XRF IDENTIFICATION OF ALLOYS USING LOTUS APPROACH 97® DATABASE WITH ASM INTERNATIONAL® DATA

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ABSTRACT

Very often an industrial laboratory is asked to determine a commercial name for an alloy, as the internal customer is more interested in the name of the alloy than in its chemical composition. An electronic version of Woldman’s Engineering Alloys® (7th Edition) is available from ASM International in multiple files in Excel 4.0 format. This package contains data for more than twenty six thousand alloys. To make these data more usable, the original data were reformatted and condensed into just one database search tool, Paradox 5.0® database file, in order to be processable by the Approach database program, part of the Lotus SmartSuite 97®. The Approach program from Lotus/IBM is excellent. An intelligent template included in this software package allows non-programmers to easily formulate database filtering subroutines.

Our Database covering only Lighting Materials also has been modified in order to take advantage of the Smart Template searching power. On many occasions both databases have helped to interpret the XRF results as required by customers.

INTRODUCTION

Quantitative XRF Analysis of alloys is well covered in the literature.1-13 For some analysts, this is the end of their involvement and only the report is left, where findings will be summarized. For other analysts, one additional step is involved, identifying the alloy from the XRF Analysis, as the customer wants to known its commercial name.

There are publications covering the composition and mechanical properties of the most popular alloys from the different manufacturers around the world.31-41 In these publications, the properties and compositions of alloys are listed, and used mainly by designers. The classic publication in this field is Woldman’s Engineering Alloys,30,37,38 which comes in two versions (paper and electronic). The electronic version has been adapted and improved; this process is covered in this paper. The alloy data arrived on seven diskettes in Excel format, and was transferred into one Paradox database file.

Lotus Approach 97, the database used, does not even have a proprietary data format. The Lotus philosophy when developing Approach was to deliver a better way of working with data, not storing it. Approach connects directly and quickly to almost all popular data formats, including 1-2-3, dBASE, DB2, Oracle, Paradox, and Notes.
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Approach's architecture separates data connectivity from the database engine so that any number of data formats can be easily supported, each looking and behaving exactly the same to the Approach user. The Paradox Database was chosen for all the database needs in the XRF Lab.

PC DATABASES IN GENERAL WITH PARTICULAR EMPHASIS ON APPROACH 97

Most of today's PC databases are relational. Desktop databases are being shaped by the increase in team computing in corporate environments. The essence of a database calls for sharing of information and collaboration. Data is stored centrally on servers, where everyone on a team can access it. Charts and reports need to be shared with others for review and modification.

Lotus has addressed these desired features and delivered a new release of Approach that not only builds on a tradition of usability, but reflects the different ways people work today. Approach 97 is known for combining power, ease of use, and robust functionality in a desktop database in a way that none of its competitors has achieved. Because of these characteristics, Approach appeals to a broad audience of users, letting even general business users to find exactly the data they need to create sophisticated reports in minutes.

Comparing Approach to its competitors, namely MS Access and Corel Paradox, it quickly becomes apparent that Approach is a step ahead of them. When opening a date file for the first time, a fully functional form is automatically generated and displayed, allowing the user to browse any database immediately. With either Access or Paradox, it takes several distinct steps to reach that same intuitive form. All three database programs provide step-by-step assistants/wizards to guide a user through complicated tasks. Approach however, comes with assistants that are much easier to utilize, showing every step in the process. Access wizards are much less flexible, and Paradox experts are significantly worse. Approach 97 also offers a new macro and Lotus script recorder, as well as improved SQL support, and compliant menus and dialog boxes.

Approach comes with more than 50 customizable table templates, and easily customizable applications. Approach assistants are invaluable tools in helping novices, as they create forms, queries, reports and charts with ease. It also comes with one of the best online help systems for new users in the business. Lotus' database also allows users to generate very powerful macros by following their actions with the new Record transcript option. These macros can easily be attached to a field, button, object, or view.

One major benefit of Approach's superior design is fast, direct connectivity. It's very simple to start working with data in any format, quickly connecting users directly to the chosen table. Microsoft's Access, on the other hand, is less connective. It gives users the option to import the external data first into Access's format, or to "link" it to a table. By linking data, Access will not allow field properties to be changed, such as rules and lengths. Although, users have access to the data, they can do little with it. Paradox is even more limited, letting users only open data stored in dBase or Paradox formats, all other data must be imported before being used (unless more software is purchased separately.) In addition, import options with Paradox are very
restricted, supporting only a handful of spreadsheet formats. Even accessing other formats through ODBC or SQL drivers still leaves limited functionality, restricting the ability to join tables if different formats, which hinders users from created queries or reports dependent on such a joining.

