RESEARCH OR RE-SEARCH?

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Abstract

The concept of Information Science is outlined with particular reference to the Sugar Industry. A short review on sources of information on sugar manufacture is given.

Introduction

The renowned technologist who improved the Proceedings of this Association with papers entitled 'from the work of others', received the slings and brickbats of outrageous criticism on grounds of non-originality. Today we are more enlightened and his plagiarism would receive nods of approval from the Information Scientist. It is probable that these papers represented the only form in which the contents ever reached the attention of the majority of our technologists.

'From the work of others' has become very much of age, for the title conveys the essence of the science of Information Storage and Retrieval. This infant discipline promises to grow with increasing rapidity as more and more scientists publish more and more information in more and more journals. In a world which enforces specialisation, Information Science represents an inter-disciplinary bridge, and Information Scientists, who, with schoolmasters, may be last of the breed of 'general knowledge' scientists, are well on the way to becoming the most important single group in the whole spectrum making up 'scientific progress' in the '70's. Today, vast sums and resources are being applied to the problem of treating the flood of information in a way that brings maximum benefit to the greatest number of people.

Perhaps the problem is without solution? J. M. Ziman[7] stresses the alarming increase in the costs of maintaining a scientific library. In sympathy, the costs of abstracting services have spiralled to a level that is beyond the resources of individuals, and many institutions. If the only answer to the overall problem of information storage is to resort to the computer, there can only be a widening gap between the technologies of the few countries able to support such a system and the rest of the world, including South Africa, where computerised information storage and retrieval on a scale sufficient to supply the needs of either the individual researcher or separate industry, can be no more than a pipe dream. Even if heavy subsidy permitted the establishment of a nation-wide information system, the accent would be towards the interests of the major contributors and the needs of individuals and smaller institutions and industries would probably not be covered adequately.

What is more to the point is the storage of specialised information. In the university this may take the form of a system specific to a discipline or sub-discipline, or may even refer to a particular topic which is the subject of intensive research.

Similarly, in most industries the limits are likely to be clearly defined. Even if we include by-products, effluent treatment, and packaging, the sphere of direct interest to the Sugar Industry has tangible radius. It is the storage of sugar information which is the main concern of this paper but specialisation begets further specialisation and the subject has been constricted further by concentrating on manufacture rather than agriculture.

Research or Re-search?

If the problem is so difficult, why bother with other people's information? Can we not get by quite adequately in isolation, pursuing an ostrich existence repeating the work carried out five years earlier in another part of the world? With the limited resources at our disposal repetition of effort is almost criminal, yet this has happened in our industry all too often. Indeed we have had occasions where work done in South Africa has been repeated by another party, simply because the earlier work had not been known. Too often the reason for the duplication was that searching was too tedious.

With so much of our sugar manufacturing policy moulded by cost accountants, it is inevitable that the question of the financial value of an information service will be raised. The question is almost impossible to answer but an economist who had made a study of information science in industry came to the conclusion that information storage and retrieval was the cheapest form of research, the cost-per-reward being about ten per cent of the cost through experimental research. If this was the end of the story we would be well advised to close down our research organisations and concentrate on 'the work of others'. Unfortunately what holds for one industry does not hold for another, for to stop all South African sugar research would be to remove a significant slice of the world's innovations in sugar manufacture, and so, proportionally, the information available for storage and retrieval. The economist who made the

calculations works in a world-wide, multi-product chemical industry which is highly competitive and research-orientated. In such an industry the South African contribution to overall publication of information must be small.

What is needed is a balance between information service and experimental research and development. In many cases published information will supply part of the answer to a problem which can be completely solved through research in laboratory or factory. Indeed, without the key provided through knowledge of the work of others, the practical solution to a problem could prove tedious and expensive, or even unobtainable.

The impression may have been gained that information science is solely for the use of research and development. This is far from the truth, for an efficient information department can be of similar benefit to process, engineering, and management. In any situation where people have to make a decision, the chances of that decision being correct are greatly increased if the people are well informed. The information should be current and historical, for it may be as important to know what happened in the past as to know what is happening at present.

It has become customary over recent years, for inventors in the sugar world to seek patent protection for their inventions. An information service is a most valuable support for a company interested either in proposing or opposing patents. A knowledge of prior publications can help to determine whether an invention is patentable and as a result save the considerable costs of defending a shaky patent application. On the other hand, published literature forms a most effective opposition to a patent application from a competitor, and the knowledge of that literature and of the patent application itself, may save a company great expense both in legal costs and royalties.

