

## INFORMATION RETRIEVAL IN ELECTROCHEMISTRY USING MICROCOMPUTER

R SRINIVASAN, Mrs VIDYALAKSHMI RAMAN, N MEYYAPPAN, Miss K SHANMUGASIGAMANI and PVS SUBRAMANIAN

Central Electrochemical Research Institute, Karaikudi - 623 006

### ABSTRACT

Experiences gained in the initial stages of computerised handling and processing of electrochemical information using DATAWEALTH, a microcomputer of PSI Data Systems are presented.

**Key words:** Information retrieval, Electrochemistry, Microcomputer

### INTRODUCTION

The Scientific and Technical Information Services Section (STIS) of the Central Electrochemical Research Institute (CECRI) Karaikudi is dedicated to provide necessary information support to the R & D staff of the Institute and answer the technical enquiries received from various industries and organisations against charges. To provide Selective Dissemination of Information (SDI) as well as retrospective searching services, it was thought worthwhile to explore the use of a computer system. Recently in May 1984 a microcomputer (Data Wealth) from PSI Data Systems, Bangalore, was acquired for CECRI and a terminal has been installed in STIS for the above purpose.

#### Configuration

The microcomputer installed is a Z80A based 8-bit system and the configuration is given below:

1. Data Wealth Z80A CPU with 64 KB memory
2. Video terminal with keyboard - 2 Nos
3. Floppy disc drives - 2 Nos
4. 132 Col. 160 cps black dot matrix printer
5. 132 Col. 200 cps colour dot matrix printer
6. 35 MB Winchester disc

The terminal in STIS consists of a video terminal with keyboard and one 132 Col. 160 cps dot matrix printer.

#### Software

PSI Data Systems has provided the following:

- Cobol Compiler
- Fortran Compiler
- Basic Interpreter and Compiler
- Word Processor
- DBMS/User Query Language

dBase II, a general purpose Data Base Management System [1] (DBMS) which is capable of handling both bibliographic data, numeric data and structural data is being used for creating the files, retrieving the relevant documents and getting the output in desired format.

#### File creation

As our aim is to create a comprehensive database in the field of electrochemical science and technology in course of time, it was first decided to create a few files containing the scientific contributions of this Institute as the Institute is a unique one in the field of electrochemical science and technology.

To start with two files namely (a) & PAPERS.DBF and (b) & PATENTS.DBF containing the scientific publications and patents by the scientists of CECRI have been created. & PAPERS.DBF contains the scientific papers of the Institute from 1953 till date and has 1891 records which occupies 464 KB and & PATENTS.DBF contains patents from the Institute from 1953 till date and has 272 records which occupies 96 KB.

The structure and specimen record of the files & PAPERS.DBF and & PATENTS.DBF are given in figures 1 & 2 and 3 & 4 respectively.

.USE & PAPERS

.LIST STRUCTURE

STRUCTURE FOR FILE: & PAPER.DBF

NUMBER OF RECORDS: 01891

DATE OF LAST UPDATE: 07/16/85

PRIMARY USE DATABASE

FLD	NAME	TYPE	WIDTH	DEC
001	C	C	001	
002	A	C	002	
003	AU	C	080	
004	T	C	120	
005	J	C	020	
006	V	C	004	
007	I	C	003	
008	Y	C	004	
009	P	C	008	
Total			00243	

Fig. 1: Structure of the file & PAPERS.DBF

RECORD # 01811

```

C      : R:
A      : 30:
AU     : NARASIMHAM, K C UDUPA, K S VENKATESAN, VK
T      : HYDROGEN PRODUCTION BY WATER ELECTROLYSIS-I:
J      : ELECTROCHEM BULL:
V      : 2:
I      : 3:
Y      : 1984:
P      : 77-87:
    
```

Fig. 2: Specimen record of the file & PAPERS.DBF

Note: Field "C" denotes the Type of the paper (i.e.) whether Original or Review paper and "A" denotes Area (i.e.) A = "10" means the paper deals with Batteries, A = "20" means the paper deals with Corrosion, etc.

```

. USE & PATENTS
. LIST STRUCTURE
STRUCTURE FOR FILE : & PATENTS. DBF
NUMBER OF RECORDS : 00272
DATE OF LAST UPDATE : 10/07/85
PRIMARY USE DATABASE
FLD      NAME      TYPE      WIDTH      DEC
001      A         C         002
002      C         C         008
003      PN        C         012
004      IN         C         080
005      T         C         150
006      D         C         008
007      R         C         020
TOTAL                                00281

```

Fig. 3: Structure of the file &amp; PATENTS.DBF

```

RECORD # 00126
A       : 10
C       : INDIA
PN      : 130788
IN      : DAKSHINAMURTHY, K MATHUR, PB
T       : LEAD CHLORIDE WATER ACTIVATED CELL SYSTEM
D       : 04/08/73
R       : L 80

```

Fig. 4: Specimen record of the file &amp; PATENTS.DBF

Note: Field "A" denotes Area and "C" denotes Country and "R" denotes Remarks (i.e.) L 80 means Lapsed on 1980.

