OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as "developed", "industrialized" and "developing" are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

18262

ESTABLISHMENT OF COOPERATIVE RESEARCH DATA - BASE FOR THE SUPPORT OF JOINT RESEARCH IN THE FIELD OF FINE CHEMICALS.

by

G.D.Honti

consultant

September 1989.

2/53

TABLE OF CONTENTS.

	Page
1./ Introduction	1
2./ Summary	1
3./ Users requirements	3
4./ Information system	5
4.1./ Content of the information system	5
4.1.1./Product data	5
4.1.2./Enterprise data	5
4.1.3./Process data	6
4.2./ Structure of the information system	7
4.2.1./System outline	7
4.2.2./Information gathering	8
4.2.3./Information processing	9
4.2.4./Data entry	9
4.2.5./Outputs	10
5./Structure of the computer database	11
5.1./ The file system	11
5.1.1./ Data files	11
5.1.1.1./Directory files	12
5.1.1.2./Tree files	12
5.1.2./ Auxiliary files	12

5.2./ Program system 13

5.2.1./ Data entry and administration 13

5.2.2./Use 17

5.2.2.1./ Product information 17

5.2.2.2./ Enterprise information 19

5.2.2.3./ Process information 20

5.2.3./General features 20

5.3./ Hardware and software requirements 21

6./ Implementation. 22

6.1./ Information gathering 22

6.1.1./Sending out questionnaires 22

6.1.2./Processing the information 22

6.2./ Creation of a computerized information system. 22

6.3./ Operation of the system. 22

Annexes:

1./Questionnaires.

2./Selected trees.

1./INTRODUCTION

The chemical industry worldwide is rather well documented. Information on the production, who is producing what, export volumes, process availability, raw material and intermediate availability can be assessed from various sources. The data are not always fully reliable and great effort is needed to verify, compare and asses the information gathered from different sources. There is however a field, from where the information flow until now was less abundant and it was not always easy to find out, if a product or a process was available and from where - and this field is that of the socialist countries: East Europe (GDR, Poland, Checkoslovakia, Hungary, Rumania, Bulgaria), the Soviet Union and in the Far East, China, Viet-- Nam and North Korea.

It was thought, that UNIDO could fill this gap by devising an information system based on microcomputer application and on questionnaires sent out to the central authorities and to the individual enterprises in the countries mentioned.

The present work gives the outline of such an information system and presents proposals for the future work to be done which is necessary to design in detail and implement this information system.

2./SUMMARY

Soaring from the aim proposed, the study outlines the information system needed.

First the necessary information content is defined with regard to the user's requirements, but not only in its extent and nature, but also the individual data and other information requirements are identified. Three groups of data will be collected and stored for retrieval:

- enterprise data
- product data
- process data

A special feature of the information content is the inclusion of the so-called manufacturing trees, a sort of graphic information giving a clear picture of the relationship between the different chemicals intervening in the given production process as starting materials, intermediates or end products. The necessary questionnaires for gathering information have been designed and can be found in Annex No.1. They identify at the same time the information content of the system. Annex No. 2. contains more than thirty manufacturing trees for the most important products.

Second, the most appropriate structure for this information system is selected. After defining the information sources and the methods for gathering them, an information processing step is included and defined, which has the important task to provide for the reliability and correctness of the informations entering the system and also for the unequivocal and faultless coding and labeling of the information for sure and easy retrieval. The methods for data entry and information retrieval as well as for user service are outlined. The whole system is designed for safety of information, impeding all tampering.

The core of the information system is the computerized database. It will be composed of a file system and a program system. The file system contains data files for storing the information defined above and auxiliary files for accessing them. The program system is so designed, that all input operations: data entry, editing, or other, as well as all retrieval operations to access the stored information and present them in forms required by the users should be made by people having no special knowledge either in computer technics, or in chemical science. Menu driven, user-friendly system is outlined. This will allow for the dissemination of the information not only from UNIDO headquarters, but the system can be posted in form of diskettes to the different national and regional centers for direct use.

The study outlines also the hardware and software requirements
A normal personal computer with a hard disk is needed only, with the usual peripherals. The program system should be made using to the greatest extent possible existing software packages.

For implementation of the system the study proposes to begin with sending out of the questionnaires of Annex 1. Attending for the answers, the whole information system, including the necessary software should be worked out. Then the processing of the first information flow should follow. After completion, including checking of the software, regular operation should begin. Updating, extension and modification of the system forms part of the operation.

Manpower requirements are defined by the study as follows:

- for setting up and implement the system: two and a half man-months consultant time.,
- for information processing: one man-month of consultant time every year.

Normal operation, data entry, retrieval, reply to user's demands will demand only secretarial type of work, about three to six man-months per year, distributed more or less evenly over the year. So it could be part of the work load for one staff member.

3./USERS REQUIREMENTS.

We can start from the assumption that the potential user is engaged or intends to be engaged in a research or development project aiming at the implementation of a given manufacturing facility. For that purpose he probably will first buy the product itself, at the very beginning for laboratory investigation, then for market research and introduction. In the next stage he will need to know, which raw materials and intermediates are needed for the production, are they available and where. The processes available for the manufacturing of the product and the process owner are the informations which are requested next.

There can be another approach from the potential user. He may have some well defined raw materials and /or intermediates. Then the question he will ask is: what can I manufacture from these materials? The questions for the other materials necessary for the manufacturing, about their availability, the processes and licensors involved follow.

Summarizing both cases, the information system to be set up has to give answer to the following questions:

- who is manufacturing the product (raw material, like phenol for manufacturing caprolactam and further nylon 6; intermediate,like dimethylterephtalate for polyester fibre production or end product, like Alachlor, a pesticide);
- what are the raw materials and intermediates necessary for the manufacturing of a given product, like for the product polyacrylonitrile fibre acrylonitril is the monomer, but the raw materials are methane, ammonia and air;
- who is manufacturing these raw materials and intermediates, e.g. who is delivering the styrene and the butadiene necessary for the production of the SBR synthetic rubber;
- what can be manufactured from a given raw material or intermediate, e.g. from ethylene one can make polyethylene, PVC, ethylene-oxide, styrene (with benzene) polyols, etc.;
- which are the other materials needed and where are they available, like the benzene for the styrene production from ethylene in the previous case;
- which processes are available for the manufacturing, e.g. for the production of adiponitrile four different processes are presented in Annex No.2.;
- who is the licensor of the processes involved, e.g. for Alachlor, licensors can be found in Hungary (Nitrokemia).

