

A Petroleum Research Staff Looks at Information Services*

By BERNARD H. SHOEMAKER and PHILIP HILL

Research and Development Department, American Oil Company, Whiting, Indiana

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There exists today no wider span of interests in technical knowledge than that of the petroleum industry. Petroleum research necessarily embraces many technical disciplines and functions. Success in any phase of research depends largely upon the effective use of prior knowledge, or "information."

An effective petroleum research staff includes many people with a great diversity of assignments. Research chemists and physicists seek new scientific data useful in initiating new research projects. Development chemists and engineers seek both to improve existing products and processes and to devise and perfect new ones. Automotive engineers devise simulated service tests and conduct final evaluations of proposed fuels and lubricants. Technical-service engineers look for more efficient ways to operate manufacturing facilities. The staff may include experts in mathematics, metallurgy, and entomology, as well as engineering specialists versed in both equipment and materials problems. All of these people can be classified as either exploratory researchers, who seek new technical knowledge, or development researchers, who seek to use knowledge in a practical and profitable manner.

Other functions also must be performed. The research superior oversees related projects and carries responsibility for conducting them. The patent attorney strives to gain commercial protection for research findings. Finally, the research manager interprets the results of research to top levels of management in the light of major business objectives.

A petroleum research staff is many people performing distinct, yet interrelated, duties. Each views the burgeoning literature with a sense of frustration, because he inherently desires to do all things well and is thwarted by concern lest he devote too much time to information and too little to other facets of his job.

A petroleum research staff is a typical laboratory organization. It has a broad gamut of interests and a similar broad range of information needs.

INFORMATION NEEDS

Each type of researcher has different needs peculiar to his particular assignment. Information services must be fashioned with these differences in mind.

The exploratory researcher is the "idea" man—the most creative member of the research staff. He reads a

lot and is well informed in his own field of interest. When embarking on a new project, he will usually conduct his own search of the literature—with perhaps some assistance first in compiling a list of apparently important references. He does not need, and should not have, an interpretation of the literature. His value is greatest when he applies his creative imagination to what he experiences personally in reading. However, many technical advances have come from the creative adaptation of knowledge from one field to another. The exploratory researcher therefore needs to keep abreast of promising developments in fields other than his own. Here he needs his attention called promptly to interesting articles in journals he normally would not see. The exploratory researcher faces some unusual problems. His chief task is generating new scientific information. Often even a brief search of the literature will consume as much time as a quick experiment in the laboratory. If a choice must be made, the laboratory approach should be selected because additional observations are always possible and sometimes the earlier findings reported in the literature are misleading.

The development researcher reads technical journals and should have other information that relates to his particular field. Typical sources of needed information include articles in the trade press, brochures of competitors or suppliers, patents, reports on activities of other workers on the staff, and pamphlets from government agencies. The researcher needs a service that scans new literature in his field, permitting him to select reading material, and also screens out repetition of information already reported. He wants to be kept informed, but cannot afford to be burdened with mere duplication of information already gleaned from a different trade journal, an equivalent patent granted in a different country, or publication of the same paper in more than one technical journal. He is likely to depend on information people for searches that interpret and evaluate older literature.

The research supervisor may be responsible for only the exploratory or the development phase of a project, but more often he is concerned with both. Like the exploratory researcher, he wants to keep aware of scientific developments in a given field and to keep in contact with other disciplines as well. Like the development researcher, he wants extensive knowledge of all aspects of a field of research. More than either, he needs to know what competitors are doing. He has a greater need for review articles and searches that permit him to interpret the technical literature. Because he often is responsible for more than one project, he must lean heavily on information people to supply his needs.

