Environment and waste management in metallurgical industries - role of databases

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ABSTRACT

Metallurgical industries are responsible for all kinds of pollutants, solid, liquid and gaseous. Due to various technology development efforts towards their abatement, significant quantum of wastes is now being re-cycled and pollutants contained within permissible norms. However, intelligent environment decisions require a comprehensive information base. This paper explains the complexity of setting up databases in environmental and waste management. It also mentions some of the prominent databases available world-wide and in India. Two major initiatives in India on environment databases i.e. ENVIS and TIFACLINE have been described. There is a good potential for India to become a global player in this area.

INTRODUCTION

The decades of the 1960s and 1970s have been marked by the intensification and spread of awareness on the hazards of pollution. There has also been growing perception of "Environmental" problems, based on a recognition of the importance and complexity of the interrelationships between mankind, the global resource base and the encompassing environment. Thus, the last 2-3 decades witnessed the rebirth of environmentalism, not as a unitary movement but sectionalised into diversity of groups and ideologies. As a result, the first UN Conference on Human Environment was held in Stockholm in 1972.

In India, it was known from Vedic times that Nature and Humankind (i.e. "Prakriti" and "Purush") form an inseparable part in the life-support system. This has five elements; air, water, land along with flora and fauna which are inter-connected, inter-related and also inter-dependent. They have co-evolved and co-adapted. However, Indian policy planners and industry only took major steps in this direction after a decade of the UN Conference by holding the first National Environmental Congress in 1982. A little before this conference, the importance of minimizing pollution was formally recognised by the Government of India in the Industrial Resolution of 1980 followed by the Environmental Act (protection)1986.

Metallurgical Industries — their critical role

It is a matter of great concern that primary metallurgical industries top the list of 20 highly polluting industries notified by the Central Government. Thus, they require prior clearance from the Department of Environment as well as Pollution Control Boards for setting up an industrial unit. It is, therefore, most appropriate that a seminar has been organised to focus on this segment of industry, which has perhaps in its fold all kinds of pollutants i.e. solids, liquids, gaseous as well as noise (besides intense heat and dust!) and that too, in "mega terms" which requires a well conceived and systematic approach for abatement. This calls for taking intelligent environmental decisions and implementing them in right earnest, which in turn, have to be based on a factual information base of past and current data vis-a-vis standards and norms of different polluting parameters in the industry.

Role of Databases

Except for a few starting discoveries all scientific pursuit targeted towards a better quality of life for mankind is based on incremental additions to the vast, existing "knowledge base". Technology development has to necessarily depend on a systematic monitoring as well as analysis of all available past and current data and aim at improvements based on R&D work being carried out world-wide. Any professional must keep himself and his organisation up-to-date with the latest developments in his or her field of operations. In many industries there are several thousand journals, directories, conference proceedings and market reports that have to be regularly scanned. With today's globalisation of industries, this has become a difficult and time consuming task. The solution is to have "Information" literally at one's finger-tips through a database : thanks to the rapid advances in computers and communication technology which have effected a quiet revolution in the areas of information collection, analysis, storage and their quick retrieval towards a more realistic decision making system. With the recent advent of satellite communication, it is now possible to access "Online" any of international databases and have information on virtually any field of activity around the world within a few minutes.

Databases on Environment and Waste Management

Unfortunately for mankind, hazardous wastes were handled for many years on an "out of sight, out of mind" principle until a few well published instances of indiscriminate or illegal disposal brought this subject into public domain.

Environmental irregulations, rules and codes of practices proliferated along with regulatory bodies who were suddenly confronted with a quantum jump in technology and practice compared to what had gone before. New inventions, discoveries and legislations against industrial accidents and requirements for environmental

protection have caused a great increase in the need for information related to health, safety and environment.

Environmental information being extremely broad and multi-disciplinary in scope, it may not be possible for any individual organisation/agency to provide detailed information on all aspects. It is, therefore, logical to have co-ordination/linkage with various organisations capable of providing information on different specialist subjects and thus form a comprehensive, quick, responsive and wide ranging information system. Such a system improves the accessibility and use of environmental information.

