Overview

In November of 1987, the First International Symposium on Computerization and Networking on Materials Databases was held in Philadelphia. That highly successful meeting capped the first two years of activity aimed at focusing the vast amount of diffuse energy going into the developing of new computerized databases describing the properties of materials and substances in such a way as to lead to useful guidelines and standards.[1] This mission was taken up by ASTM Committee E49 on Computerization of Materials Property Data, and that first symposium was a logical consequence of the recognition by the group of the need for a strong educational aspect to their work.

Since 1987, and with heightened interest provided by the visible efforts of Committee E49, the intensity of effort has increased. Several new standards and guidelines have been issued or are in the final stages of balloting, and so the need for education and for the sharing of experience and progressive learning has continued. The logical consequence was the Second International Symposium, held in Orlando, Florida, in late November and early December of 1989.

As the overview indicates, the Second International Symposium focused on three major aspects of this work: (1) the international nature of this effort; (2) the progress being made in standardization and the definition of guidelines to aid newcomers to the activity; and (3) the breadth of application of such databases to different aspects of the materials business.

The International Aspects

Once again, the international participation at the meeting was impressive; thirteen of the twenty-four papers presented, and twelve of the twenty-one papers contained herein are from outside the United States of America. Of notable importance are contributions from three countries not represented at the first symposium (Union of Soviet Socialist Republic (USSR), Switzerland and Sweden), and this represented the first presentation and paper on a technical subject by the USSR at a major ASTM Symposium.

In his key contribution, A. D. Kozlov provides a snapshot of the very substantial effort in the USSR and Eastern European countries on materials databases, the first time the magnitude of that effort has been clear. Brandstatter's and Marx's provide updates of the German and French efforts, respectively, providing emphasis to the opportunities for cooperative effort between government and business.

In papers representing the efforts of the international community as a whole, in the form of CODATA (the Committee on Scientific and Technical Data of ICSU (the International Council of Scientific Unions), Barrett and Reynard describe two activities of the CODATA Task Group on Materials Database Management. Barrett, the Task Group chair, provided the status of the group's studies of the economic impact of computerized databases, noting the large number of advantages and benefits. However, Barrett also admitted the difficulty of quantifying these because so much of the task involves speculating upon the possible impact of not having such information computerized. Reynard summarized work to date in

[1] Published as *ASTM STP 1017, Computerization and Networking of Materials Data Bases,* J. S. Glazman and J. R. Rumble, Jr. Editors.

cataloging the huge number of material designation systems, indicating the substantial task before users of materials data in determining equivalency among similar materials with different names and specifications.

Progress in Standardization

In the past two years, the aggressive pace of effort to standardize data formats and operating practices for computerized materials databases has begun to pay off. In Rumble's paper summarizing ASTM Committee E49 efforts, he notes the near completion of work on standards for developing thesauri, and on generic guidelines for characterizing materials and reporting test data. In addition, progress on more than a dozen applications of the generic guidelines is summarized.

The importance of a menu-driven interface and of the metadata systems in responding to users' expectations for such scientific information systems is covered in Kaufman's paper, based heavily on the experiences to date in developing the Materials Property Data (MPD) Network on STN International. A key feature of such systems, emphasized by both Kaufman and Rumble is providing flexibility to users with regard to access or search paths, recognizing the potentially diverse needs of different searchers.

Westbrook and Grattidge expand upon the work to maximize the utility of computerized databases with metadata systems, providing the background and support information to facilitate understanding the value and limitations of the data. Sargent provides some unique views of options for use of abstractions in establishing the thesauri.

Applications of Computerized Materials Data Systems

Two broadly different types of applications are described in individual papers. The extensive coverage of a number of materials and their properties by ASM International is documented by Gall and Weida, encompassing a far-reaching program with potentially major impact in the future. More specific applications are described in most other papers in this area.

Stanton characterizes the complexity of dealing with composite materials, both with respect to describing the materials themselves and the scope of metadata required, and also with respect to the breadth of test methods and limitations of standardization for such materials. Applications to other materials, ceramics and coatings, are covered by Munro and Begley, and Strieff, respectively.

Applications of computerized databases to specific types of data are also included, notably to fatigue, tribology, and creep/high temperature data, in papers by Yu et al., Ruff et al., and Sandström, respectively. An application to material selection is also covered by Sandström.

Much Remains To Be Done

While much progress is reported in a number of areas, it is equally clear that much more remains to be done. In particular, problems with the exchange of machine-readable data were not satisfactorily addressed despite specific call for papers in this key area. It will remain a major focus for following Symposia and publications.

While generic guidelines are nearing publication, the application of these standards to specific materials and for specific types of data is clearly just beginning. How successful the work to date has been will await the reviews of some specific applications of the emerging standards.

A different task results from work on metadata and thesauri. The guidelines are clear and seemingly useful. But they require considerable investment of time and intellectual effort to fully implement, adding a measurable cost to the already burdensome expense of computerizing materials data.

Finally, the economics of the whole process are not yet clear. Many of us are convinced of the ultimate value of well supported and documented materials databases, but proving this with valid economic analyses is not easy and has clearly not been accomplished.

In summary, much of great value is reported herein, but much is yet to be reported. The major value of this volume will be to those starting now to plan and build new computerized materials databases, and to those well underway who wish to keep their work current. There will be another chapter telling us of our success or lack thereof in meeting our substantive goals.

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