

Contents

<i>Preface</i>	<i>iii</i>
Chapter 1 IMPACT OF MAN ON THE ENVIRONMENT: AN OVERVIEW	1
The Biosphere	1
The Hydrologic Cycle	3
The Nutrient Cycles	4
Consequences of Population Growth	10
Energy Problem	14
Pollution of Air, Water and Soil	17
Towards a Solution	25
Chapter 2 AIR POLLUTION: SOURCES AND EFFECTS	30
Definition and Concentrations	30
Classification and Properties of Air Pollutants	34
Emission Sources	38
Major Emissions from Global Sources	41
Importance of Anthropogenic Sources	44
Behaviour and Fate of Air Pollutants	46
Photochemical Smog	50
Effects of Air Pollution	55
Health, Vegetation and Materials Damage in India	70
Air Pollution Laws and Standards	71
Chapter 3 METEOROLOGICAL ASPECTS OF AIR POLLUTANT DISPERSION	77
Temperature Lapse Rates and Stability	77
Wind Velocity and Turbulence	85
Plume Behaviour	90
Dispersion of Air Pollutants	94

Solutions to the Atmospheric Dispersion Equation 97
The Gaussian Plume Model 101

Chapter 4 AIR POLLUTION SAMPLING AND MEASUREMENT 122

Types of Pollutant Sampling and Measurement 122
Ambient Air Sampling 122
Collection of Gaseous Air Pollutants 124
Collection of Particulate Pollutants 126
Stack Sampling 132
Analysis of Air Pollutants 142
 Sulphur Dioxide 142
 Nitrogen Oxides 146
 Carbon Monoxide 148
 Oxidants and Ozone 150
 Hydrocarbons 151
 Particulate Matter 152

Chapter 5 AIR POLLUTION CONTROL METHODS AND EQUIPMENT 157

Control Methods 157
Source Correction Methods 157
Cleaning of Gaseous Effluents 159
Particulate Emission Control 160
 Gravitational Settling Chambers 163
 Cyclone Separators 169
 Fabric Filters 175
 Electrostatic Precipitators 182
 Wet Scrubbers 188
 Selection of a Particulate Collector 198
Control of Gaseous Emissions 200
 Absorption by Liquids 200
 Adsorption by Solids 219
 Combustion 229

Chapter 6 CONTROL OF SPECIFIC GASEOUS POLLUTANTS 238

Control of Sulphur Dioxide Emission 238
 Desulphurization of Flue Gases 243
 Dry Methods 243

- ✓Wet Scrubbing Methods 248
- Control of Nitrogen Oxides 257
 - Modification of Operating Conditions 260
 - Modification of Design Conditions 263
- ✓Effluent Gas Treatment Methods 263
- Carbon Monoxide Control 268
- Control of Hydrocarbons 269
- Mobile Sources 270

Chapter 7 SOURCES AND CLASSIFICATION OF WATER POLLUTANTS

- Water Resources 277
- Origin of Wastewater 282
- Types of Water Pollutants and Their Effects 286
 - Oxygen Demanding Wastes 286
 - Disease Causing Agents 298
 - Synthetic Organic Compounds 299
 - Plant Nutrients 302
 - Inorganic Chemicals and Mineral Substances 303
 - Sediments 305
 - Radioactive Substances 305
 - Thermal Discharges 306
 - Oil 307
- Water Pollution Laws and Standards 308

Chapter 8 WASTEWATER SAMPLING AND ANALYSIS

- Sampling 313
- Methods of Analysis 315
- Determination of Organic Matter 315
- Determination of Inorganic Substances 319
- Physical Characteristics 323
- Bacteriological Measurements 325
- Water Quality Standards 328

Chapter 9 WASTEWATER TREATMENT

- Basic Process of Water Treatment 333
- Primary Treatment 334
 - Pretreatment 334

Sedimentation	335
Flotation	347
Secondary (Biological) Treatment	348
Activated Sludge Process	349
Trickling Filters	361
Sludge Treatment and Disposal	363
Advanced Wastewater Treatment	368
Removal of Suspended Solids	368
Removal of Dissolved Solids	370
Nitrogen Removal	380
Phosphorus Removal	383
Advanced Biological Systems	385
Chemical Oxidation	387
Recovery of Materials from Process Effluents	389

Chapter 10 SOLID WASTE MANAGEMENT

Sources and Classification	396
Public Health Aspects	399
Methods of Collection	399
Disposal Methods	402
Potential Methods of Disposal	408

APPENDICES

A.	Conversion Factors and Constants	
B.	Physical Properties of Fluids	418

<i>Notation Index</i>	420
<i>Index</i>	427