The development of an information system on environment is, therefore, quite complex and distinct from the development of information system in particular areas, on relating to specific projects or problems. The system has to take into account the specific information requirement of each development sector so far as it's relevance to environment is concerned.

A further complexity in setting up an information base on Waste Management is the problem of defining "Wastes" based on different perceptions as well as the legal standards existing in a particular country. As an example, it is extremely difficult to draw a dividing line between "wastes" and "hazardous wastes". In order to clarify this point and elaborate how some wastes could be recycled through process design, it would be useful to categorise wastes. This would also indicate the complex nature of setting up a database on this subject.

Types of "Waste"

Most processes that convert a raw material into a saleable main product will also produce wastes. However, we tend to categorise waste products rather loosely, as illustrated below :

Raw material	-	Metal ores
Main product	-	Purified metals
Waste products	-	scrap, slags, fume, stack gases, electrodes, phenolic and other liquid effluents, cells, gangue-materials etc.

Perhaps, the above wastes can be divided into three groups as follows :

Group-I - Easily re-cyclable wastes, like ore fines, flue dust and return sinter

Group-II : Wastes with some potential for recycle or use e.g. metal scrap, slag, spent catalysts, tars etc.

Group-III : Wastes that are difficult to recycle or have no (present) economic value, .e.g. Over burden in mines, acid tars, gangue materials, still bottoms etc.

The above illustration give a flavour of the complexity and technical depth required before setting up a database on this subject.

International Database

Rapid change in public awareness and the consequent technology development efforts in combating pollution and handling wastes led to setting up of databases specifically on Environment and Waste Management. The most popular and comprehensive database on this subject is ENVIRONLINE which is hosted by several International database service agencies like DIALOG, ESA-IRS, STN etc. Before we describe database agencies with particular reference to databases related to environment, pollution etc. it may be interesting to have a look at the most prominent database in this area.

Enviroline

Time Span	-	1971 to-date
File Up-date	-	Monthly
File category	-	Bibliographic

Enviroline is concerned with all aspects of environmental sciences. It provides indexing and abstracting coverage of more than 5000 international primary and secondary sources/publications. It contains items on technological and policy oriented aspects, renewable and non-renewable, marine environment and pollution planning etc. Some of the international database service agencies, which provide easy and instant access to accurate up-to-date and vital information on environment besides other areas of Science and Technology are mentioned below.

Dialog

The DIALOG Information Retrieval Service in USA has been serving users since 1972. With over 450 databases from a broad range of disciplines ranging from agriculture to engineering and even travel, it includes one on Energy and Environment. It also includes ENVIROLINE.

STN International

The Scientific and Technical Information Network is an online service providing direct access to more than 160 databases. It provides several unique features like "CAS Registry Numbers" which can be used as a link between databases or "STN database clusters" having similar databases covering a broad subject area. The cluster on 'Environment' for example, covers 30 databases like ABI-INFORM, POLLAB, MEDLINE which include aspects related to environment..

ESA-IRS

The European Space Agency Information Retrieval Service, ESA-IRS is the market leading European online host for the provision of information to the scientific, technical, industrial and institutional communities in Europe and throughout the world. It has more than 200 databases and databanks in a broad range of subjects and powerful search capabilities.

The ESA-IRS has information from the world's best known scientific and technical databases containing more than 50 million records. On the area of Environmental Sciences, there are some 17 databases likely, ENVROLINE, POL-LUTION etc. A few databases related to some aspect of enviro are only available on ESA-IRS like ACOMPLINE/URBALINE, AFEE and AGENDA 21 (which is an 800 page list of environmental programmes for the 21st century!).

Indian Scenario

As compared to the developed world, the position regarding setting up of databases in India is rather dismal. For an information environment primarily dependent on an informal dissemination of knowledge till some time ago, an urgent need was felt to create an efficient system for the collection, collation and value-addition of technology information towards technology development efforts in India. While a few location specific databases of bibliographic nature do exist in the country, information on technology along with some economic parameters were not available.

Scientific Databases*

Even though, we have started late, it is encouraging to note that in the last few years several "User-oriented" database services have been set up in India, including some in the private sector. It is indeed a happy augury that several new database services are now being offered both to the scientific as well as the business community. The names of a few prominent database services in India are mentioned below :

- *Indian National Scientific Documentation Centre (INSDOC), New Delhi* - It provides computerised access to titles of research papers in various standard journals.