The ability to save data from one database format to a different one is extremely useful when changing database systems. Paradox is unable to provide this functionality, allowing users to export data only in native formats. Approach and Access both can perform this function, however Approach provides an additional feature. When users save data to a different format in Approach, they can save their application along with it. This allows users to continue using either of the data sources. Such a capability is beneficial in environments where a variety of database formats are in use.

Approach 97 is the best program to work with DB2 data. This database lets users execute QMF queries within Approach, or automatically convert those QMF queries and reports to Approach format. It also helps users support more features in DB2 though DB2 BLOB support, new pass-through SQL, as well as new commit/rollback capabilities.

Another significant benefit of Approach’s design is that it not only grants access to, but it can easily generate new tables in any of its supported formats. Access users must utilize programming to create new table in external formats.

MATERIALS ELECTRONIC DATA IN GENERAL

The recent technological development of PC has affected all branches of science and engineering. Huge hard disks have allowed development of programs with very large reference data; one example is the X-Ray Diffraction Search/Match programs. In addition to that, designing engineers can take advantage of publications based on the database of materials where all physical and mechanical properties are listed. Some of these publications contain chemical compositions of alloys as well. The development of the Internet created a new and powerful tool where specific things can be found. Certain material data can also be found on the WWW. 31-41

The Alloys Data Bank (Alloys-DB) is a computer-based system for mechanical and physical properties data of engineering alloys. The database structure covers the material behavior at low, elevated and high temperatures for base materials and welded joints and is oriented to international material standards and recommendations. Its emphasis is on data from standardized tests and on evaluation methods, which are well established and widely accepted. The data management and evaluation functions can be applied to mechanical and physical property test results reported by test laboratories in defined format and quality. Such test results can be entered and stored in the "data bank" component of the system where they can be accessed and handled with typical data bank routines and from where they can also be taken for data evaluation. This data bank was known in its previous version as HTM-DB (High Temperature Materials Data Bank).
Alloys-DB computerizes the scientific process of engineering data generation for material testing through the functions of data organization, data validation, quality control, model-based and statistical data evaluation, to the presentation of materials parameters which find use in engineering algorithms. Alloy-DB Version 2.0 is developed by the Institute for Advanced Materials, I.A.M., at the Joint Research Centre (J.R.C.) Petten (NL) of the European Commission (EC),

WOLDMAN’S ENGINEERING ALLOYS WITH APPROACH

The basic essence of this publication is presented below. The book was edited by J. Frick, Ph.D. 1994 – Contains more than 1400 pages-ISBN:087170-5443- this is an ASM Publication. 30, 37, 38

7th Edition Formatted for Microsoft Excel – Electronic Format

ASM advertises these publications in the following wording:

“Whether you are looking for data on the latest alloy advances or a forgotten alloy that hasn’t been used in years, you will find what you need in this superb reference book.”

In the assembled computing system the Alloys Data searchable fields are as follows:

- Alloy name
- Manufacturer
- Notes with some mechanical properties and applications
- Fields with elemental compositions

The Lotus Approach 97 Smart Template has the following Find Request SmartIcons and Operators that are self-explanatory:

=, <> , < , <=, >, >= , , , & , * , ? , ... , ~ , ! , if , @

By using the above operators, one at a time or in a group, one can define the proper searching conditions to filter out the alloys of interest. For example, by specifying the tolerance windows for 3 or more strongest lines/compositions, one can get a display/printout of similar/closest alloys present in the database.

LOCAL DATABASE FOR LIGHTING MATERIALS

A couple of years ago in a group discussion in OSI, one of the managers mentioned that some members of the team are not familiar enough with the materials used to produce electric lamps. They came to work from completely different industries. The author of this paper used to work in the past with jet engines, and the jet can be viewed as a sort of hot, glowing torch. Electric lamps are more advanced than the ancient torch, so one could consider the job switch as a step toward higher technology.
This remark about familiarization with Lighting Materials was very important and to make up for it the idea of Electronic Database for Lighting materials was born. At the beginning, Quattro Pro for Windows was a storage medium for this project. Different types of glass, brasses, solders, stainless steels, phosphors, etc... were introduced to our database of Lighting materials. This database is still growing and at this moment we have about 1000 records.

