Energy Efficient Industrial Technology in Europe and Japan

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ENERGY EFFICIENT INDUSTRIAL TECHNOLOGY IN EUROPE AND JAPAN

by

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ENERGY EFFICIENT INDUSTRIAL TECHNOLOGY IN EUROPE AND JAPAN

Foreword

This book describes energy efficient industrial technology currently in use in Europe and Japan.

Energy prices in Europe and Japan, particularly natural gas prices, have exceeded those in the U.S. for many years. These higher energy costs create a demand for energy efficient industrial equipment. Information on this equipment has previously been available only in bits and pieces. This book is an effort to collect information on these technologies in one reference.

The technologies described constitute most of the advanced, gas-related technologies available to European and Japanese industry. Some of the technologies are unique and some are currently available in the U.S.

The book contains three parts. Part I, European Technology, concentrates on equipment in use in West Germany, France, and the United Kingdom. Part II, Japanese Technology, stresses equipment used in the Japanese aluminum, steel, and cement industries. Part III, Selected Technologies—In-Depth Studies, describes those technologies considered to have potential for widespread use.

A short overview of each general technological category, as well as a brief statement of the U.S. position in the field, precedes detailed descriptions of specific technologies. Information provided for each technology includes, where available, the developer or manufacturer, application or use, features, principles of operation, energy-saving performance, operating data, cost data, schematic diagrams, and patenting and licensing status.

The information in the book is from the following documents:

> *Energy Efficient Industrial Technology in Europe: A Compendium,* prepared by A.G. Fassbender and M.J.

McGee of Battelle, Pacific Northwest Laboratories for Gas Research Institute, August 1982.

Energy Efficient Industrial Technology in Japan: A Compendium, prepared by A.G. Fassbender, Y. Yanase, and M.J. McGee of Battelle, Pacific Northwest Laboratories for Gas Research Institute, August 1982.

Selected Energy Efficient Industrial Technology in Europe and Japan, prepared by A.G. Fassbender of Battelle, Pacific Northwest Laboratories for Gas Research Institute, January 1983.

The table of contents is organized in such a way as to serve as a subject index and provides easy access to the information contained in the book.

Disclaimer

Other Noyes Publications

COGENERATION TECHNOLOGY AND ECONOMICS FOR THE PROCESS INDUSTRIES

Edited by D.J. De Renzo

Energy Technology Review No. 81

This book assesses the potential for industrial cogeneration development in the immediate future, for the process industries. Available technology and economics are discussed, and the details of case studies in five major energy-intensive industries–textiles, chemicals, pulp and paper, petroleum refining, and food–are presented. The case studies involve plants actually using cogeneration, as well as projected sites for this energy-saving technology. The book is based on research by *Resource Planning Associates, Inc.; Jack Faucett Associates; TRW, Inc.; Arthur D. Little Inc.; Westinghouse Electric Corp.;* and *Gibbs & Hill Inc.*

Cogeneration is the sequential production of electric or mechanical power and useful thermal energy. Much has been written and said about the energy-saving potential of co-locating facilities which generate electric power with facilities which consume large quantities of low-grade heat. Co-location of such facilities allows the by-product heat from electricity generation, which has traditionally been "thrown away," to be used productively. Properly designed and operated cogeneration facilities could, thus, save large amounts of fuel and capital.

Listed below is a condensed table of contents including **part and chapter titles.**

ISBN 0-8155-0932-4 (1983) **395 pages**

Other Noyes Publications

ELECTROSTATIC PRECIPITATOR MANUAL

by

Jack R. McDonald **Alan H. Dean**

Southern Research Institute

Pollution Technology Review No. 91

This manual covers the fundamentals of electrostatic precipitation (ESP); mechanical and electrical components of electrostatic precipitators; factors influencing precipitator performance; measurement of important parameters; advantages and disadvantages of cold-side, hot-side, and flue gas conditioned electrostatic precipitators; safety aspects; maintenance procedures; troubleshooting procedures; the usage of a computer model for electrostatic precipitation; and features of a well-equipped electrostatic precipitator.