These requirements will define the content and structure of the information system, but also the method and form, how the user can have access to these informations, will be defined by these requirements.

The simplest way is to ask questions by writing or by phone from the appropriate service of UNIDO and get the answers by the same way. It is however also possible to give copies of the database to individual users (regional centers and/or national institutions in the developing countries) who can then directly give the information to the client. This approach makes mandatory the development of an information system and data base in a very user-friendly form, demanding no special knowledge in computer technics and a regular updating service for the local centers.

Since the aim is anyway, that even at the UNIDO headquarters, the persons dealing with the system should not be necessarily computer experts, we started from the viewpoint that the system should be designed to be user-friendly and its utilization should be possible without special knowledge in computer technics and programming.

4./INFORMATION SYSTEM.

In order to design an information system, we have to define its

- content,
- structure,
- access mode,
- gathering method,
- processing method.

We shall deal with these issues in the following sub-chapters.

4.1. CONTENT OF THE INFORMATION SYSTEM.

According to the precedings, the information system should store information on :

- products (including raw materials, intermediates and end products;
- enterprises, engaged in manufacturing, R&D, engineering,contracting, training and licensing;
- processes used in manufacturing products;

4.1.1./ Product data.

For each product the following data are required:

- product name;
- product code;
- manufacturers name and address;
- processes used for manufacturing;
- place of the product in manufacturing processes.

The first four items are self-explanatory, but the last asks for some explanation.

In order to define, what can be done with the product in question or how can it be produced from which materials, the processes must be found, where the product appears, either as raw material, intermediate or end product. Therefore among product data, all the information must be included, which defines the role of the given product (starting material, intermediate, or end product), and its place (which are the chemicals it is produced from; respectively what is the next chemical made directly from it) in the processes, where it appears.

4.1.2./Enterprise data.

The following data are necessary:

- Name, code, acronym;
- address;
- contact person;
- products;
- processes offered;
- activity.

4.1.3./Process data.

This is a special case. Besides the usual information:

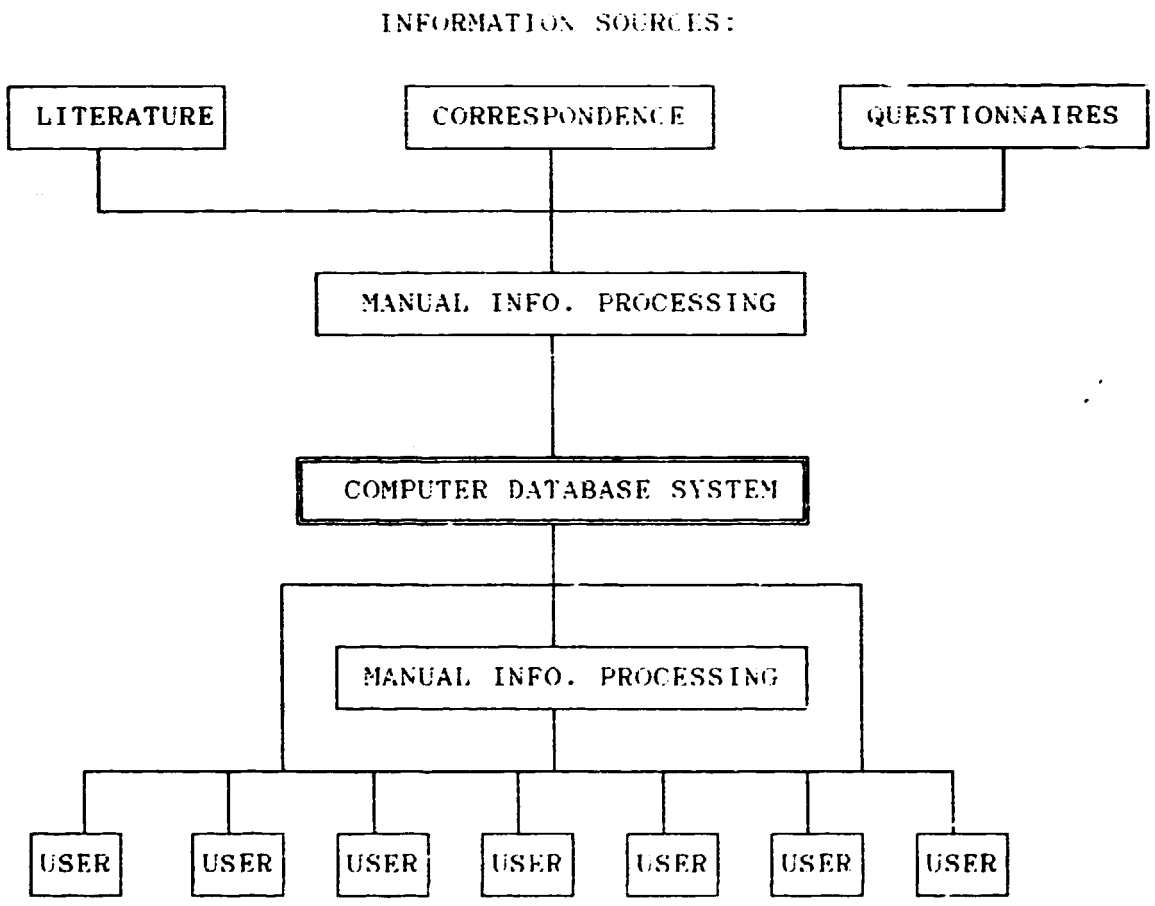
- process name, code;
- licensor's name. code; and
- process characteristics (see Questionnaire No.2.)

It is necessary to define all raw materials, intermediates, end products and by-products taking part in the manufacturing process and also establish their relationship. For that purpose a simplified flow-sheet, called production tree will be used, which can be stored in the computer memory without real graphic capabilities and can be printed on a normal matrix printer. Using the information contained in these trees, it is possible to list all processes, where a given product has a role and present the possibilities for that product. On the other hand, it allows also the display of the raw materials and intermediates needed for a given product. So e.g., adiponitrile will be found in several trees, where it is the end product and in others, where it is the starting material.

