases

3 Environment Release

Emissions from MSW Incinerators

Plastics Contribution to Incinerator Ash

LITTER

Background

Analysis of Relative impacts of Plastic and other Litter

27. The Potential for Divertable Plastic Waste

1. SCENARIO DEVELOPMENT

1 Scenario 1

2 Scenario 2

3 Scenario 3

4 Scenario 4

5 Scenario 5

2. ESTIMATED QUANTITIES OF DPW

1. Scenario 1

2. Scenario 2

3. Scenario 3

4. Scenario 4

5. Scenario 5

3. SUMMARY

28. Objectives and Action Items

OBJECTIVES FOR IMPROVING MUNICIPAL SOLID WASTE MANAGEMENT

Source Reduction

ACTION ITEMS:

ACTION ITEMS:

OBJECTIVE 1: EVALUATE POTENTIAL FOR MINIMIZING PACKAGING

ACTION ITEMS:

OBJECTIVE 2: EDUCATION AND OUTREACH ON SOURCE REDUCTION

ACTION ITEMS:

RECYCLING

ACTION ITEMS:

Improving Recyclability of the Waste Stream

Collection/Separation

Processing

Marketing

Public Education

Landfilling and Incineration

OBJECTIVE 1: FURTHER EVALUATE ADDITIVES

ACTION ITEM:

OBJECTIVE 2: MONITOR PVC USE

ACTION ITEMS:

OBJECTIVE 3: IMPROVE DISPOSAL OPTIONS

ACTION ITEMS:

OBJECTIVES FOR HANDLING PROBLEMS OUTSIDE THE MSW MANAGEMENT SYSTEM

Wastewater Treatment Systems/Combined Sewer overflows/Stormwater Drainage Systems

Wastewater Treatment Systems

ACTION ITEM:

Combined Sewer Overflows

ACTION ITEMS:

Storm water Discharges

ACTION ITEMS:

Other Sources of Marine Debris

Vessels

OBJECTIVE 1: IMPLEMENT ANNEX V OF MARPOL

ACTION ITEMS:

OBJECTIVE 2: REDUCE IMPACT OF FISHING GEAR

ACTION ITEM:

Plastic Manufacturers, Processors, and Transporters

ACTION ITEMS:

Garbage Barges

ACTION ITEM:

Land- and Sea-Originated Litter

OBJECTIVE 1: SUPPORT LITTER RETRIEVAL AND CHARACTERIZATION

ACTION ITEMS:

OBJECTIVE 2: SUPPORT LITTER PREVENTION

ACTION ITEMS:

Degradable Plastics

ACTION ITEMS:

29. Recent Legislative and Regulatory Actions

LOCAL AND STATE ACTIONS

FEDERAL ACTIONS

IMPLICATIONS FOR PLASTICS RECYCLING

## About Niir

NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are: Pre-

feasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of Plant and Machinery, Manufacturing Process and/or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes various technology books, directories, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists, and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureaus, consultants and consultancy firms as one of the inputs in their research.