

## CHEMICAL INDEXING: MANAGEMENT'S POINT OF VIEW\*

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Whether research is basic or practical, academic or industrial, involving individual or team effort, it requires a variety of facilities and auxiliary skills in its various phases. From the time the objectives of a research program are defined until the results are obtained there are many excursions into areas of analysis, physical measurement, instrumentation, special apparatus, and the literature. The success of a program often is determined by the availability of the necessary facilities and the specialized skills required by the researcher.

Research management in an industrial organization has the responsibility of maintaining a productive research environment. Toward this end it therefore aims to provide the facilities and skills required for successful attainment of the research objectives. The availability of technical literature from which a knowledge of the existing information in the field being investigated may be obtained is one of these essential facilities. Indexing of this information is one of the skills which makes possible effective utilization of this literature. Depending to some degree on the size of the laboratory concerned, this skill may be the responsibility of a specialist or may be one of the skills of the individual research man. Ultimately, however, every scientist must obtain the information he needs in his work. Indexing and literature searches may help him a great deal but the necessity for him to do his own reading and searching cannot be displaced completely.

Chemical indexing is a skill, and the chemical index a facility whose sole objective is to provide assistance in the solving of research problems. Published indexes, such as Chemical Abstracts, Chemisches Zentralblatt, and "Beilstein," are vital to a research chemist or engineer. This close relationship between chemistry and the chemical index has arisen from the cumulative nature and growth of the chemical literature and from the natural inclination of a scientist to put things in order. The stock in trade of a research chemist is the chemical literature and his awareness of it through his experience, reading, and study.

Research chemists disdain to repeat the past through ignorance. To avoid this pitfall they allocate a share of their time to the study of the literature and to the use of available chemical indexes. It is not uncommon for research chemists to supplement available indexes with personal card files, and to this extent they are chemical indexers. Their card files

are usually peculiarly their own, but nevertheless quite usable keys to a storehouse of information.

A research chemist's information needs are governed by several factors. If he has been working in the same field for many years, he knows the literature and has little need for chemical indexes except to refresh his memory or to find specific data and statistics. His great need, in this case, is to keep abreast of current journal articles, theses, new books, and miscellaneous publications within his special area. On the other hand, when he enters into a new field, his first move is to gain access by means of the standard abstract services and to read and study the original documents thus disclosed until the literature is a part of the scientific experience he brings to bear on the solving of the problems. These actions are characteristic of the scientist and of the scientific method.

In addition to the published literature, the industrial research chemist must have access to and be aware of his organization's internal literature, such as technical reports and correspondence. This literature constitutes the who, what, when, how, and why of a company's past, present, and future. The key to this internal knowledge and know-how can be provided only by the company itself.

Thus, research management in making decisions on what information facilities, tools, and skills should be made available to its research staff will consider, among other things, the kinds of information that may warrant the expense of chemical indexing. These considerations and decisions will be conditioned by the research objectives of the company and by the research staff's natural and intuitive information needs.

The usefulness and need for published indexes, such as Chemical Abstracts, Chemisches Zentralblatt, Biological Abstracts, Information for Industry's patent index, and others are quite obvious. Many are good buys and are indispensable tools of research. Research management's decision here is not only what abstract services but also how many subscriptions to each service are required by the research environment. This does not mean that industry is open game for abstract services. Each is evaluated on its merits and on what it might contribute to the research effort. Indeed, many such services are found wanting within a

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given environment, some by inspection and others after a short trial.

An alert industrial research environment does not wait for an abstract service to appear to take care of its information needs and problems. When these needs and problems are apparent and their solution can be realized within a reasonable budget, appropriate actions are taken. By the same token, however, research management does not expect its information groups to undertake or to continue an operation which is handled better, faster, and more economically by someone else, whether internally or externally.

Chemical Abstracts is an outstanding example of an abstract service that successfully meets many needs of research chemists. It was not designed to take care of all needs for all people, and its limits have been well defined by Dr. Crane and members of his staff in numerous papers.<sup>1</sup> No other abstract service is available which even attempts to fill the areas not included in Chemical Abstracts' objectives for the journal literature.

The pace and tempo of industrial research and the information needs of many industrial research environments have led a number of research managements to the decision to set up internal operations and services to handle the current literature problem. Depending upon the scope of chemical products and the research program of a chemical company, its research chemists and engineers will have a group need of fifty to about eight hundred periodicals. Most of the scientists will want to read at their desks or at home five to ten journals in their specialty. They will know the literature in these journals well, but the need is no less great for articles of interest appearing in the other journals which an individual does not read regularly nor have time to read. Management has one of several choices for bringing such articles to his attention:<sup>2</sup> (1) Set up a journal reference bulletin and index, (2) let the scientist solve this problem on his own or in a group effort, (3) participate in a cooperative current literature service, such as the petroleum companies do.

The first solution is popular and is used in some degree by most of the medium and large sized chemical companies. This solution assigns to a specialist group the responsibility for examining the articles in every journal received by the research library and for selecting those articles of interest to the company's products, processes, and research interests. These articles are abstracted and the assembled abstracts issued in a bulletin on a set publication schedule. The research chemist will continue to read his chosen five or more journals regularly, but with the knowledge that articles pertinent to his interests and needs in the other journals will be brought to his attention by the bulletin.