4.2./STRUCTURE OF THE INFORMATION SYSTEM.

4.2.1./System outline.

Based on the requirements discussed in the previous paragraphs, the database system should adopt the following structure



The different informations coming from the sources of information presented in the upper line of the figure enter the manual processing stage. Here an expert performs the necessary screening, selection, checking, cross- checking, coding and preparation for data entry. He must therefore have not only knowledge of the chemical industry, processes and companies, but also an adequate expertise in the database system.

The information thus processed by the expert is ready for data entry in the database system by the data entry operator, who can be a typist with a limited training in the database system.

The whole database system once established and constantly updated serves two purposes.

First the operator can use the system to give information, advice and other services for those outside the UNIDO Secretariat, especially in the developing countries, who do not intend to have their own copy of the system.

Second, potential users outside the Secretariat can acquire the system on diskettes or on other appropriate information carriers and use directly by themselves for the same purposes. A constant regular updating service is a precondition for this use.

4.2.2./ Information gathering.

4.2.2.1./ Information sources.

For the purpose of this information system three sources can be considered:

- literature
- correspondence
- questionnaires.

Literature.

Directories containing manufacturing, research, engineering and contracting organizations can be found in most big libraries. In most cases they contain little information on the countries of our present interest. The specific ones for the chemical industry or one of its sub-sectors can provide without further selection the necessary information for the data base, but a preselection is necessary with the general ones (e.g., who makes what?).

Technical literature gives regular surveys on the companies, projects and processes. There is also continuous reporting in the relevant periodicals on the same subjects. Unfortunately, here also the information on the field of our interest is not very complete. Regular lecture and monitoring of the selected periodicals is necessary to make use of this source of information, but even so, it will not give a full picture.

Correspondence.

Regular correspondence with the leading chemical companies and the national, regional, global professional organizations can be a valuable source of information. It needs however constant work.

Questionnaires.

The questionnaires from Annex No.1. can serve as the main source for the collection of the data from the companies having a substantial role on the world market.

4.2.3./Information processing.

Experience proves, that in computerized data bases, the incoming information is for a good part lost or deformed (which means either misinformation or loss of information) if not thoroughly checked and coded by knowledgeable people. A small mistake made in answering a questionnaire or a misspelled code will make the whole information content of that item irretrievable at the right place and misleadingly appearing at a wrong place. Therefore for all information from all sources a manual processing stage is included, which is intended to transform the controlled content of the information gathered into truly controlled machine readable input.

4.2.4./Data entry.

In order to avoid any possibility of tampering with the data contained in the system and and secure its reliability, the following three basic principles should be adhered to:

- all data for entry should be checked and confirmed by the responsible expert who prepares and signs the input data in form of records containing all the necessary information in a form directly readable by the computer;

- the computer prints a report on all data entry operations. The expert must check and compare this report with the original data entry sheet. The actual saving of the data in the appropriate files will be made only after his approval.

- only authorized person can make data entries.

1.2.5./Outputs.

With the same safeguarding ideas in mind, the output system should work in the following manner:

- all the files are "read only" for the user;
- use begins with the creation of a workfile dedicated to the user. He can then copy any information from all the data files in his workfile, perform any operations on them, save and print it in tables or graphics.

All information transfer to the workfiles and all operation on them has to be completely user-friendly, menu-driven and simple to learn for non-computer people.

5./ STRUCTURE OF THE COMPUTER DATABASE.

The computer database must be designed according to the tasks and aims of the whole information system. It should provide for:

- the easy and unequivocal input of the data collected,
- a storage with the minimum . memory space requirement, but at the same time with all the elasticity for further extensions,
- sure and easy access to the information stored, retrieval from all the possible aspects and their combinations.

The computer database system corresponding to these requirements, will be composed of two main components:

- the file system, and
- the program system.

5.1./ THE FILE SYSTEM.

The file system's backbone are the data files, containing all the information of the system. The data entry, the memory space management, the retrieval and combination of the individual pieces of information asks for other type of files, named here auxiliary files.

5.1.1./ Data files.

The information content of the system comprises four different type of data:

- Enterprise data
- product data
- process data

and

- product tree data.

The first three category of data can be accommodated in simple, "normal" data files, they are either of numerical or text type, called here directory type files. The product trees are of graphical nature and more complex in their nature and will be accommodated in so-called tree files.

5.1.1.1./Directory files.

The following files are necessary with the indicated content:

Enterprise file.

- name
- company code
- acronym
- headquarter address
- contact person
- activity
- main products or product groups with yearly production and export figures
- turnover
- name of processes offered for license.

Product file.

- name
- code
- List of trees, where the product is figuring, as
  - starting material
  - intermediate
  - end product
- for each tree
  - chemicals entering into the formation of the product
  - chemical directly derived from it
  - other chemicals needed in this last mentionned step
- manufacturers

Process file.

- process name
- code
- licensor
- product
- tree
- starting material(s)
- process characteristics

5.1.1.2./Tree files.

The graphic information on the process is stored as a text file in a form which can be retrieved in the original graphic form.

No other information is stored in these files.

5.1.2./ Auxiliary files.

Three type of auxiliary files are necessary:

- name files
- index files
- thesaurus.

The first two will facilitate the easy and quick access to the data files. The exact number, size and content of these files will be defined in the detailed system analysis.

The question of the thesaurus is different. Nearly all the end products (drugs, pesticides), but also many intermediates and starting materials have several chemical and quite a number of commercial names. A thesaurus, grouping them by chemical composition and identifying them by an unequivocal code system is necessary to avoid mistakes, loss of information and facilitate retrieval.

5.2./ PROGRAM SYSTEM.

The general structure of the program system is represented on the figure next page. A short discussion will allow a better understanding of this structure and of its working.

After the start of the system, the main menu offers the choice between

- data entry, and database administration and
- inquiry,

The first is open only for the operator of the database system, the second to any user.

5.2.1./ Data entry and data base administration.

If from the main menu, the database administration was chosen, the program asks for the password of the operator. This excludes unauthorized access to the input of the files.

