

CHAPTER 78

SOURCES OF MECHANICAL ENGINEERING INFORMATION

Fritz Dusold

Retired from Mid-Manhattan Library
Science and Business Department
New York, New York

Myer Kutz

Myer Kutz Associates, Inc.
New York, New York

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78.1 INTRODUCTION

This chapter is designed to enable the engineer to find information efficiently and to take advantage of all available information. The emphasis is placed on publications and services designed to identify and obtain information. Because of space limitations references to individual works, which contain the required information, are limited to a few outstanding or unusual items.

78.2 THE PRIMARY LITERATURE

The most important source of information is the primary literature. It consists mainly of the articles published in periodicals and of papers presented at conferences. New discoveries are first reported in the primary literature. It is, therefore, a major source of current information. Peer review and editorial scrutiny, prior to publication of an article, are imposed to ensure that the article passes a standard of quality. Most engineers are familiar with a few publications, but are not aware of the extent of the total production of primary literature. *Engineering Index*¹ (known as *Compendex* in its electronic version) alone abstracts material from thousands of periodicals and conferences.

Handbooks and encyclopedias are part of the secondary literature. They are derived from primary sources and make frequent references to periodicals. Handbooks and encyclopedias are arranged to present related materials in an organized fashion and provide quick access to information in a condensed form.

While monographs—books written for professionals—are either primary or secondary sources of knowledge and information, textbooks are part of the tertiary literature. They are derived from primary

and secondary sources. Textbooks provide extensive explanations and proofs for the material covered to provide the student with an opportunity to understand a subject thoroughly.

78.2.1 Periodicals

In most periodicals published by societies and commercial publishers, articles are identified usually by issue, and/or volume, date, and page number. Bibliographic control is excellent, and it is usually a routing matter to obtain a copy of a desired article. But some problems do exist. The two most common are periodicals that are known by more than one name, and the use of nonstandard abbreviations. Both of these problems could be solved by using the International Standard Serial Number (ISSN), which accurately identifies each publication. The increasing size and use of automated databases should provide an impetus to increased use of ISSN or some other standard.

The first scientific periodical, *Le Journal des Scavans*, was published January 4, 1665. The second, *Philosophical Transactions* of the Royal Society (London), appeared on March 6, 1665. The number of scientific periodicals has been increasing steadily with some setbacks caused by wars and natural catastrophes. The accumulated body of knowledge is tremendous. Much of this information can be retrieved by consulting indexes, abstracts, and bibliographies.

78.2.2 Conference Proceedings

The bibliographic control for papers presented at conferences is not nearly as good as for periodicals. The responsibility for publishing the papers usually falls upon the sponsoring agent or host group. For major conferences the sponsoring agency is frequently a professional society or a department of a university. In these cases an individual with some experience in publishing is usually found to act as an editor of the *Proceedings*. In other instances the papers are issued prior to the conference as *Preprints*. In still other situations the papers will be published in a periodical as a special issue or distributed over several issues of one or more periodicals. An additional, unknown, percentage of papers are never published and are only available in manuscript form from the author.

78.3 INDEXES AND ABSTRACTS

Toward the end of the last century the periodical literature had reached a volume that made it impossible for the "educated man" to review all publications. In order to retrieve the desired or needed information, indexes and abstracts were prepared by individual libraries and professional societies. In the 1960s computers became available for storing and manipulating information. This led to the creation and marketing of automated data banks.

78.3.1 Manual Searching

The major abstracts typically provide the name of the author, a brief abstract of the article, and the title of the article, and identify where the article was published. Alphabetical author and subject indexes are usually provided, and a unique number is assigned to refer to the abstract. Many abstracts are published monthly or more frequently. Annual cumulations are available in many cases. The most important abstracts for engineers are:

*Engineering Index*¹

*Science Abstracts*²

Series A: Physics Abstracts

Series B: Electrical and Electronics Abstracts

Series V: Computer and Control Abstracts

*Chemical Abstracts*³

*Metals Abstracts*⁴

A comprehensive listing of abstracts and indexes can be found in *Ulrich's International Periodical Directory*.⁵

78.3.2 Online Searching

Most of the major indexes and abstracts are now available in machine-readable form. For a comprehensive list of databases and online vendors see *Information Industry Market Place*.⁶ The names of online databases frequently differ from their paper counterparts. *Engineering Index*,¹ for example, offers COMPENDEX and EI Engineering Meetings online. Most of the professional societies producing online databases will undertake a literature search. A society member is frequently entitled to reduced charges for this service. In addition to indexes and abstracts, periodicals, encyclopedias, and handbooks are available online. There seems to be virtually no limit to the information that can be made available online or on CDROM's, which can be networked in large institutions with many potential users. The high demand for quick information retrieval ensures the expansion of this service.