Although communication of current literature is the primary objective of the journal bulletin, the need for finding references may be sufficiently great to warrant an index. The need for this index is most acute during the interval between the publication of the journal article and the issuance of the Chemical Abstracts "Annual Index" in which the article is indexed. It is not uncommon for this interval to span a period of two years. Another need for this index may be for selective or generic subjects, such as azeotropes, chlorination, amines, flotation agents, which are inclusive for all articles containing pertinent information. Whereas selective or generic subjects may be important and economical in a limited index, they are far too costly and unwieldy for an abstract service to include, except in the most general sense or as a cross reference. A further need of a journal index may be for those subject areas not included within the objectives of abstract services. Examples of these subject areas are management, communication, documentation, library science, equipment, instruments, economics, production statistics, and so on.

A company journal index should be designed for the research staff and should meet the needs of practically everyone in research. It is desirable that this index be considered by the research chemists and engineers as their personal index. This means then that the index must be open and available for use by everyone. Consequently, an index system which must be approached through consultation with a designated information specialist or which requires special instructions does not conform with the objective of openness and availability. Alphabetical and formula indexes meet the requirements quite adequately. They are the closest approximation to the way the research chemist or engineer keeps his own file or index. It is economical to maintain a central journal index, for if it meets the needs of the researchers, the net indexing time is considerably less than that which would be involved by everyone doing his own indexing and filing. A journal index which allows more time for research and which helps in the solving of research problems is an efficient research facility.

Patents, like journal articles, constitute an information source. Their contents need to be communicated to the research staff and means should be available to research for referring to patents on demand. The index service for United States chemical patents provided by Information for Industry is comprehensive, economical, and timely. Since the advent of this service, the need to provide a patent index similar to the journal index has been lessened considerably. The effect of this abstract service on many company patent indexing operations illustrates the statement

made earlier that information groups should not undertake or continue an operation which is handled better, faster, and more economically by someone else. It is possible, however, that the needs of the environment may indicate a patent index which supplements and implements that which is already provided. In this event, the same evaluation must be made as described for the journal index.

Patents, if subject indexed, are filed numerically by country of issuance. In the event that an organization does not provide nor subscribe to a subject index, it may be convenient to file the patents according to a classification scheme, such as that used by the United States Patent Office.

Other library material, such as books, government publications and specifications, trade publications, house organs, academic theses, and preprints, are information sources that require little special treatment beyond that which a catalog librarian would normally do and is trained to do. The approach here is classification rather than chemical indexing. Research chemists and engineers are quite accustomed to library classification systems. In general, they know the contents of the books published in their specialty. Their need for classification is such that the arrangement of books should permit the maximum flexibility for browsing, particularly in those categories beyond their specialty. The treatment of books must be considered in a dual role. They will be on the shelves strictly according to a classification scheme, whether Dewey, Library of Congress, or one designed for the special needs of the environment. The book catalog, on the other hand, may be a systematic or classified catalog or an alphabetical subject catalog. Both have advantages and disadvantages, although the alphabetical is probably most familiar to the research chemist and engineer. In a special library using a classification system that meets the need of its users, the subject approach in the book catalog appears to be the more feasible. In all probability, however, the approach may be modified to favor generic over specific headings. Management's problem in the realm of the book catalog and classification is to ensure that the effort expended is not greater than that required and that the research chemist's needs and habits are known to the catalog librarian.

Pamphlet material in the library, such as government publications and specifications, constitutes a real problem. This material usually is put in vertical files and more often by agency than by subject classification. If it is subject indexed in the book catalog, the mere bulk in a special library will tend to dilute the subject headings for books. In general, a compromise of some kind must be made for pamphlet material so its relative importance is maintained.

Relative importance can be gauged only with respect to the research needs. Management expects the librarians to be as aware of these as are the chemists who index patents and journal articles.

Trade literature and house organs are an important information source in a special library. They do not present a problem, however, in terms of chemical indexing. House organs which are journals by all intents and purposes and those which are no more than a serial trade literature are treated accordingly.<sup>3</sup> Trade literature, with few exceptions, does not warrant indexing, because an adequate key is provided by existing services, such as Chemical Week's Buyers' Guide, Thomas Register of American Manufacturers, and Oil, Paint and Drug Reporter's Green Book.

A company's research reports, laboratory record books, and technical correspondence constitutes its unique and valuable information facility.<sup>4</sup> These records of the who, what, when, how, and why of research are the very foundation of the company's patent structure. They are the communications by which research grows into a commercial product.