The next menu offers selection between

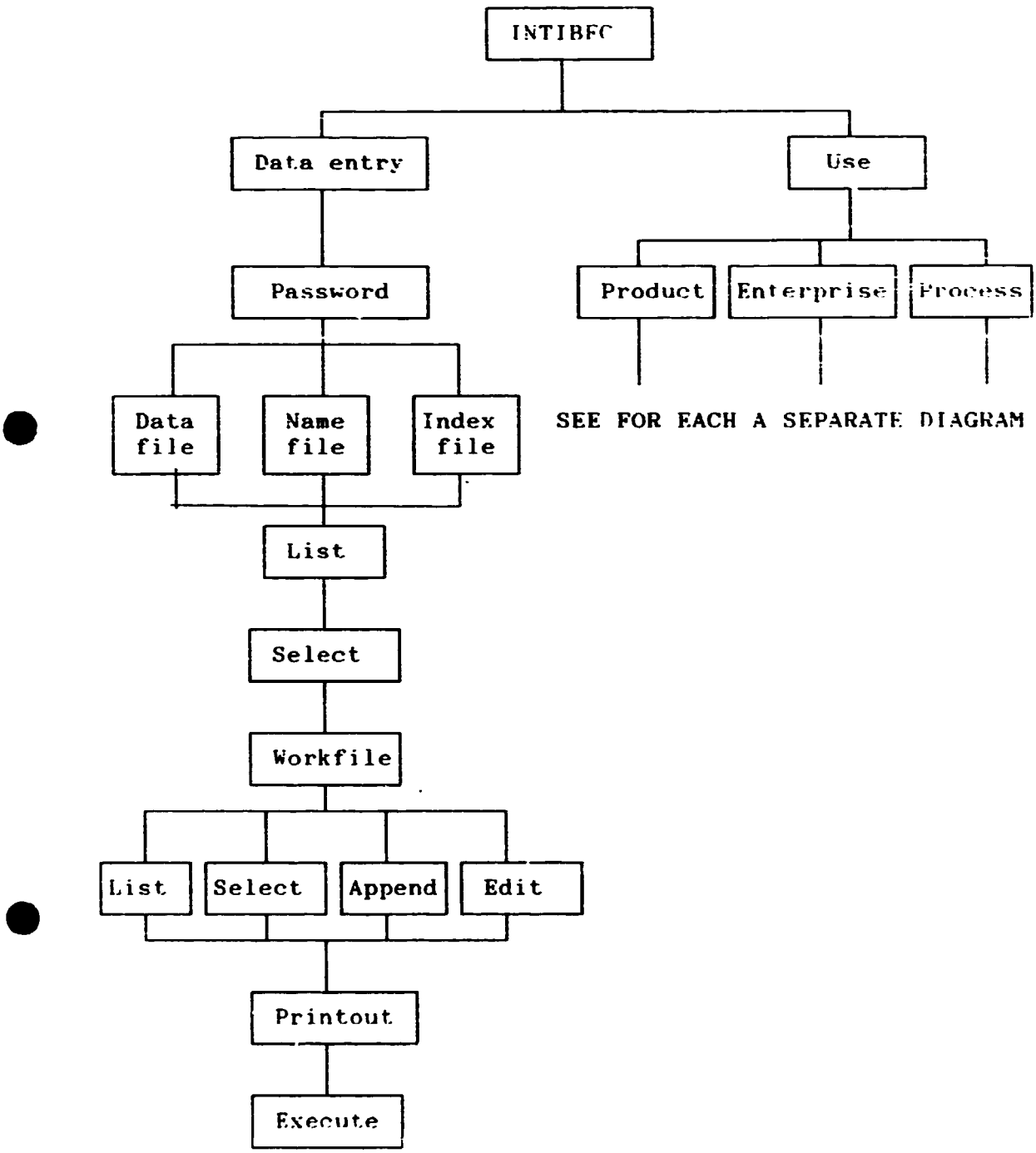
- data files;
- name files,
- index files

Then it lists all the files of the category selected and asks the operator to select the file to be updated. The program searches for the file selected and copies it in a workfile. All subsequent operations will be executed on the content of this workfile.

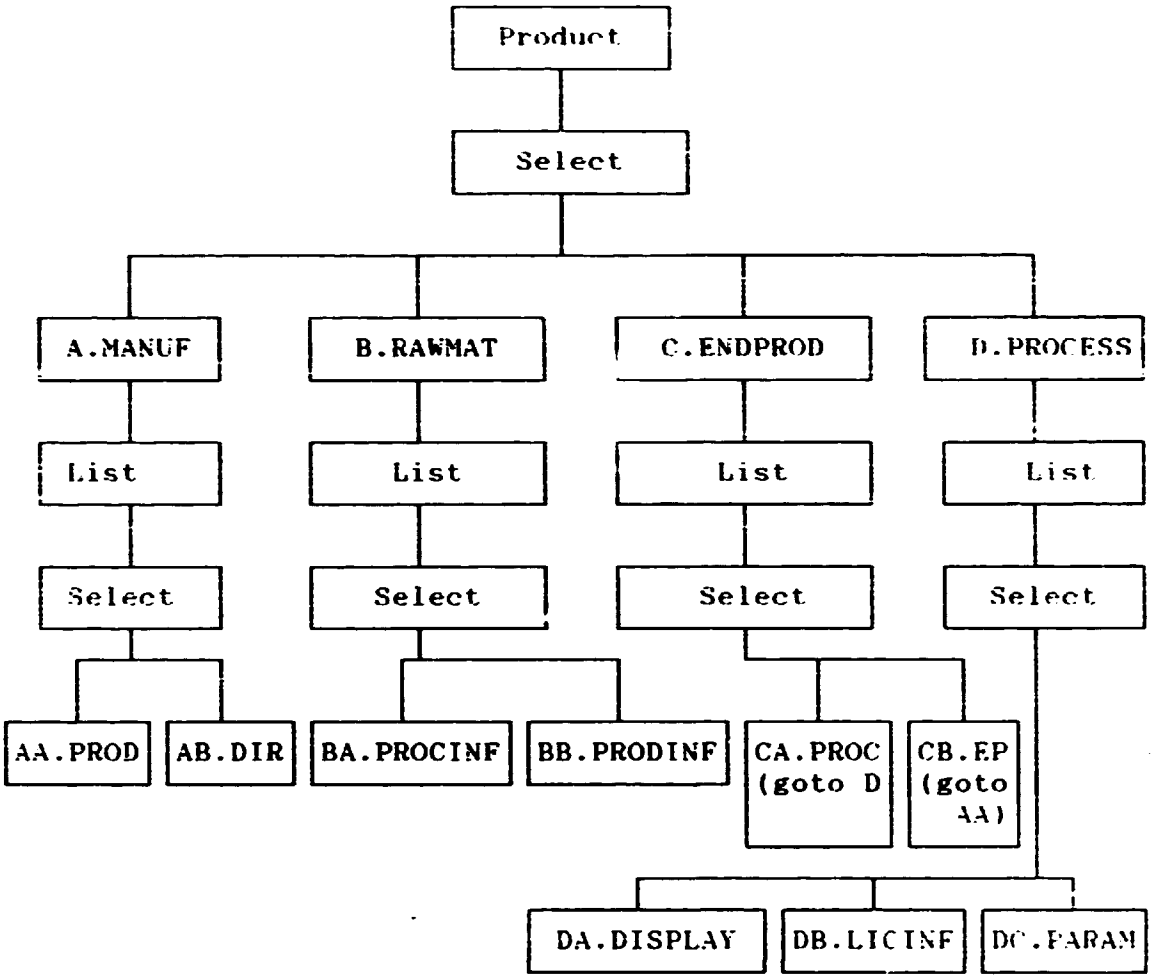
For the file selected, the following options are offered;