In addition to the online indexes, several library networks and consortia, such as OCLC, the Online Computer Library Center, located in Columbus, Ohio, produce online databases. These are essentially equivalent to the catalogs of member libraries and can be used to determine which library owns a particular book or subscribes to a particular periodical.

78.4 ENCYCLOPEDIAS AND HANDBOOKS

There are well over 300 encyclopedias and handbooks covering science and technology. "amazon.com" and "barnesandnoble.com" are Internet sites with comprehensive catalogs of books. The date of publication should be checked before using any of these works if the required information is likely to have been affected by recent progress. The following list represents only a sampling of available works of outstanding value.

The *Kirk-Othmer Encyclopedia of Chemical Technology*⁷ provides in 24 volumes, plus a separate index, a comprehensive and authoritative treatment of a wide range of subjects, with heaviest concentration on materials and processes. The basic set is updated by supplements.

The *Encyclopedia of Polymer Science and Engineering*⁸ is one of the major works in this important area of materials.

*Metals Handbook*⁹ provides an encyclopedic treatment of metallurgy and related subjects. Each of the volumes is devoted to a separate topic such as mechanical testing, powder metallurgy, and heat treating. Each of the articles is written by a committee of experts on that particular topic.

The *CRC Handbook of Chemistry and Physics*,¹⁰ popularly known as the "Rubber Handbook," is probably the most widely available handbook. It is updated annually to include new materials and to provide more accurate information on previously published sections as soon as the information becomes available. The CRC Press is one of the major publishers of scientific and technical handbooks. A *Composite Index of CRC Handbooks*¹¹ provides access to the information covering the latest editions of 57 CRC handbooks, some of them multivolume sets, which were published prior to 1977.

The increasing concern with industrial health and safety has placed an additional responsibility on the engineer to see that materials are handled in a safe manner. Sax's *Dangerous Properties of Industrial Materials*¹² provides an authoritative treatment of this subject. This book also covers handling and shipping regulations for a large variety of materials.

Engineers have always been concerned with interaction between humans and machines. This area has become increasingly sophisticated and specialized. The *Human Factors Design Handbook*¹³ is written for the design engineer rather than the human factor specialist. The book provides the engineer with guidelines for designing products for convenient use by people. The second edition offers new material drawn from the lessons learned, for example, in the computer and space industries. Another important title is the *Handbook of Human Factors and Ergonomics*.¹⁴

Engineering work frequently requires a variety of calculations. The *Standard Handbook of Engineering Calculations*¹⁵ provides the answer to most problems. Although most of the information in this handbook is easily adaptable to computer programming, a new edition would probably take greater advantage of the increasing availability of computers.

Conservation of energy remains an important consideration, owing to energy's increasing cost. Two titles dealing with this subject are the *CRC Handbook of Energy Efficiency*¹⁶ and the *Energy Management Handbook*.¹⁷

Composite materials frequently offer advantages in properties and economy over conventional materials. Information about composites can be found in several McGraw-Hill and CRC Press handbooks.

When England converted to the metric system the British Standards Institution published *Metric Standards for Engineers*.¹⁸ With the increasing worldwide distribution of products, metric units will gain in importance regardless of the official position of the U.S. government. This handbook offers the engineer an authoritative and detailed treatment of metrification.

78.5 CODES, SPECIFICATIONS, AND STANDARDS

Codes, specifications, and standards are produced by government agencies, professional societies, businesses, and organizations devoted almost exclusively to the production of standards. In the United States the American National Standards Institute¹⁹ (ANSI) acts as a clearinghouse for industrial standards. ANSI frequently represents the interests of U.S. industries at international meetings. Copies of standards from most industrial countries can be purchased from ANSI as well as from the issuer.

Copies of standards issued by government agencies are usually supplied by the agency along with the contract. They are also available from several centers maintained by the government for the distribution of publications. Most libraries do not collect government specifications.

Many of the major engineering societies issue specifications in areas related to their functions. These specifications are usually developed, and revised, by membership committees.

The American Society of Mechanical Engineers²⁰ (ASME) has been a pioneer in publishing codes concerned with areas in which mechanical engineers are active. In 1885 ASME formed a Standardization Committee on Pipe and Pipe Threads to provide for greater interchangeability. In 1911 the

Boiler Code Committee was formed to enhance the safety of boiler operation. The 1983 ASME Boiler and Pressure Vessel Code was published in a metric (SI) edition, in addition to the edition using U.S. customary units, to reflect its increasing worldwide acceptance. The boiler code covers the design, materials, manufacture, installation, operation, and inspection of boilers and pressure vessels. Revisions, additions, and deletions to the code are published twice yearly during the three-year cycle of the code.