**Search strategies [2]**

The following search strategies are used in order to get relevant documents to answer the queries:

1. Single Aspect/Single Clue
2. Strategy of the Logical Sum
3. Strategy of the Logical Product
4. Strategy of the Logical Product of the Logical Sums
5. Strategy of the Logical Difference
6. Strategy of Sequence
7. Strategy of Greater Than and Less Than

The logical operators [3] AND, OR and NOT are used in the query formulation in order to retrieve all relevant documents and exclude irrelevant documents.

**AND (= Coordination):** This is a primary means of increasing search specifying and reducing the number of documents retrieved. Here it is better not to confuse the grammatical meaning of AND and logical meaning of AND. If papers dealing with SOLAR CELLS and PHOTOVOLTAIC CELLS are required and if the query formulation is SOLAR CELLS AND PHOTOVOLTAIC CELLS then papers dealing with any one of the above two topics will be lost. So the query formulation should be SOLAR CELLS OR PHOTOVOLTAIC CELLS.

**OR (= Alternation):** This is a primary means of increasing the search generalising and increasing the number of documents retrieved.

**NOT (= Exclusion):** This is a primary means of excluding the irrelevant documents. Enough attention is to be given when this operator is used, as it may sometimes eliminate important relevant documents if it is not properly used.

Table 1 illustrates how relevant documents are identified using the above search strategies.

Table 1: Examples of various search strategies

(Total number of records searched: 1891)

S.No.	Query	Search Strategy	Formulation	Remarks	No. of citations retrieved
1.	Papers on BATTERIES	Single Aspect/Single Clue	List for A = "10"	A = Area and "10" is Code No. for BATTERIES	153
2.	Papers on ELECTROPYRO-METALLURGY or ELECTRO-HYDROMETALLURGY	Strategy of the Logical sums	List for A = "40"	"40" is Code No. for OR. A = "50" is Code No. for ELECTRO-PYROMETALLURGY	ELECTROHYDRO- 199
3.	Papers on CORROSION OF ZINC	Strategy of the Logical Product	List for "CORROSION" \$ T .AND. "ZINC" \$ T	-	7
4.	Papers authored by ARAVAMUTHAN, V and UDUPA HVK on BATTERIES and ELECTRO-HYDROMETALLURGY	Strategy of the Logical Product of the Logical Sums	List for ("ARAVAMUTHAN, V" \$ AU .OR. "UDUPA, HVK" \$ AU) .AND. (A = "10" .OR. (A = "40"))	-	143
5.	Papers on ELECTROPLATING published in the journals other than PLATING AND SURFACE FINISHING	Strategy of the Logical Difference	List for A = "80" .AND. .NOT. "PLAT SURF FINISH" \$ J	"80" is Code No. for ELECTROPLATING	425
6.	Papers on PLATING ON ALUMINIUM and not on ALUMINIUM PLATING	Strategy of Sequence	List for "ALUMINIUM" \$ T .AND. "PLATING" \$ T .AND. .NOT. "ALUMINIUM PLATING" \$ T	-	8
7.	Papers published during the period 1970-1980	Strategy of Greater Than and Less Than	List for Y > "1969" .AND. Y > "1981"	-	683

In the above searches, words as used in the natural language are used as index terms and no attempt has been made to search through the standardised keywords.

A sample dBase command file used for retrieving the relevant documents for any given query and the output are given in figures 5 and 6 respectively.

```

ERASE
SET TALK OFF
ACCEPT "ENTER FILE NAME" TO FILENAME
USE & FILENAME
GO TOP
ACCEPT "ENTER QUERY FORM" TO QUERY
ACCEPT "ENTER SUBJECT" TO SUBJ
SET FORMAT TO PRINT
SET PRINT ON
STORE 0 TO ROW
STORE 1 TO PAGE
STORE 0 TO COL
STORE 00 TO TOTAL
STORE 00 TO REL
@ ROW, COL SAY SUBJ
STORE 2 + ROW TO ROW
DO WHILE .NOT. EOF

STORE 00 TO COL
IF & QUERY
  @ ROW, COL SAY # USING "*****"
  @ ROW, COL + 6 SAY C-(" " + A) - (" " + AU)
  @ ROW + 1, COL + 6 SAY T
  @ ROW + 2, COL + 6 SAY J-(" " + V) - (" " + I) - (" " + P)
  STORE 4 + ROW TO ROW
  STORE REL + 1 TO REL
  IF ROW >= 89
    STORE 1 TO ROW
    STORE PAGE + 1 TO PAGE
    @ ROW, 5 SAY "PAGE:."
    @ ROW, 12 SAY PAGE
    STORE ROW + 2 TO ROW
  ENDIF
ENDIF
STORE 1 + TOTAL TO TOTAL
SKIP
LOOP
ENDDO
QUIT
    
```