- list all records in the file (browse)
- select
- append
- edit

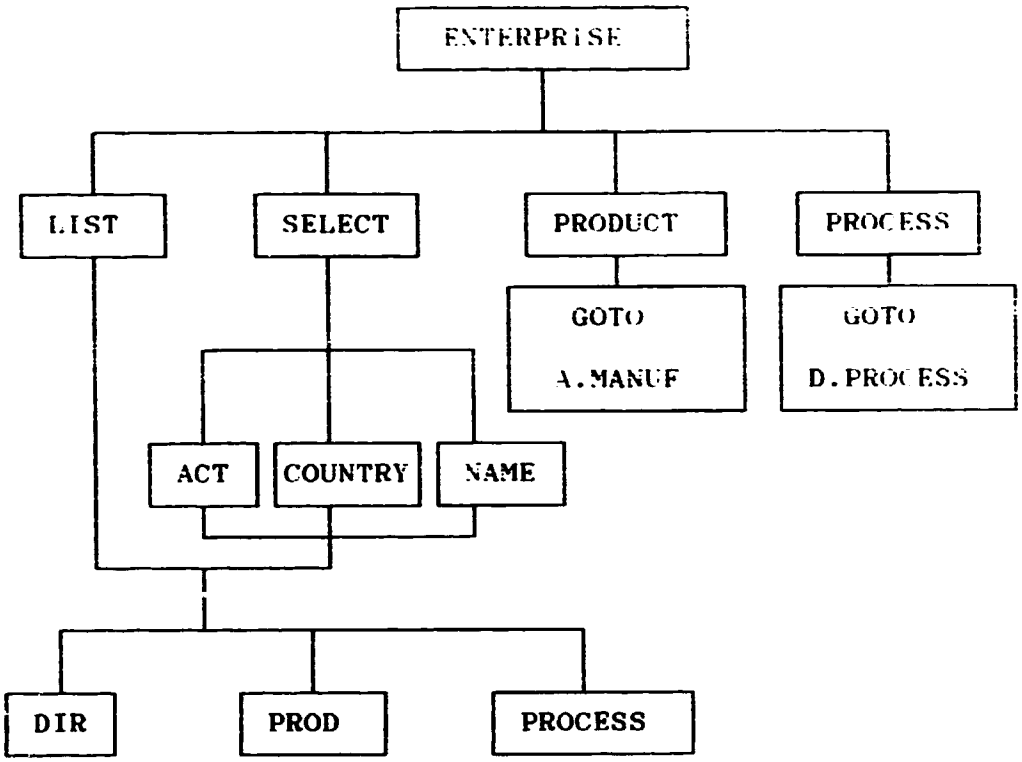
PROGRAM STRUCTURE.

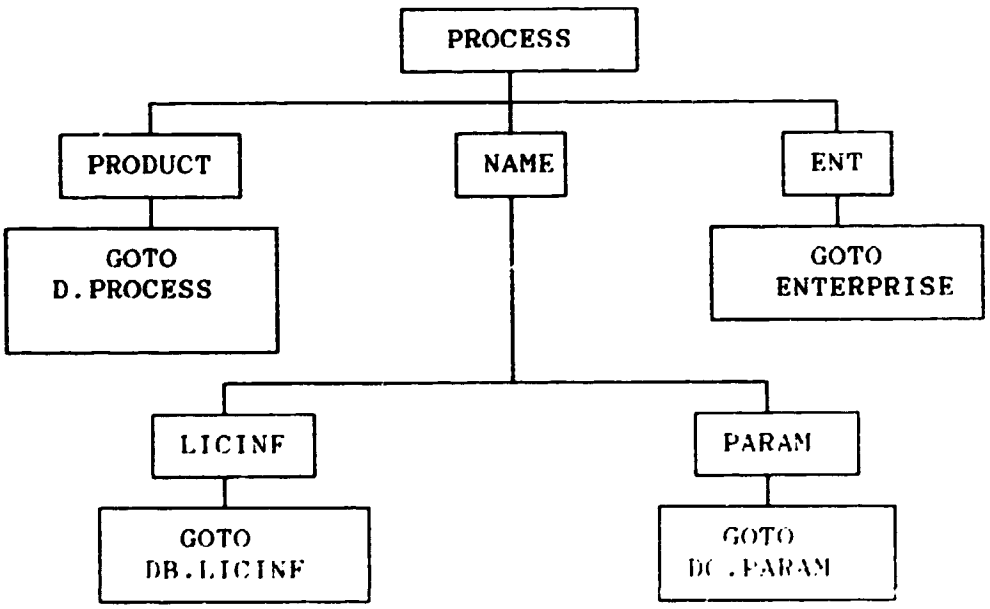


PROGRAM STRUCTURE
(Second Part)



PROGRAM STRUCTURE.
(Third Part)





For listing, the file name and the field names are displayed as headline and the records without selection shown. The display stops at full screen and resumes by pressing any key.

