POLLUTION TECHNOLOGY REVIEW No. 34

Particulates and Fine Dust Removal

Processes and Equipment

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PARTICULATES AND FINE DUST REMOVAL

Processes and Equipment

Marshall Sittig

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PARTICULATES AND FINE DUST REMOVAL

FOREWORD

Particulates and fine dust created by man's activities contribute significantly to all major aspects of air pollution. While the generation of natural fine dusts is also very large in some parts of the earth, industrially generated, particle-loaded air emissions may push the particulate level to a point where acceptable air quality standards are exceeded continuously.

How to reduce such emissions at the source, and what processes and equipment to use, is the subject of this book, which is based on reports of federally-financed air pollution studies as well as U.S. patents.

The enormity of the problem as a whole is described clearly and succinctly in the comprehensive introduction and every user of this book is urged to read and study this introduction before attacking his own particular aspect of this insidious type of air pollution.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. It provides detailed guidance to the information contained in this book. Bibliographic reference lists follow each of the 28 chapters to give easy access to yet more complete information available elsewhere.

PRACTICAL TECHNIQUES FOR SAVING ENERGY IN THE CHEMICAL, PETROLEUM AND METALS INDUSTRIES 1977

by Marshall Sittig

Energy Technology Review No. 12
Chemical Technology Review No. 90

The above-captioned industries were selected for coverage in this book because they are the three largest consumers of energy in the U.S. economy. They constitute an interacting group: they use many common raw materials and are simultaneously feeding products and by-products to one another.

Practical thinking about industrial energy conservation requires interceptive calculations of such material transfers to produce positive energy savings.

The major conservation approaches are arranged as follows:

1. **Waste Utilization**
2. **Process Integration**
3. **Process Modification**
4. **Design Modification**
5. **Maintenance and Insulation**
6. **Market Modification**

The three major industries are subdivided into 39 individual processing industries. The following discussions and proposals are presented for practically every processing industry:

1. **Process Technology Involved**
2. **Major Energy Conservation Options to 1980**
3. **Goal Year (1980) Energy Use Targets**
4. **Some Projections beyond 1980 to 1990**

INDIVIDUAL PROCESSING INDUSTRIES

Introduction & Analytical Procedures
Metals Industry—General
Steel Industry
Aluminum Industry
Iron Foundries
Copper Industry
Ferroalloys
Non-Ferrous Foundries
Steel Foundries
Other Primary Non-Ferrous Metals
Non-Ferrous Processing Industry
Miscellaneous Metal Products
Secondary Non-Ferrous Smelting and Refining Industry
Primary Zinc Industry
Primary Lead Industry
Chemical and Allied Products
Alkalis and Chlorine
Industrial Gases
Inorganic Pigments
Other Industrial Inorganic Chemicals
Plastic Materials Industry
Synthetic Rubber Industry
Rayon and Cellulose Acetate Industry
Synthetic Fibers Industry
Drug Industry
Soaps, Detergents, & Toiletries
Paint Industries
Gums and Wood Chemicals
Coal Tar Chemicals, Dyes & Pigments
Aliphatic Organic Chemicals
Nitrogen Fertilizer Industry
Phosphate Fertilizer Industry
Fertilizer Mixing Industry
Agricultural Chemicals
Adhesives and Sealants
Explosives and Allied Industries
Printing Inks
Carbon Black
Fatty Acids & Allied Industries
Petroleum & Coal Products

As can be seen from this large and impressive table of contents, entries have been arranged in an encyclopedic manner whenever possible.

To be found at the end of the book is a complete and detailed list of reports and references cited throughout the work. In this list titles are complete with their publishers and other sources of procurement and are never abbreviated.

Under the Energy and Conservation Act, the U.S. Federal Energy Administration was required to set energy conservation targets for the most energy-intensive manufacturing industries. Goals to be attained by Jan. 1, 1980 were established by the end of 1976. Major contributions to the manuscript are acknowledged from the energy target documents, particularly from those on the chemical, petroleum, and metals industries.

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524 pages

HOW TO REMOVE POLLUTANTS AND TOXIC MATERIALS FROM AIR AND WATER A PRACTICAL GUIDE 1977

by Marshall Sittig

Pollution Technology Review No. 32

This book is designed to provide a one volume ready reference for the handling of noxious materials emerging into the air and water as a result of industrial processes or from running machinery of any kind.