A frequently used collection of specifications is the *Annual Book of Standards*²¹ issued by the American Society for Testing and Materials (ASTM). These standards are prepared by committees drawn primarily from the industry most immediately concerned with the topic.

The standards written by individual companies are usually prepared by a member of the standards department. They are frequently almost identical to standards issued by societies and government agencies and make frequent references to these standards. The main reason for these "in-house" standards is to enable the company to revise a standard quickly in order to impose special requirements on a vendor.

The large number of standards issued by a variety of organizations has resulted in a number of identical or equivalent standards. Information Handling Services (IHS)²² makes available virtually all standards on CD-ROM.

78.6 GOVERNMENT PUBLICATIONS

The U.S. government is probably the largest publisher in the world. Most of the publications are available from the Superintendent of Documents.²³ Publication catalogs are available on the Government Printing Office web site, GPO.gov. Increasingly, the GPO is relying on electronic dissemination rather than print. These publications are provided, free of charge, to depository libraries throughout the country. Depository libraries are obligated to keep these publications for a minimum of five years and to make them readily available to the public.

The government agencies most likely to publish information of interest to engineers are probably the National Institute of Science and Technology, the Geological Survey, the National Oceanic and Atmospheric Administration, and the National Technical Information Service.

78.7 ENGINEERING SOCIETIES

Engineering societies have exerted a strong influence on the development of the profession. The ASME publishes the following periodicals in order to keep individuals informed of new developments and to communicate other important information:

Applied Mechanics Reviews (monthly)

CIME (Computers in Mechanical Engineering, published by Springer-Verlag, New York)

Mechanical Engineering (monthly)

Transactions (quarterly)

The *Transactions* cover the following fields: power, turbomachinery, industry, heat transfer, applied mechanics, bioengineering, energy resources technology, solar energy engineering, dynamic systems, measurement and control, fluids engineering, engineering materials and technology, pressure vessel technology, and tribology.

Many engineering societies have prepared a code of ethics in order to guide and protect engineers. Societies frequently represent the interests of the profession at government hearings and keep the public informed on important issues. They also provide an opportunity for continuing education, particularly for preparing for professional engineers examinations. The major societies and trade associations in the United States are

American Concrete Institute

American Institute of Chemical Engineers

American Institute of Steel Construction

American Society of Civil Engineers

American Society of Heating, Refrigerating, and Air-Conditioning Engineers

American Society of Mechanical Engineers

Institute of Electrical and Electronics Engineers

Instrument Society of America

National Association of Corrosion Engineers

National Electrical Manufacturers Association

National Fire Protection Association

Society of Automotive Engineers

Technical Association for the Pulp and Paper Industry
Underwriters Laboratories

78.8 LIBRARIES

The most comprehensive collections of engineering information can be found at large research libraries. Four of the largest in the United States are:

John Crerar Library
35 West 33rd Street
Chicago, IL 60616

Library of Congress
Washington, DC 20540

Linda Hall Library
5109 Cherry Street
Kansas City, MO 64110

New York Public Library—Science, Industry and Business Library
188 Madison Avenue
New York, NY 10016

These libraries are accessible to the public. They do provide duplicating services and will answer telephoned or written reference questions.

Substantial collections also exist at universities and engineering schools. These libraries are intended for use by faculty and students, but outsiders can frequently obtain permission to use these libraries by appointment, upon payment of a library fee, or through a cooperative arrangement with a public library.

Special libraries in business and industry frequently have excellent collections on the subjects most directly related to their activity. They are usually only available for use by employees and the company.

Public libraries vary considerably in size, and the collection will usually reflect the special interests of the community. Central libraries, particularly in large cities, may have a considerable collection of engineering books and periodicals. Online searching is becoming an increasingly frequent service provided by public libraries.

Regardless of the size of a library, the reference librarian should prove helpful in obtaining materials not locally available. These services include interlibrary loans from networks, issuing of courtesy cards to provide access to nonpublic libraries, and providing the location of the nearest library that owns needed materials.

78.9 INFORMATION BROKERS

During the last decade a large number of information brokers have come into existence. For an international listing see *The Burwell World Directory of Information Brokers*.²⁴ Information brokers can be of considerable use in researching the literature and retrieving information, particularly in situations where the engineer does not have the time and resources to do the searching. The larger brokers have a staff of trained information specialists skilled in online and manual searching. Retrieval of needed items is usually accomplished by sending a messenger to make copies at a library. It is therefore not surprising that most information brokers are located near research libraries or are part of an information center.

The larger information brokers usually cover all subjects and offer additional services, such as translating foreign language materials. Smaller brokers, and those associated with a specialized agency, frequently offer searching in a limited number of subjects. The selection of the most appropriate information broker should receive considerable attention if a large amount of work is required or a continuing relationship is expected.

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