For selection, the names of the fields are listed and the operator chooses the selection parameter. If e.g. the product file was selected and the operator would look at all the records relating to "ethylene", he would choose the field "product" and name the product "ethylene". The program will select all the records, where ethylene is the product and will display their content. It is possible to select according to more than one parameter (field).

For appending, the program displays the headline containing the field names and the last record and waits for new entries.

In case of editing, the record(s) selected by one of the previous methods can be modified.

When the operations on a given file are finished, the operator will ask for a printout of the modifications. The printout is checked against the original update instructions, signed by the responsible expert and filed for documentation.

To replace the old data by the updated ones, a "password" gives authorization. The interim file is deleted at the same time.

5.5.2./Use (Inquiry).

The system should give answers to the questions formulated in Para 3./ So, when "Use" is selected in the main menu, the following options will open:

- Product
- Enterprise
- Process

5.2.2.1./ Informations on product.

If information on a give product is required, this can be:

A./ Who is manufacturing this product? (MANUF)
The program searches in the "Product file" for all records, where in the product field, the given product (e.g. Nylon 6) appears as end product and lists the name of the maufacturers figuring in the "manufacturer" field of the relevant records.

The next question can be either
- AA./ production, export and prices of the product at the given enterprise (PROD)
- AB./ directory data of the enterprise. (DIR)

Both questions can be put for all the enterprises listed, for those in a given country or for a single selected one.

The program will, for the selected enterprises go over to the linked "Enterprise file", look for the enterprises selected and list from the relevant fields the corresponding data either of directory or of production, etc. nature.

B./ What are the raw materials and intermediates necessary for the manufacturing of the selected product?(RAWMAT)

The program remains in the " Product file", searches for all records, where the selected product appears as end product an lists the raw materials and intermediates figuring in the corresponding fields. The process and tree names are also listed.

Selecting one of the processes listed, the following further information can be accessed:

BA./ Process information.(PROCINF) Using the link between product and process file, the program goes to the process file, looks for the process selected then follows the path described in point D./

BB./Raw materials and intermediates listed for the process selected.(PRODINF). The user selects one of them an then the same questions as for A./;AA./: and AB./ can be posed and answered following the same path.

C./What are the products which can be manufactured from a selected product as raw material or intermediate? (ENDPROD.)

The program remains in the " Product file", searches for all records, where the selected product appears as raw material or intermediate an lists the processes, trees and end products figuring in the corresponding fields.

Selecting one of the processes listed, the following further information can be accessed:

CA./ Process information (PROC). Using the link between product and process file, the program goes to the process file, looks for the process selected then follows the path described in point D./

CB./ End product of the process selected (EP). The same questions as for A./;AA./: and AB./ can be posed and answered following the same path.

C./ What are the processes available for manufacturing a selected product? (PROCESS)

The program searches in the "Product file" all records relating to the product selected as end product and lists the corresponding processes and their licensors from the adequate field.
Selecting one of them, the following options open:

DA./Display the production tree.(DISPLAY)
The program using the link between "Product file" and "Tree file" goes over to the latter, retrieves and displays the corresponding tree.

DB./Information on the process licensor.(LICINF)
Using the link between "Product file" and "Enterprise file", the corresponding information on the enterprise acting as licensor is accessed and displayed.

DC./ Information on process technical parameters. (PARAM)
Using the link between "Product file" and "Process file", the program looks for the process selected and displays from the information content the process characteristics.

5.2.2.2./Information on enterprise.

It must be remembered, that many information on enterprises will be accessed by the other route, through product (Para 5.2.2.1.) information, so we deal here only with the cases, where the question relates directly to the enterprise. E.g., if the user is asking, which enterprises are producing a given product, or have a process for manufacturing another product,he will start by defining the product he is interested in and so follow the path indicated in Para 5.2.2.1./ and will arrive to the questions relating to the enterprises. For all eventuality,, an option is offered for those, who inadvertently have chosen this route, to reconduct them to the right path:

- are you interested in one specific product? (PRODUCT)
- are you interested in one specific process? (PROCESS)

For the enterprises directly, the information requested can be relating:

- to one specific enterprise
- to a group of them, selected according to a given parameter
- to all of them

So first an option is offered for either listing (LIST) all enterprises or select some of them (SELECT).
For selection, three possibilities open:

- by country (COUNTRY)
- by activity (ACT)
- by name (NAME) (one specific enterprise)

For all alternatives questions can be asked regarding:

- directory data (DIR) (address, etc.)
- which products are manufactured, exported and the prices (PROD)
- which processes are offered for license (PROCESS).

Information can be asked for one, more or all of these questions.

5.2.2.3./Information on processes.

Here the situation is even more simple. Most request for information will start with the definition of the product for the manufacturing of which it serves:

- what processes are available for manufacturing a given product (PRODUCT)

This has been provided for in Para 5.2.2.1. So here we have only to reroute the question to that path.

Another possibility is to ask for the processes offered by one selected enterprise (ENT). Then we have to reroute to the ENTERPRISE path.

The only other alternative, we have to deal with is, when information on a given process is requested. This is the NAME route, selecting the process named. Then information on the selected process can be requested either for the licensor's data (LICINF), or for the process characteristics (PARAM). This reconducts us to the paths already described.

5.3.3./General features.

The program system must be completed by all the usual facilities:

- Print
- Help
- Error message
- Save
- Export

The dialogue, menu and other texts used in the program should be placed in separate text files. This will allow easy and simple adaptation of the system to different languages and character sets. So an edition of the system in different languages (e.g. Spanish, French, Russian, Chinese or Arabic) will be possible without any modification to the program system, exchanging only the corresponding text files and character sets (fonts).

5.3./ HARDWARE AND SOFTWARE REQUIREMENTS.

The preliminary outlines led to the conclusion, that the total memory space necessary for the database would be at the beginning below 5 megabytes and with a fully developed system it would not request more than 12 megabytes. The program system itself would occupy about one megabyte or less. So the whole system is easily implementable on a microcomputer. A normal configuration consisting of:

- a personal computer with 1 Mbyte direct access memory, min. 40 Mbyte hard disk capacity and two floppy drives
- a matrix printer with graphic capabilities
- a streamer

Software should use to the maximum extent possible existing packages. E.g. menu management, file management, graphics should be used from existing systems. File system, field definitions and names, code system, linkages, menu system and the thesaurus must be developed specially for this purpose.

