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SUPPORT SYSTEMS FOR DECISION AND NEGOTIATION PROCESSES

Preprints of the IFAC/IFORS/IIASA/TIMS Workshop

Warsaw, Poland

June 24-26, 1992

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VOLUME 1:

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DESIGN OF AN INFORMATION AND DECISION SUPPORT SYSTEM FOR EMISSION CONTROL MEASURES

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OBJECTIVE

Due to technical progress and to the evolution of legislation environmental technologies are developing very rapidly. Information on the available emission technologies and the experience with the application of these control technologies are needed by authorities and operators of small and medium sized combustion installations.

National authorities have recommended that the development of the state of the art in emission reduction should be documented and made accessible on-line (WUI, 1986). The European Community has also instructed Member States in its Directive (EEC, 1984) to exchange information regarding their experience and knowledge on techniques to prevent air pollution.

For documentation, analysis and evaluation of the present state of the art and its development, an information system for emission control measures has been conceived and developed in conjunction with selected industrial users and administrative institutions using modern information and communication which offers unexperienced users fast and qualified access to the information on environmental technologies without using special search languages (especially information on the capacity and potential of various methods). For the air pollution sector emission control systems for emissions of particulates, sulphur dioxide and nitrogen oxide of small and medium-sized combustion systems from stationary sources have taken on a pilot function.

The concept as a whole is spread over four levels with an increasing outlay and degree of complexity (see Figure 1).

In coordination sessions with representatives of industry (operators) the importance of operating experience as a basis for the data bank in particular was emphasized. Therefore the planned environmental information system will be mainly built up relying on operating experiences from the relevant branch of industry. Furthermore a working party has already been established for project assistance with representatives of industry, hosts and authorities.

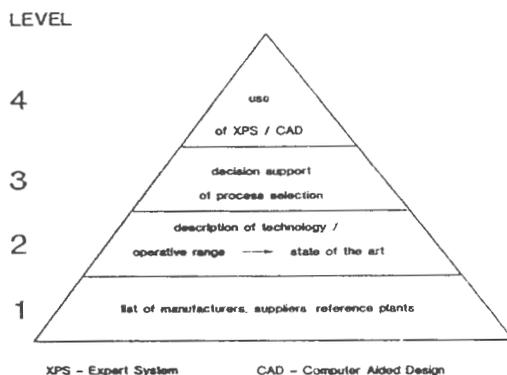


Fig. 1: 4-Level-concept of the environmental technology information system

In a pilot phase firstly the two levels have been completed with the help of a test data bank on a personal computer. Secondly the information of these two levels is used as a decision support system at present being developed. In addition, the conception for an online-data bank will be worked out. In a later phase the data bank service can be extended to other environmental areas such as all air sectors, soil and water.

DEMANDS TO THE SYSTEMS

Together with some of the test users from the established working party from industry, hosts, consultants and authorities the demands to the test data bank have been compiled. These are:

- information about alternative technologies,
- representation of the state of the art,
- technical and economical evaluation,
- user-friendly interface,
- easy access,
- high flexibility.

In dialogue with the test users, the demands have been checked and specified, since some of the potential users have less experience in dealing with computers and online data banks. The main results of these dialogues show that emphasis is put on operating experience with emission control technologies of stationary combustion systems from 1 to 50 MW_{th} and on an easy handable user-interface without any program language. An important element of the technology description is the integration of flow sheets, because a graph gives a survey on the whole cleaning system.

The general demands addressed to technology data banks are to describe alternative technologies and to show the state of the art of existing systems.

The access to the data bank with an efficient user-friendly user interface raises the acceptance of the user groups.

The exact and clear modelling of the applied technologies requires structured parameter lists (data sentences) and tables. Thus, data handling as well as access can be arranged flexibly. The structure of the data sentences uses the logical sequence of the combustion-emission control system. Here the emission control technologies are classified into NO_x reduction, flue gas desulfurization, and dust reduction.

Since the process categories include different technology parameters and since it is of no use to the different processes in one rigid data sentence, separate data sentences have to be created for each process category and every table. The comparison of the different emission control technologies is guaranteed by taking a consequent sequence of general and specific information of both technical and economic parameters.

For the decision support system both combustion installation and emission control measures have to be modelled by numeric parameters. These parameters depend on the criteria for decision making and cover technical and economical data. This system shall show to the user the technical possibilities of emission reduction for a certain combustion installation and shall select cost-efficient emission control measures.

DESIGN OF A DECISION SUPPORT AND INFORMATION SYSTEM FOR ENVIRONMENTAL TECHNOLOGIES

The greatest problem regarding the acceptance of such information systems is the access to the information, which mostly requires a special search language and thus hinders occasional users to work with these information systems. Therefore the emphasis lies on an efficient, user-friendly user interface, which should facilitate occasional users to obtain desired information speedily and easily. Further emphasis lies on an appropriate modelling of the emission control measures in a data bank system. For this purpose, it is necessary to divide the various emission control technologies into particular technology categories. Then every technology category is transformed into a specific technology module (data sentence) for achieving the best transformation into a data bank system and to obtain continued flexibility in view of new technological developments.

Finally potential users emphasize that also process flow charts should be integrated in the subsequent technology description.

At the moment, no integrated commercial software package fulfills these requirements, so that the user-interface essentially has to be programmed by ourselves. The graphics data bank has to be linked by an external interface.

The important items of the implementation of the information system should be characterized.

The main item is the control of the information system by cursor and function keys, so that it can be dispensed with almost complete text input and search language.

The technology description of installed plants consists of 3 steps which make clear the hierarchical structure of this system:

1. Selection of a technology/reference plant from overview listings
2. Configuration of the reference plant
3. Technology masks of plant components

Material balances, process flow sheets and addresses can be called-up by function keys from every technology mask. Flexible text fields for the description of non-standardised parameters can be obtained in special windows by cursor and function keys.

The module "general description of technologies" shows the alternatives of emission reduction and their operative range. In the decision support system emission control measures are selected according to legislative, technical and economical criteria, depending on the input data of a specific combustion installation.

The development of this information system is being supported by the "European Research Centre for Air Pollution Prevention Measures", Karlsruhe.

LITERATURE

(WUI, 1986) Report of the Working Group "Economic Development - Environment - Industrial Production" in commission of the government of Baden-Württemberg (FRG); Stuttgart 1986 (in German).

(EEC, 1984) Guideline of the European Council for prevention of air pollution by industry, June 28th, 1984, in: official gazette of the European Community, Brussels 1984 (in German).

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