The descriptions are based almost entirely on U.S. patents dealing with practical environmental control methods and systems. The book surveys some 500 patents in the 1973 to 1976 period with exhaustive coverage up to November 1st, 1976. Since environmental patents are given priority handling by the U.S. Patent Office, some applications for these patents were filed only in late 1975 and even early 1976. This book therefore contains substantial technical information on very late developments in their field.

This book is addressed to industrialists who must keep abreast of the latest pollution removal techniques, to legislators and public health officials intent upon sensible rules and regulations, to interested conservationists and to those eager students who can foresee permanent and brilliant careers in the fields of pollution abatement and engineering.

Subject entries are in alphabetical sequence. Because of the encyclopedic nature of the book, only those entries which are at the beginning of the alphabet can be shown here without bias.

Introduction

ACETONE CYANOHYDRIN
Removal from Water

ACID MINE WATERS

ACROLEIN PROCESS EFFLUENTS
Removal from Water

ACRYLIC RESIN EMISSIONS
Removal from Water

ACRYLONITRILE EFFLUENTS
Removal from Air
Removal from Water

ADIPIC ACID EFFLUENTS
Removal from Water

ALDEHYDES
Removal from Air or Water
Removal from Water only

ALKALI
Removal from Air

ALKALI CYANIDES
Removal from Air

ALKYL IODIDES
Removal from Air

ALKYLATION PROCESS EFFLUENTS
Removal from Air

ALUMINUM
Removal from Water

ALUMINUM CELL EFFLUENTS
Removal from Air

ALUMINUM CHLORIDE EFFLUENTS
Removal from Air

ALUMINUM ETCHING LIQUORS
Removal from Water

ALUMINUM REFINING EFFLUENTS
Removal from Air

AMINES
see **Foundry Casting Effluents**

AMMONIA
Removal from Water

AMMONIA-SODA EFFLUENTS
Removal from Water

AMMONIA SYNTHESIS EFFLUENTS
Removal from Water

AMMONIUM PHOSPHATE EFFLUENTS
Removal from Air

AMMONIUM SULFATE
Removal from Air

AMMONIUN SULFIDE
Removal from Water

AMMONIUM SULFITE
Removal from Water

ANTIFOULING PAINTS
Disposal of Residues

ASBESTOS
Removal from Air
Removal from Water

ASPHALT VAPORS
Removal from Air

AUTOMOTIVE EXHAUST
Removal from Air

BATTERY CHARGING EFFLUENTS
Removal from Air

ETC.

The book contains a total of 293 subject entries. The subject name refers to the polluting substance and the text underneath each entry tells how to combat pollution by said substance.

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621 pages

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INTRODUCTION

Particulate removal, conventionally called dust collection, involves the removal of coarse and fine particles from an airstream (1). Although generally limited to that required for controlling plant-generated air emissions, particulate control equipment also has wide application for air cleaning and filtration inside the plant, as well as for recovery of usable products (primarily in processing industries).

In 1974, the Environmental Protection Agency set a total suspended particulate standard of 75 micrograms per cubic meter as a primary standard for the protection of public health. A secondary standard of 60 micrograms per cubic meter was established as necessary to protect the public welfare.

Actual measurements at background sites have consistently shown counts of about 35 micrograms per cubic meter. Measurements at national monitoring sites run very close to the tolerance level of 75 micrograms per cubic meter. In fact, even dust from unpaved roads in rural, basically nonindustrial, parts of the country (fugitive dust) may push the particulate level to the point where further industrial development is banned. Thus an understanding of all particulates, as well as of industrial contributions, is vital both to human health and industrial growth.

As pointed out by Vincent J. Schaefer, the scientist who first developed cloud seeding as a rain-making technique, the invisible particles in the atmosphere constitute a serious threat to human health. Many such small particles which are inspirated and reach the lungs remain there. Unlike water pollution, the sources of which can generally be identified easily, the small particles in polluted air are controlled hardly at all by gravitational forces. Once they enter the atmosphere, their residence time is likely to range from a month to several years.

The suspended atmospheric particles are of four general types. The first are the light ions produced in the air by cosmic rays and radioactivity. They consist of small aggregates of molecules having dimensions up to a few molecular diameters. The second important type of particle consists of the so-called "Aitken nuclei."