- *Biotechnology Information System (BTIS)* - taken up by the Department of Biotechnology.

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* *The databases are only indicative and not a comprehensive list.*

- *Environmental Information System (ENVIS)* - compiled by the Department of Environment.

- *Indian National Agricultural Bibliography (INAB)* - compiled by the Indian Council of Agricultural Research (ICAR).

- *Databank on Toxic Chemicals (DABTOC)* - compiled by the Industrial Toxicology Research Centre (ITRC).

- *National Information System for Science and Technology (NISSAT)* - under the auspices of the Department of Scientific & Industrial Research (DSIR).
- *TIFACLINE* - Technology database set up by Technology Information, Forecasting and Assessment Council (TIFAC) of the Department of Science and Technology.

Database Services on Business Information

In addition to the above, several private sector agencies have directed considerable efforts in compiling Indian business information related to company profiles, stock market operations, tender information, current topic abstracts & SDI services, export-import data etc. Some of the major initiatives are :

- *Dataline & Research Technologies (India) Ltd. (DART)* - they have records on over 4200 companies and their performance over the past five years.

- *Confederation of Indian Industry (CII)* - have joined hands with European community to set up Technology Information Centre (TIC).

- *Capitaline* - database on company information and Indian business scenario, compiled by the publishers of Capital Market.

Indian Databases on Environment and Waste Management

Even though, this subject is fast occupying a prominent place in most of the databases, particularly those related to the manufacturing sector, it may be useful to give some detailed information on two major initiatives taken in India.

Environmental Information System (ENVIS)

Realising the importance of Environmental information, the Government of India, in December 1982 established an Environmental Information System (ENVIS) as a planned programme. The focus of ENVIS since inception has been on providing environmental information to decision makers, policy planners, scientists, engineers and research workers all over the country.

ENVIS is a decentralised system with a network of distributed subject-oriented

centres ensuring integration of national efforts in environmental information collection, collation, storate, retrieval and dissemination, avoiding duplication of efforts. Presently the ENVIS network consists of focal point at the Ministry of Environment and ENVIS Centres set-up in different organisations/establishments in the country in selected areas of environment. These Centres have been set up in the areas of pollution control, toxic chemicals, ecology, environmentally sound and appropriate technology, bio-degradation of wastes and environment management.

Presently there are 20 ENVIS centres, each having different areas of specialisation. The two centres which are closely related to metallurgical industry are :

a) National Environmental Engineering Research Institute (NEERI), Nagpur - has a database on solid waste, including hazardous waste.
b) Central Pollution Control Board (CPCB) - on control of pollution (Water, Air and Noise).

TIFACLINE : Information Services : TIFAC Initiatives

Technology Information, Forecasting and Assessment Council (TIFAC) was established in mid 1988 as an autonomous organisation under the aegis of the Department of Science and Technology, Government of India to spearhead the national initiatives in technology information and technology planning. Towards such a mandate, TIFAC has undertaken a number of technology status reports and techno-market surveys in the areas of prime importance viz. Biotechnology, Materials, Instrumentation and Process Control, Energy and Environmental Technologies etc. Such value-added specialised technology documents have been prepared under the active guidance of expert groups specific to the technology area.

Realising the urgent need for creation of an efficient system for collection and analysis of technology information, including cost and other economic aspects towards technology development efforts in India, TIFAC had taken up an important project for creating an on-line, interactive, spatially dispersed but nationally accessible technology information system : TIFACLINE.

"Information edge" - that's precisely what TIFACLINE aims to offer : a standardized package in a structured format with easy accessibility and timely availability. Identifying INFOWARE as one of the key factors towards strategic decision making, TIFACLINE aims to cater to the information needs of the Government Executives, Corporate Managers and R&D Planners by identifying business opportunities, emerging as well as obsolescence of the technology, raw material usage, product profile and market scenario.

TIFACLINE builds on the existing expertise available at various centres of excellence across the country. Thus, this project has inducted partner institutions as data producers on specific technologies as per their areas of specialisation. A data producer is equipped with regular technology scanning mechanism and it can deliver timely, updated information on a specific technology.