Information on Sugar Manufacture

Schalit[6] has produced an extensive list of books and periodicals published about sugar. Although not complete, this guide is adequate for supplying details of available publications.

Of particular interest is Schalit's list of abstract publications. Abstract services offer the only practical method for keeping up-to-date with worldwide developments but the best abstract services are very expensive since the subscriptions must cover the costs of employing abstracters highly qualified in science and information handling.

It is beyond the scope of most sugar companies to subscribe to Chemical Abstracts or Biological Abstracts, both of which contain much material of direct use to the Sugar Industry. Both these journals are available in the University of Natal library where they may be used, provided the sugar company has someone with the time and patience to use them!

Fortunately there are less costly services available which are more specific to sugar manufacture. For the English speaking, the best of these is undoubtedly 'Sugar Industry Abstracts', compiled by Tate & Lyle Ltd., Research Centre and now published by Raffinerie Tirlemontoise S.A. in Belgium. This abstract journal covers relevant information in over 450 technical journals from all parts of the world and in many languages. All abstracts are in English and English tranlations of the original articles can usually be supplied at additional cost.

The abstracts which form an indispensible part of the International Sugar Journal are well known to most sugar technologists. Less well known is an abstract journal not mentioned by Schalit. This recently started journal, 'Food Science and Technology Abstracts' is published in England by the International Food Information Service and is backed by a contributory translation service. The abstracts are published monthly and include an extensive section on sugar production.

In the past, some sugar journals have published state-of-the-art reviews of aspects of sugar manufacture. A new publication by Elsevier, 'Sugar Technology Reviews', will provide similar reviews without, it is hoped, the commercial undertones which often detracted from earlier efforts.

Two South African contributions deserve mention The South African Sugar Association recently established a Library and Documentation Centre which publishes abstracts and information on articles mainly concerned with the commercial aspects of sugar. An extensive summary of literature on sugar is contained in the annual survey produced by the Sugar Milling Research Institute under the authorship of M. J. Kort[5]. This publication, 'The Industrial Utilization of Sugar and Mill By-Products' contains entries gathered from a wide variety of sources. The most recent (1970) edition contained almost 600 references.

It can be seen that the sugar manufacturing industry is well served by technical journals and abstract services. It is unfortunate, however, that much of the best technical material is not available in South Africa except in abstract form. It is even more unfortunate that relatively few of our technologists have the opportunity of reading those journals which are available, or of using the abstract services for gaining information on particular topics.

The Information Scientist can be said to have two prime objectives. The first is to make as many people as possible aware of all recent developments in their fields. The second concerns the necessity to be able to refer to earlier publications in order to obtain with speed and accuracy, information on a subject of immediate interest.

Current Awareness

One way of achieving the first objective of the Information Scientist is to expand the circulation lists of technical journals and to increase the annual budget for subscriptions. Anyone who has tried to circulate a journal among say, ten persons at one factory will be aware of the shortcomings of this idea! Persons whose names appear on the lower

half of the circulation lists receive the journals, if at all, when the contents are no longer of current interest. While the publishers would no doubt be delighted if the number of each journal ordered was increased, this would not be practical both for economic and administrative reasons. In any case there is a limit to the number of journals which can be sensibly digested by the technical staff of a sugar factory, the average engineer or process manager has neither the time nor the inclination to wade through a large pile of magazines.

The problem can be overcome by the circulation of current awareness bulletins, containing the titles and brief indications of the contents of relevant articles which have appeared in the most recent journals. To be effective the current awareness bulletins should be produced at regular intervals, certainly not less than once a month, and should reach as many people as possible. Each person on the distribution list should receive his own copy of the current awareness bulletin which should be filed for personal reference. The current awareness bulletins should be supported by an annual index.

The only problem is to find someone to prepare the bulletins! There is no ready made current awareness service available to the sugar industry. Because of the work involved in preparing informative abstracts, the entries in abstract journals appear many months after the date of publication of the original article. Even if abstract journals could be brought up to date, cost would prohibit their use for current awarness purposes.

For more than four years, Huletts Research and Development had distributed monthly current awareness bulletins representing the content of over 60 technical journals, to technical personnel within the Group. A copy of the original article is sent to anyone whose interest is aroused by an entry in the bulletin. The response to this service has been growing steadily.

Information Storage and Retrieval

How often can you remember having seen an article of interest in a journal received a few months earlier, without being able to remember which journal and which issue? Finding that article can be quite a problem, especially if there is no fixed procedure for storing journals at your centre! Memory is no substitute for an organised storage and retrieval system.