The manual is a summary of the results of studies performed by various individuals and organizations on the applications of electrostatic precipitators to the collection of fly ash particles produced in the combustion of pulverized coal. These studies include comprehensive performance evaluations of full-scale precipitators, in-situ and laboratory measurement of fly ash resistivity, rapping reentrainment investigations, tests to evaluate the effects of flue gas conditioning agents on precipitator performance, investigations into the fundamental operation of hot-side precipitators, basic laboratory experiments, and development of a mathematical model of electrostatic precipitation.

A condensed table of contents listing **chapter titles and selected subtitles** is given below.

ISBN 0-8155-0895-6 (1982) **484 pages**

Contents and Subject Index

PART I: EUROPEAN TECHNOLOGY

Part I

EUROPEAN TECHNOLOGY

The information in Part I is from *Energy Efficient Industrial Technology in Europe: A Compendium* (GRI Report 80/0147), prepared by A.G. Fassbender and M.J. McGee of Battelle, Pacific Northwest Laboratories for Gas Research Institute, August 1982.

1. Load Management

Load management technology is usually electro-mechanical equipment that controls the inputs of a process. It ranges in complexity from simple gauges to computer systems. Load management equipment on gas-fired appliances controls the combustion of a fuel to minimize pollution, maintain product quality, conserve energy and ensure safe operating conditions. U.S. technology in load management systems is very strong. High technology load management equipment is usually made up of several components. These components include sensor or transducer equipment, electronic systems or microprocessors and servo-mechanical equipment. Technology advances in any one of these component areas improves load management technology as a whole. The recent advances in microprocessors has brought a new sophistication to load management systems. Research on in-situ combustion gas analyzers is steadily improving sensor technology. The National Bureau of Standards has an ongoing effort to develop advanced furnace sensors.

The complexity of a load management system is related to the scale and complexity of the equipment being controlled. Oil refineries have large complicated control systems that monitor far more than just combustion variables. This can be contrasted with small furnaces equipped with a thermocouple and a hand operated valve. This study will focus on the larger scale, sophisticated technologies.

BATTELLE-GENEVA BURNER CONTROL SYSTEM

The Battelle-Geneva Burner Control System (BCS) was developed as part of the Battelle Energy Program established in 1973. Patent applications are in place in France, UK, West Germany, and Japan. The BCS received U.S. Patent No. 4,118,172 on October 3, 1978.

Developer

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Application

For many precision combustion applications, control systems are required that will supply both a demand heat flux and a fixed fuel-air ratio relative to stoichiometric. This results in a need for two measurements in the control system for cases where the fuel composition is variable. In the Battelle burner control system concept, the two required signals to control the air flow rate and the fuel flow rate are generated in a control burner.

In the version discussed here, the signals are generated by simultaneous measurements in the control burner of the hot flue gas temperature near the flame and the heat release rate (using calorimeter principles).

The uniqueness associated with the Battelle burner control system relates to the temperature measuring aspect. The flame temperature sharply peaks close to stoichiometric. The air flow and fuel flow to the control burner are maintained in preset proportions relative to the respective flow rates to the main burner. The flow of air (or fuel) is supplied to the control burner with an alternating current component. The temperature output is compared with the instantaneous air flow rate. If the high temperature is associated with a low air flow rate, the main air flow rate is reduced, and vice versa. This process continues until the temperature signal is essentially constant. At this point, the control burner will be operating slightly on the rich side of stoichiometric. With the proper offset, the main burner will be operating at the desired mixture ratio. Changes in load or fuel composition are rapidly compensated for.

Fuel and air systems can be interchanged and interconnected, parameters other than temperature may be used, and the alternating current (AC) air component may be replaced by other oscillatory patterns.