TIFACLINE has now entered the operational phase. For wider dissemination as well as updating of technology records, it has joined hands with CMC Limited, the premier information technology company in India. So far, five databases have already been launched on the following areas :

Technology Areas	Agency
• Composites	
- Technology Records	NAL, Bangalore
- Patents base	CMC Ltd., Bangalore
- Literature base	NAL/CMC Ltd.
• Food Technology	CFTRI, Mysore
• Non-Ferrous Materials	MRSI, Hyderabad
• Energy	TERI, New Delhi
• Environment Technologies	NCL, Poona

In addition a few supplementary databases have also been set up by TIFACLINE :

• Expertbase	TIFAC, New Delhi
	CMC, Bangalore
• Standards directory	BIS, New Delhi
• Technology Sourcing Worldwide	CMC Ltd., Bangalore

TIFACLINE - Environmental Database

Nearly 500 records have been created in this database and the information coverage is
- Aerobic systems
- Anaerobic systems
- Air pollution systems and control
- Waste gas disposal systems
- Solid sludge disposal systems
- Equipment & Machinery.

A typical listing of some of the records in this database related to metallurgical industries is given at Annexure I.

Knowledge based reports of TIFAC

In addition the database mentioned above, TIFAC has generated more than a 100 Techno-Market Survey reports on different aspects of technology, including a few related to Envrionment.

Code No.	Titles of TIFAC Report
• S:030	Energy recovery systems including hot gas clean up (in steel industry)
• TMS:014	Industrial raw water treatment (in 3 volumes)
• TMS:047	Application of technology for recycling of Nickel used in Electroplating, Electrolysis & Electroforming process
• TMS:017	Technologies for disposal of thermal power station fly ash
• TMS:080	Application of bio-technology for water treatment
• TMS:056	Air pollution control instrumentation

Besides the above reports, each nodal centre for the TIFACLINE database has a large number of records pertaining of Environment Engineering in their own field of activity. As an example, database on Non-ferrous Materials at MRSI (DMRL Campus) Hyderabad, has compiled a good collection of technological articles related to waste management/recycling of non-ferrous metals. A typical listing of such records is given in Annexure II.

CONCLUSION

Although, there are nearly 10,000 International databases on a wide gamut of subjects including a large number related to Environment, it is indeed sad to note that there is no database from India which is recognised worldwide. We can and should change this.

In fact, use of databases in hard copy form in India is perhaps the highest amongst developing countries. The journals subscribed by the libraries of S&T institutions have many overlaps. This would not have been a cause for worry but for the fact that Library budgets are unable to cope up with annually increasing cost of journals and books, particularly those from abroad. Thus, there is an urgent need for establishing effective networks as well as "easy to-access", "User-friendly" services for quick information retrieval.

With our immense reserve of scientific and technical personnel (oft mentioned as fourth in the world!), it is possible to make a major dent in the field of database services, if we select and nurture the teams carefully. There is good potential for India to derive competitive advantages for rendering information related services in the global market.

ACKNOWLEDGEMENT

REFERENCES

[1]   R. Kerry Turner : "Sustainable Environmental Management — Principles and Practice", published by Belhaven Press, London in association with ESRC.
[2]   T.N. Khoshoo : "Environmental Concerns and Strategies", published by Ashish Publishing House, New Delhi.
[3]   J. Bromley in "Hazardous Waste,Management Handbook", edited by Andrew Porteous. pp. 256.
[4]   Harjeet Singh : "Environmental Information System (ENVIS) - Infoterra National Focal Point for India", Ministry of Environment and Forests, New Delhi.
[5]   Y.S. Rajan and others from TIFAC :
       "Experiences of India and TIFAC in Technology Monitoring" presented in the UNIDO meeting on Cooperation in Technology Monitoring in Developing Countries, 22-25 November, 1994.
[6]   Jagdish Shettigar : Industry Initiatives in Controlling Pollution published by ASSOCHEM.
[7]   STN International Database Category, 1994.
[8]   DIALOG Database Category, 1994.
[9]   ESA-IRS an overview : Directory 1993.
[10]   Database on Environmental Technologies, TIFACLINE.