Annual indexes can be of some help, but many of the indexes of sugar journals suffer from a lack of standardisation in the 'shorthand' used to describe the content of an article. Another drawback is that the indexes of sugar journals and the proceedings of technical societies concerned with sugar are annual, not cumulative. This greatly increases the task of compiling a literature survey, for the researcher must plough through a range of annual indexes in his quest for information. The cumulative index of I.S.S.C.T. Proceedings prepared before the 11th I.S.S.C.T. congress in Mauritius is a notable contribution, but unfortunately even this index has not been kept up-to-date.

A storage system, based on keywords, and covering as much of the world's sugar literature as possible, offers the best chance of providing fast and accurate retrieval of information. To increase the value of the system to the sugar company, the storage of published literature should be linked to the storage of internal reports and other unpublished technical data. By using the same range of keywords the two storage systems could be made complementary, which would greatly simplify the task of information retrieval. Confidential information could be handled by leaving the original document in the care of the author and including a non-confidential title or abstract in the storage system.

Unfortunately a storage and retrieval system costs money, for the keywording and abstracting of technical articles requires a person possessing both general knowledge of all technical aspects of sugar manufacture and specialised knowledge of keywording. The number of abstracters needed will depend on the quantity of journals obtained and the activity of technical interest within the company. When the cost of employing the personnel is added to the cost of journal subscriptions it may be even harder to convince the cost accountants that involvement in information retrieval is worthwhile!

Industry-wide storage of published information, with individual companies having the option of pooling their internal technical reports appears to be the logical solution. This scheme could utilise the recently announced service offered jointly by Sugar Industry Abstracts and Rafinierie Tirlemontoise, which will provide subscribers with keyworded abstract cards for all entries appearing in Sugar Industry Abstracts. These abstract cards will be back-dated for five years and may be used as the software for a storage and retrieval system. Details of the mechanics of a system based in the S.I.A. abstract cards are given by Jones, Binard, and Jacques[4]. More detailed descriptions of storage and retrieval systems based on keywords, and on information science in general are given by Bourne[2], Becker and Hayes[1], and Jahoda[3].

Conclusion

The South African Sugar Industry should investigate the introduction of a technical information centre. The service provided by this centre should include the distribution of current awareness bulletins throughout the industry, but the principal function should be the storage of technical information in a form that will facilitate accurate retrieval. The information centre should be able to provide an answering service which might on occasions expand to a full literature survey.

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Discussion

Mr. MacGillivray: Where will the cards be stored and how does one gain access to them?

Mr. Dawes: The cards are stored in a cabinet in alphabetical order. If you require information on a ceretain subject you phrase your request in such a way as to cover the various aspects of the subject. There is a thesaurus of terms, like a dictionary, which helps you use the correct terms. You can pull out the cards concerned with your subject, put them together and find holes that go through all of them. The holes are numbered and the numbers correspond to abstract cards which refer to original papers.

Mr. Alexander (in the chair): The abstracts are systematically stored and by looking at the abstracts you can decide whether you need go any further to the original article.

Mr. Francis: Will the abstracts from Tate & Lyle be similar to Sugar Industry Abstracts?

Mr. Dawes: They are the same.

Mr. Jennings: One reason for requiring a system of this type is that proceedings of technical sugar associations are very badly indexed. We hope to have one cumulative index of all available sugar literature.

Dr. Matic: An information storage and retrieval system is necessary for the sugar industry. Unfortunately a unified system for the whole sugar industry, both the agricultural and manufacturing section, is apparently not feasible.

Because of poor storage and filing of information it is quite possible that research work may be duplicated, particularly due to staff leaving.

Because of the expense the S.M.R.I. Board of Control have been somewhat wary about starting a system so I am pleased that Huletts have started. The system will be most useful for also storing details of practical work carried out by factories.

Mr. Muller: Has there been a good response from factories asking for information?

Mr. Dawes: At this stage we are asking various centres to contribute information as we do not have sufficient information on file.

When we can provide a proper service we except the response to snowball.

Mr. Jennings: Mr. Dawes has not mentioned his current awareness surveys. Articles from various journals are abstracted and sent out monthly to technologists in the Hulett group. The response to this has been very encouraging.

Mr. Wilson: The experiment Station had an information service and accumulated a large number of card index files which could well be filed in the manner suggested by the authors. The sugar industry is certainly big enough to establish a centre for this purpose even if it is not computerised.