On many occasions this local database has helped to identify analyzed solders. It is very handy, allowing users to get hints or answers in a short period of time. Knowing what kind of solders are available on the market helps in XRF work considerably. Some solders have lead, some don’t. Other solders may have antimony, some not. This helps to create Boolean logical filters to generate the listings as required in a specific situation. Very often we have to identify the lead-free solders used by some of our competitors. This local database, with data about available market products, is invaluable in such tasks.

**LOTUS APPROACH 97 IN ACTION; SOME EXAMPLES**

Lotus Approach 97 with the Woldman’s Engineering Alloys can generate an unlimited number of printouts and to list all of them here it will be impossible. Only some of them will be presented here in order to illustrate the power of Approach 97. The reader may have in mind a different data to process in order to represent their problems better. Whatever the data is, Approach 97 will act the same way, producing nicely formatted reports.

![Lotus Approach 97 results - wild card searching for “625” between the names of alloys.](image)

Figure 1. Lotus Approach 97 results - wild card searching for "625" between the names of alloys.
Figure 2. Lotus Approach 97 display of a single record – chemistry of INCO 625 alloy.

Figure 3. Setting a filter for the "INCO 625 like" materials on the Lotus Approach 97 smart template.
DISCUSSION OF ASSEMBLED DATABASE SYSTEM OF MATERIALS

Woldman's Engineering Alloys references may not be big enough and sometimes cannot produce desired results. The ASM has more materials stored on different media that can be purchased and implemented to work with Lotus Approach 97 Database. Perhaps in the future we will implement all the available Data Files from ASM. At the moment what we have is sufficient for our needs.

As far as the database is concerned, we will continue to use Lotus Approach 97. At the moment Lotus, with IBM as a new owner, creates a very good team, assuring a positive future for database development. They have all the resources they need, and are fully capable addressing demands of customers.

CONCLUSION

It has been shown that two independent software components, namely Lotus Approach 97 Database and Alloy data files by ASM International, can work together. This synthesis creates an invaluable alloy identification database system that can extend the activities of the XRF Laboratory, as may be required in some organizations.
GLOSSARY AND SOME DEFINITIONS

This paper presents terminology that may require some clarification. Most of the abbreviations used from Information Technology are described/defined below:

**Binary Large Objects (BLOBs)**
Approach 97 lets you go multimedia. You can use PicturePlus™ fields to store and retrieve Binary Large Objects such as pictures, sounds, and OLE objects.

**DB2** is the IBM family of relational database products. Approach lets you create new DB2 tables from scratch, access existing DB2 tables, and even work with different database types at the same time. For example, you can join a locally stored Access table to DB2 data on a server. You can also create and maintain simple desktop databases contained in flat files with extensions like .DBF or .DB.

**DB2 OMF support**
Build on your current investment in QMF™. Approach 97 automatically converts QMF queries and reports to Approach forms and reports, or you can use QMF as a server.

**DB2 transaction support**
Using Approach 97 and LotusScript, you can now create applications supporting commit and rollback control of DB2 transactions.

**Using IBM DB2 and Lotus Approach** Users of the IBM DB2 database family want easier access to their business and personal data through a graphical interface. Lotus Approach users want the functions and features of a world class database like DB2. IBM has adopted Lotus Approach as an important component of its database product line, and a strong complement to DB2. Over time, you can expect to see increasing integration and even more synergy between these complementary products, greatly increasing the value of both. The purpose of this document is to help you get started quickly so that you can get the benefit of this potent product combination.

**FTP** (File Transfer Protocol) -- A very common method of moving files between two Internet sites. FTP is a special way to log in to another Internet site for the purposes of retrieving and/or sending files. There are many Internet sites that have established publicly accessible repositories of material that can be obtained using FTP, by logging in using the account name anonymous, thus these sites are called anonymous ftp servers.

**HTML** (HyperText Markup Language) -- The coding language used to create Hypertext documents for use on the World Wide Web. HTML looks a lot like old-fashioned typesetting code, where you surround a block of text with codes that indicate how it should appear, additionally, in HTML you can specify that a block of text, or a word, is linked to another file on the Internet. HTML files are meant to be viewed using a World Wide Web Client Program, such as Netscape or Mosaic.
**Lotus Approach**, by Lotus Development Corporation, is a powerful, intuitive database interface that can extend DB2's value for you and your users, with query, reporting, application development and data analysis features that have won over 50 industry awards and honors. Approach provides a graphical interface to your data, enabling you to use the mouse to click and point to access data and search your databases. Approach 97 is a full 32-bit application; it runs only on Windows 95 (TM) and Windows NT (TM) (watch for the OS/2 version soon). If you plan to use 16-bit client platforms, then you would use Lotus Approach 3. It is designed to run on Windows 3.1 and Win-OS2 (but it will also run on Windows NT and Windows 95). A few Approach terms differ slightly in meaning from database terms that you are familiar with. Approach uses two kinds of files: database files and Approach files (.APR). A database file, such as a DB2 table, stores the actual data you see when you work in Approach. In most cases, when Approach uses the terms "database" or "database file", you can think of tables. Approach also works with Approach files. Approach files store the views you design for entering, organizing, and presenting data in your data files. Views can be forms, reports, worksheets, crosstabs, charts, form letters, mailing labels, or envelopes. The Approach file also stores the locations of the database files it accesses. The file extension of Approach files is .APR. A single Approach file can contain many views and can access one or more database files. In Approach, the term record is equivalent to a row of a table. The term field refers to a column of a table.