Installation and use would be easy in regional or national centers and would demand neither technical, nor computer expertise. First installation and regular updating could be made though diskettes dispatched by post together with user's guide.

6./ IMPLEMENTATION.

Based on the above considerations, we propose the implementation of the information system outlined. The work program proposed is as follows:

6.1./ INFORMATION GATHERING.

6.1.1./ Sending out questionnaires.

The questionnaires in Annex No. 1. are ready to be sent out to the enterprises and central organizations in the countries of interest. We suppose, that a sufficient number of addresses is available for the beginning, which can then be gradually extended. In this case, no outside help is necessary.

6.1.2./ Processing the information.

It is a job to be done once a year, when the Secretariat has collected all or most of the answers to the questionnaires. An expert could check, compare, verify the information received and prepare it for input to the computer. The time required would be one man-month. It would be useful to split this work in two parts. First, the expert should make a check of the information and in order to clarify the dubious points, formulate questions which will be sent to the partner. After having received the final answers, the remainder of the work will be done. The first part would require perhaps one week and the second about three weeks.

This operation will be repeated every year for updating and extending the information system.

6.2./CREATION OF THE COMPUTERIZED INFORMATION SYSTEM.

The time period between the sending out of the questionnaires (Para 6.1.1.) and the processing of the information first collected will be sufficient to create the whole software necessary for the system. The detailed system organization and the programming is estimated at two man-months; one month by an expert in the chemical industry having sufficient knowledge of the computer systems and one months by a programmer, preferably with a chemical background. They should work in close cooperation, prepare the software and the user's and programmer guides. They should check the system developed and assist in the first application. This last task may need some additional time, about one week for each of them.

6.3./ OPERATION OF THE SYSTEM.

Once established, the system can be run by the regular staff without external help; only the periodical processing of the data asks for an outside expert, as explained in Para 6.1.2.

ANNEX No 1.

QUESTIONNAIRES

UNIDO

QUESTIONNAIRE NO.1.

INTIBEC

Page 1.

INFORMATION ON THE ENTERPRISE

1./General Information. (Directory).

COMPANY name: _____

acronyme: _____

Headquarter adress:

Street: _____ No: _____

City: _____ P.O.B.: _____

County: _____ Telex: _____

Country: _____ Area code: _____

Telex: _____ Telefax: _____ E.mail: _____

Contact person:

Name: _____

Title: _____ Telef.: _____

2./Activity.

Manufacturing	
Research and development	
Engineering	
Contracting	
Training	

Please put a cross for yes in every line, where your enterprise is actually working on the field indicated.

3./Products.

lease fill in the corresponding figures for each of your products (main products) or product groups.

Product	Quantity		Price	
	Produced	Exported	Local	Export

Please indicate the quantity and monetary units used.

3./List of processes offered for licence.

Process name:	Product name:	Process name:	Product name:

Please fill in for every process a separate Questionnaire NO.2.

UNIDO

QUESTIONNAIRE NO.2.
Page 1.

INTIBFC

PROCESS INFORMATION.

Please fill in a separate sheet for each process!

1./General information.

	NAME
Process	_____
Licensor	_____
Main product	_____

Capacity range: from_____xxx/year to_____xxx/year

Standard capacity: _____xxx/year

Investment cost for standard capacity: _____ Million USD

2./Specific values. (for 1 ton of main product).

2.1./ Materials.

Byproducts:	NAME	xxx/xxx
No.1.		
No.2.		
NO.3.		
No.4.		
No.5.		
Raw materials:		
No.1.		
No.2.		
No.3.		
No.4.		

2.2./Utilities.

Power	_____	kwh/xxx
Steam	_____	xxx/xxx
Process water	_____	m3/xxx
Cooling water	_____	m3/xxx
Other energy	_____	Mjoule/xxx
Manpower	_____	manhours/xxx

1./ Please replace the "xxx" in the tables by the appropriate quantity unit corresponding to your volume of production: tons or kgs or other.

2./ Please attach all public information on the process: flow-sheets, process description, reference lists, etc.

ANNEX No.2.

SELECTED TREES

TABLE OF CONTENTS.

	Page
1./ INTRODUCTION.	4
2./SELECTED TREES	5
2.1./Pesticides.	
2.1.1./ Alachlor	5
2.1.2./ Aldicarb	6
2.1.3./ Carbaryl	7
2.1.4./ Carbofuran	8
2.1.5./ Captan	9
2.1.6./ 2-4 D	10
2.1.7./ Malathion	11
2.1.8./ Zineb	12
2. 12./ Drugs.	
2.2.1./ Mebenazole	13
2.2.2./ Acetylsalicylic acid	14
2.2.3./ Chloroquine	15
2.2.4./ Paracetamol	16
2.2.5./ Diazepam	17
2.2.6./ Praziquantel	18
2.2.7./ Ethambutol 1.	19
2.2.8./ Ethambutol 2.	20
2.2.9./ Isoniazid	21
2.3./ Synthetic fibres.	
2.3.1./ Pan	22
2.3.2./ Nylon 6	23
2.3.3./ NYlon 66	24
2.3.4./ Adiponitril 1.	25
2.3.5./ Adiponitril 2.	26
2.3.6./ Adiponitril 3.	26
2.3.7./ Adiponitril 4.	27
2.3.8./ Polyesther fibre	28
2.4./ Plastics.	
2.4.1./ Polyethylene	29
2.4.2./ Polypropylene	30
2.4.3./ PVC	31

2.5./ Elastomers.

2.5.1./ SBR 32
2.5.2./ ABS 33

2.6./ Surfactants.

2.6.1./ LAS 34
2.6.2./ AE 35

1./ INTRODUCTION.

In this Annex we collected some representative examples of typical processes and products, which are of major importance in the developing countries. As on the basis of the questionnaires, information on other processes will flow in, the collection of the process trees can be extended. It must be stressed however, that the design of a tree from a process description and/or flow-sheet asks for expertise.

General Remarks:

1./ On the drawings, the end product is marked by a box with double line. The intermediates and starting products are not marked differently. Distinction will be made by the coding.