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The patent attorney must be well-informed on both journal and patent literature, as well as what is happening in the laboratory. He needs a broad picture of technical activity coupled with intensive knowledge of fields where he is trying to obtain patent protection on new research findings and developments. Because many of his problems relate to interpretations of law, he needs all available information in a given field so that he can determine which is pertinent. He needs many searches of both literature and patent art, but they usually are narrow in scope. He needs to know promptly about newly issued domestic and foreign patents in a given field and may require translation of specific items. Once a patent application is filed, he still needs to know about further progress in related internal research. He occasionally needs to know details of manufacturing operations and proposed compositions of new products. Many of these needs are peculiar to patent work and are not shared by other members of the research staff.

The research manager needs current information on both technical and business developments. The many demands on his time require that he receive such information in capsule or "highlight" form. He needs to know about the business activities of both customers and competitors. He needs to know about all external technical developments that relate to the company's business, together with the technical significance accorded each item by his researchers. He needs thorough reviews of internal research projects, together with related literature and patent art. He also needs a crystal ball but will settle for well-reasoned forecasts of both domestic and foreign trends in research and technology.

INFORMATION SERVICES

Meeting such information needs of a large, diversified staff requires an extensive program of information services. Examples available to our people will illustrate some of the more-important ones.

A biweekly bulletin has provided a survey of recent patents and publications on petroleum and petrochemicals since 1929. It now contains abstracts, a list of current publication titles, and a list of recently issued patents. A page of news highlights presents three to five paragraphs summarizing news items having broad interest. Additional features briefly summarize the more important technical and news reports and list new patents and publications by the research staff. Few read it from cover to cover, but nearly everyone consults the listings under his specialty and related fields.

A survey of bulletin readers was conducted recently to assess the effectiveness of this service. Publication titles were more popular than patent listings. Abstracts of both were often passed by, except for items of great interest. This attitude toward abstracts stems partially from a desire to see the original complete publication. The survey also recorded an indifferent attitude toward the publication of tables of contents from current issues of selected journals; accordingly, tables of contents no longer appear.

The highlights pages circulate separately to a wider audience each week and receive much favorable comment from top management and various company departments.

This indicates that other people need technical information too.

Another biweekly bulletin provides a confidential listing of memoranda, reports, translations, searches, and special documents originating within the company. This listing of proprietary subject matter is available nowhere else and has become our most popular bulletin.

In some instances, extra copies of technical and trade journals circulate to researchers having particular interests. Although they do not all receive new information with equal promptness, they are assured that items of interest will not be missed.

Complete translations of patents and journal items are kept to a minimum because they are expensive. Many staff members can translate articles of interest adequately for most purposes. Translations usually are limited to articles of broad interest. An exception is made for descriptions of analytical techniques, where detail and precision are especially important.

Abstracts are prepared for many new publications and patents. Although some are circulated widely, all are indexed and entered in a central card file. This card file contains a wealth of useful information but is used most by the library staff. The average researcher is awed by its size and complexity and, after a few fruitless searching efforts, will return to conventional library tools. There is a real need for an efficient, simple machine for quick searches.

Searches of both literature and patent art are conducted regularly. These follow a consultation with the staff member requesting them to ascertain the researcher's needs and agree upon the proper scope to be covered. Patent searches often require a trip to the search room of the U. S. Patent Office in Washington.

Information on the commercial activities of the research department is kept up-to-date and readily retrievable in a series of project files maintained in our patent library. Here correspondence, patents, contracts, licensing agreements, internal reports, and miscellaneous items are filed together by project heading. Each main project has as many subheadings as the existing situation requires. Files are reorganized whenever changing circumstances indicate the need. Document sources—company, institute, or government bureau, for example—are listed in a companion card catalog, which is cross-indexed to all pertinent subject headings. This catalog, too, must be modified from time to time to keep the system current. We find our project files particularly useful, because they are flexible enough to reflect current needs. Particular attention is given to active business interests and, when a new business venture looms, proper file headings and subheadings are established.