Fig. g Sample dBase Command File

CECRI PAPERS ON CORROSION OF REINFORCEMENT

- \* 428 O 20 BALASUBRAMANIAN, T M RENGASWAMY, N S SUBRAMANYAN, N RAJAGOPALAN, K S  
PREVENTION OF CORROSION OF REINFORCEMENT IN CEMENT CONCRETE  
INDIAN ENGR 12 1954 17-21
- \* 467 O 20 RENGASWAMY, N S BALASUBRAMANIAN, T M VENKATARAMAN, H S RAJAGOPALAN, K S  
CORROSION OF REINFORCEMENTS IN REINFORCEMENT CONCRETE AND REINFORCED BRICKWORK: SURVEY OF DETERIORATED STRUCTURES  
INDIAN CONCRETE J 38 1964 233-7
- \* 610 O 20 RENGASWAMY, N S BALASUBRAMANIAN, T M RAJAGOPALAN, K S  
EFFECT OF ADMIXTURE OF FLY-ASH WITH PORTLAND CEMENT ON REINFORCEMENT CORROSION  
J NBO 11 1 1966 45-50
- \* 773 O 20 RAJAGOPALAN, K S RENGASWAMY, N S BALASUBRAMANIAN, T M ETC  
STEEL REINFORCEMENT CORROSION AND ITS PREVENTION  
JIRON STEEL ENG MAY 1968
- \* 840 O 20 RAJAGOPALAN, K S RENGASWAMY, N S BALASUBRAMANIAN, T M  
SOME ASPECTS OF REINFORCEMENT CORROSION AND ITS PREVENTION: WORK CARRIED OUT AT CECRI, KARAIKUDI  
J SCI INDUSTR RES 28 10 1969 382-95
- 1210 P 20 RAJAGOPALAN, K S RENGASWAMY, N S MURALIDHARAN, V S  
ROLE OF OXYGEN IN THE CORROSION OF STEEL REINFORCEMENTS EMBEDDED IN CEMENT CONCRETE  
INDIAN J TECHNOL 11 JAN 1973 34-7
- 1258 O 20 RAJAGOPALAN, K S RENGASWAMY, N S BALASUBRAMANIAN, T M CHANDRASEKARAN, S  
CORROSION OF REINFORCEMENT IN REINFORCEMENT CONCRETE AND REINFORCED BRICK CONSTRUCTIONS  
INDIAN CONCRETE J 48 5 1974 163-70
- 1419 O 20 RENGASWAMY, N S BALASUBRAMANIAN, T M RAJAGOPALAN, K S  
INHIBITED PORTLAND CEMENT SLURRY COATING TO PREVENT STEEL REINFORCEMENT CORROSION  
J ELECHEM SOC INDIA 26 2 1977 29-30
- 1554 O 20 RENGASWAMY, N S CHANDRASEKARAN, S CHANDRASEKARAN, V BALASUBRAMANIAN, T M ETC  
CORROSION BEHAVIOUR OF STEEL REINFORCEMENTS IN DIFFERENT POZZOLONA CEMENT CONCRETES-I, LAB INVESTIGATION  
J ELE CHEM SOC INDIA 30 2 1981 155-63
- 1555 O 20 RENGASWAMY, N S MURALIDHARAN, V S BALASUBRAMANIAN, T M CHANDRASEKARAN, S ETC  
CORROSION BEHAVIOUR OF STEEL REINFORCEMENTS IN DIFFERENT POZZOLONA CEMENT CONCRETES-II, FIELD EXPOSURE STUDY AT MANDAPAM  
J ELE CHEM SOC INDIA 30 2 1981 164-7

Fig. 6: The same output obtained using the command file in figure 5

### CONCLUSIONS

1. The information professional should have adequate computer knowledge/background in order to make the computerised handling and retrieval system a successful one.

2. While dBase II independently can be used for the retrieval system, the use of internal Word processor/Wordstar and the other programming languages such as BASIC, COBOL will be more effective.

3. Any medium level organisation can positively think of computerising its information needs as the cost of hardware is within the reach and the

sophisticated software packages for information storage and retrieval systems are available.

By suitably upgrading the microcomputer used in the present experiments, creating a comprehensive database of electrochemical information is possible.

### REFERENCES

1. Ellen Bates, *Spl Lib 74* - 2 (1983) 171
2. Allen Kent, *Text Book on Mechanised Information Retrieval System*, Interscience Publishers, New York (1966) p 167-174
3. Wilfred F Lancaster, *Information Retrieval Systems: Characteristics, Testing and Evaluation*, Ed.2 John Wiley & Sons, New York (1979)