The most basic documents in research are the laboratory record books. Whether or not these are indexed in a central index would depend upon management's decision on a report system, and how it ties in with the laboratory record books. Actually the laboratory record books are not particularly amenable to indexing in a central index. When properly kept, they correspond to a technical diary or journal book and, by and large, the style of writing and presentation would be as varied as there are scientists. There would be conformity, however, to certain rules recommended by patent attorneys. A further complication in the indexing of laboratory record books in a central index would be the indexer's backbreaking task of reading cursive text. The nature of a laboratory record book is such that its many experiments and results are not continuous nor do they constitute a picture until the research chemist undertakes to interpret the results and to render conclusions. Table of contents or index pages might be made a part of the laboratory record book for use by the research chemist.

The decision not to index laboratory record books is sound only if the reporting system is responsive to management's needs for communication and for an adequate key to experiments and results recorded in the laboratory record books. This implies frequent and complete reporting for both successful and unsuccessful experiments. The reporting, however, should not be so frequent and complete that it does not allow for interpretations and conclusions. The research report, properly conceived, is a well-balanced distillation of the

experiments and results recorded in the laboratory record book on which the research chemist bases his interpretations and conclusions. The research report with its references to laboratory record books and correspondence is ideally suited for indexing in a central report index. The report index is of primary importance to the research chemist who must consult it to learn of all thoughts and research and development results of his predecessors in the company from which his assignment will be extended or modified. This search of the company literature will supplement the research chemist's review of the published literature. The report index is of fundamental importance for obtaining the information and ascertaining the original concepts and data in the obtaining and protection of patents, and is consulted for this purpose by the patent attorney or, on his request, by a research chemist or report indexer.

Because of the great and frequent need of the research chemist to consult the report index, it should be available to him for his own searching and the indexing should conform to his needs. Alphabetical and formula indexes<sup>5</sup> provide the most flexibility to the research chemist. Subject headings should include both the specific and generic, the reactants, the products, the processes, and the uses or applications. The research chemist gets dizzy awfully fast on a merry-go-round, so cross references should be at a minimum and inserted judiciously. Conservation of entries should never be made at the expense of the user's patience or intelligence. Management, on the other hand, does not want the report index to grow out of house and home every other year and to absorb the time and expense of an ever-growing report index group. The report index, therefore, will maintain standards and consistency no less than equal to those of any good abstract service.

Even a report index, which, in a sense, is a miniature Chemical Abstracts, cannot be all things to all people. Several areas in a research function may have needs so individually unique that to adapt the report index to them would reduce its effectiveness for the majority. Examples of such unique needs may be those of the infrared and ultraviolet groups or the corrosion engineers who prefer their index to match or to be combined with a service provided by a society or external organization. The pharmaceutical, biological, toxicity, or insecticide group may prefer to have their reports indexed correlatively as well as subject-wise. In these cases, the report index will be supplemented to the degree of the need, and use probably will be made of other indexing techniques, such as hand- or mechanically-sorted punched cards, computing machines, or coordinate indexes.

Research reports themselves may be filed according to a classification or by accessions number. It is quite common in the chemical industry to budget research by project numbers correlative with a product or product group. Both management and the research chemists would think in terms of these project numbers and, therefore, would prefer to see the reports so filed. If the project number is random or without correlation, those who refer to the reports probably would tend to favor filing by author.

Technical correspondence is unlike any other information source so far considered. It has the uniqueness of report literature or the ephemeral nature, in a high percentage of the cases, of a price list in a fluctuating market. Furthermore, correspondence multiplies at a faster rate than do Mr. and Mrs. Rabbit. Management's solution to this is a retention schedule, set up to include categories from none to permanent retention. Management, in general, would favor some indexing of correspondence retained over ten years. Such correspondence may consist of letters written in lieu of a report to effect rapid communication, letters disclosing ideas, letters pertaining to the processing of patents, covering letters accompanying the shipment of experimental products to potential customers, and the like. This kind of indexing may well be handled by the report index group and the entries included in the report index. Correspondence retained from one to ten years, and which is technical in only the peripheral sense, does not warrant subject indexing, but may warrant classification indexing or cataloging.

Correspondence may be filed by one of three ways: author and company, some classification system, or accession numbers. The needs of the environment and the preference of the users will determine which is chosen. Research chemists and engineers intuitively associate information with people, and if they are the users then it appears likely that filing by author and company would be elected.

All of management has some stake in functions and operations involving chemical indexing. All parts, however, do not have an interest in chemical indexing per se. What is done and how it is done is of little consequence except to that managerial level accountable and responsible for the obtaining of data and results from information files. Beyond the responsibility for providing the proper facilities, tools, and skills for the conduct of research, management's views of chemical indexing are basically those of the research chemist's. That which is in shortest supply in research is creative time, and one of our greatest concerns today is means for increasing it. If chemical indexing contributes its share to creative time, then it is successful. Chemical indexing,

however, does nothing for creativity. Until it meshes with the research chemist's intuition, habits, needs, and objectives, a chemical index is just so many words and so many dollars spent. A chemical index conceived and maintained in terms of research needs and the user's wishes enhances creativity and increases the effectiveness of research. This is achieved by

a chemical index open to the hands and eyes of the research staff. Therefore, the indexing or classification system chosen must be such as to allow the research chemist to do his own searching if he wishes, and the subjects and classification terms must be those which are part of the language and experiences of the research chemist.

#### REFERENCES

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