A staff of information specialists, experienced in various technical disciplines, provides interpretive services to both researchers and management. This "information research" team uses both internal information and published literature, endeavoring to solve problems by the exclusive use of existing information. As an experimental program goes forward, the relevancy of additional areas of information develops. The results often turn the research effort in new directions. Because needs change, no simple literature search is satisfactory, and the information research team must continually readjust its objectives. Working closely

with advanced projects, the information team insures against prolonged repetition of old work and nourishes genuine new leads with relevant information.

Fruitful information sources for such research projects include many that are frequently by-passed in ordinary literature searches. Typical are university theses, trade journals, pamphlets, technical bulletins, house organs, newspapers, and securities prospectuses. Sometimes the files of the Securities and Exchange Commission are the only public source of a particular bit of information. Special libraries can be very helpful. Publications of U. S. government agencies are valuable, as are conversations with some of their people. File histories of U. S. patents may provide well-considered technical evaluations. French and Belgian patents often provide an early hint of coming technical developments.

Such information research has been productive, and we should have more of it. Few of its results are dramatic, but one will illustrate a rare situation. Our company has long had an interest in the separation of para-xylene from its isomers by selective crystallization. Early in this development, a xylenes-ethylbenzene phase diagram was found showing 92 experimental points defining the phase relationships. These data were contained in a defunct Russian journal, available only in the New York public library. Obviously, experimental determination of these points would have been slow and costly.

CONCLUSION

The digestion of technical information has grown increasingly difficult and complex as a consequence of the startling growth of research in industry, government, and university laboratories. Needless duplication of past research is a luxury none can afford in this era of intense competition. Information services can play an important role by reporting new information, assembling pertinent

information whether new or old, and evaluating specialized information. Consultation with key research people will help establish important needs; continuing liaison will assure effective development and maintenance of useful information services.

The information needs of people directly concerned with laboratory work can largely be met with services that provide a scanning of new scientific and trade literature, make journals available promptly, provide translations where necessary, inform concerning other internal activities, and execute searches, whether to provide only a bibliography or a broad, interpretive survey of a field of research. If too much service is supplied or if a particular service receives too much emphasis, there is danger that the researcher will lean too heavily on information services as a crutch. There is no substitute for the researcher's personal use of the library where he can interpret what he reads in the light of his own experiences. An important by-product is accidental exposure to other journal articles that may even prove so informative and provocative that the original quest is completely ignored or momentarily forgotten.

There exists a need for more information specialists of the highest order—creative scientists in their own right—who can cope with the special information problems that frequently beset a research staff. Machines can be devised to store and retrieve information; they cannot exercise judgment or provide technical insight and interpretation.

Information services are justified whenever a valid need can be served economically. Needs change and economic bases often require modification. Each information service should be evaluated periodically to assure its continued ability to catalyze effective research.

The petroleum researcher can only extend sympathy as he views the many problems besetting the information expert today. He is anxious for success in this area because he values highly the information services that have contributed significantly to his own advances in research.

Technical Information Needs of the Chemical Processing Industry*

R. P. GENEREAUX

Engineering Department, E.I. du Pont de Nemours Company, Wilmington, Delaware

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During the time we are spending this morning, the world will add about one thousand scientific and technical articles to its storehouse of published knowledge. You and I know that the organizations for which we work—and mankind in general—will use those thousand articles inefficiently. My objective today is to gain support for some practical steps that should be taken promptly to improve the use of technical information yet to be published.

To be meaningful and specific, I shall talk about the technical information needs of the chemical processing

industry. There are two reasons for doing this. First, my entire career has been associated with that industry. And second, you as ACS members are primarily interested in the chemical industry.

We will start by reviewing broadly the technical information needs of people in various functions in the chemical industry. Then we will focus on technical information problems of engineers and scientists in the industry. I will outline certain improvements in technical information services which I believe should be widely and immediately applied. Then, in conclusion, we will take a look at longer-range objectives and actions that should be undertaken.

Figure 1 is a simplified representation of the technical information needs of the chemical processing industry. It relates the source of information on the left to the function

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