**Open Database Connectivity (ODBC)**
ODBC is an application programming interface (API) that is defined by Microsoft. ODBC provides a standard interface for accessing a variety of databases using SQL. An application that uses the ODBC interface can connect to any database that has an ODBC driver, usually with no changes to the application code.

**Oracle** is a sophisticated large-scale database management system, widely available in industry and commerce. It is a relational database, and thus all data structures are reduced to a series of two-dimensional tables (or relations) Oracle is a registered trademark of Oracle Corporation. Located in Redwood California, Oracle Corporation is the largest supplier of software for information management, and the world's second largest software company.

**Paradox** is the name of a family of database management systems sold by Borland International, Inc., of Scotts Valley, CA. Paradox for Windows is a full-featured, relational database that has many features for storing, viewing, printing, changing, sorting and finding data. It has a graphical user interface (GUI) that operates in the Microsoft Windows environment. It also has QBE and SQL features, and it can run in a multiuser environment.

**SOL** (Structured Query Language) -- A specialized programming language for sending queries to databases. Most industrial-strength and many smaller database applications can be addressed using SQL. Each specific application will have its own version of SQL implementing features unique to that application, but all SQL-capable databases support a common subset of SQL.

**Query Management Facility** (QMF) QMF is an easy to use, menu-driven system that allows a user to create queries and then to format reports or charts to present critical business information. Users can save their work, recover their work, and put together blocks of work (groups of queries, forms, and reports) in procedures.
**Relational Databases** The next level of database is the relational database. Relational databases allow for more efficient storage of data by "pointing" data in different databases to each other, instead of duplicating information. An invoice database might point to a customer database and an inventory database to avoid having to store basic (and repetitive) customer and product data with each invoice. A relational database helps redundant storage of information and makes it easier to define and perform searches.

**What is Lotus Notes?** Lotus Notes is categorized as groupware. Groupware is a relatively new concept in software that seeks to facilitate group activities, such as sharing documents, storage, work routing and escalation, and quick development of new shared applications. Correctly applied, groupware will foster team work, improve business processes, and extend the reach of the individual and the organization.

**Understanding the Approach environments**
You work in four different environments in Approach: Design, Browse, Find, and Print Preview. Each environment is best suited for certain tasks. In Design, you create new views and edit the layout of existing views. You do not edit actual data in Design, but you can see a sample of your data and plan its arrangement. In Browse, you work with the data in a database file. You can enter and edit data in Browse, find and sort records, and print the views. You can also use assistants to create views, but you need to go to Design if you want to modify their layout. In Find, you fill out a find request to search for records that meet certain conditions. A find request is a blank copy of the view you're currently using. In Print Preview, you see what the current view looks like when you print it. This gives you a chance to correct errors or make design changes before committing a view to paper. Approach 3.02 calls this environment Preview. Sometimes your actions cause Approach to change the environment automatically. Sometimes you need to switch environments yourself. Managing your database and Approach files Through Approach you can add, delete, or change data in a database. Approach automatically saves changes to data as you work. If you make field definition changes, such as adding a new field, or if you add, delete, or modify Approach views, you need to save the Approach file.

**Microsoft Visual Basic for Applications (VBA)** is a powerful visual programming environment that is seamlessly integrated into another program, known as a "host". With VBA, users can easily extend or customize the behavior of the host by writing code using the popular Visual Basic programming language.

**WWW** (World Wide Web) -- Frequently used (incorrectly) when referring to "The Internet", WWW has two major meanings - First, loosely used: the whole constellation of resources that can be accessed using Gopher, FTP, HTTP, telnet, USENET, WAIS and some other tools. Second, the universe of hypertext servers (HTTP servers) which are the servers that allow text, graphics, sound files, etc. to be mixed together.

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