2./ The intermediates not traded, appearing only in the course of the manufacturing process were not named, but marked by a I, followed by a number, if more than one was showing up in the same tree.

3./ Connection between the trees will be established by the coding and program system.

Selection.

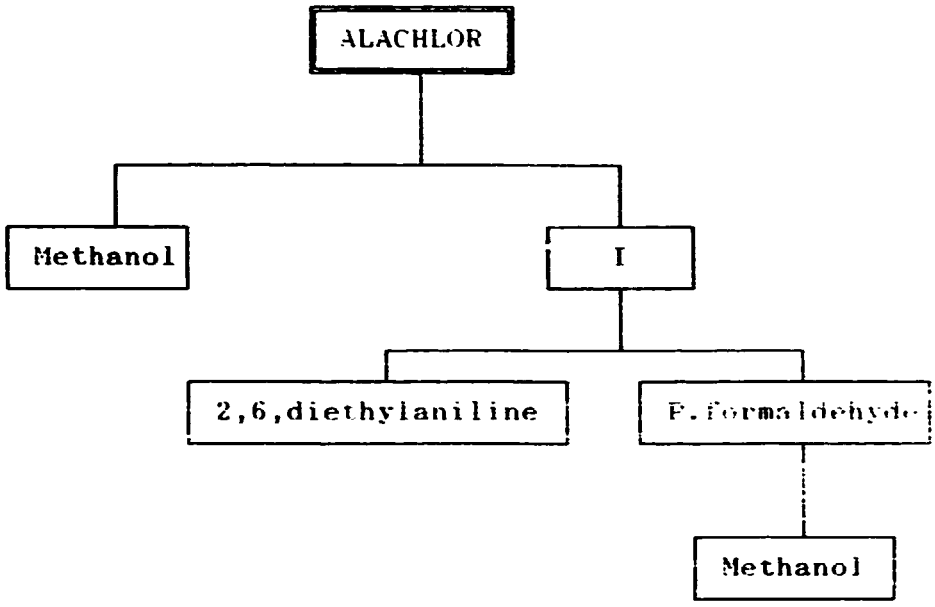
The following viewpoints were followed in the selection of the process trees:

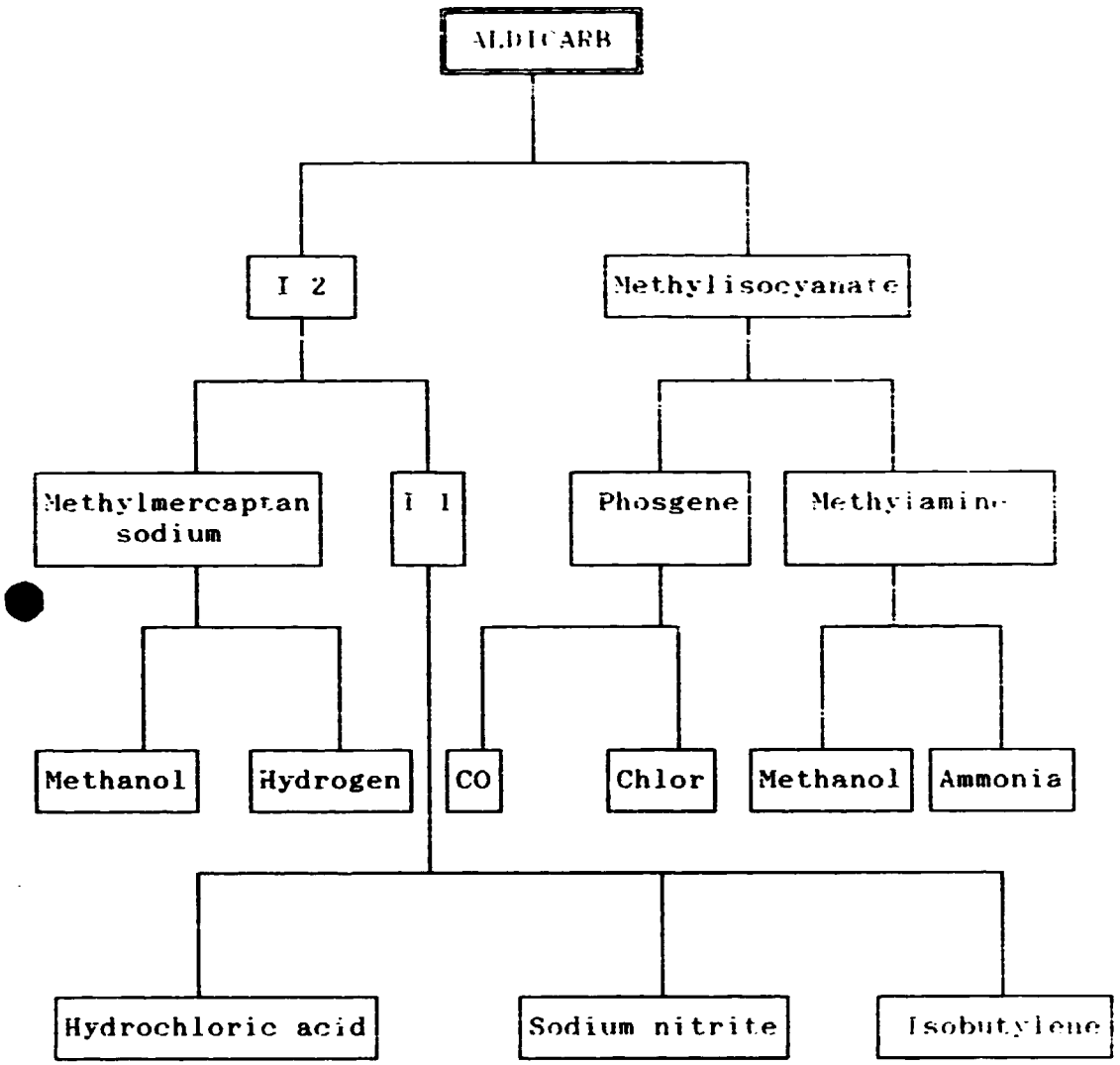
- Pesticides. Generic products from all three main groups: insecticides, herbicides and fungicides were selected, looking for the most important ones both in use and possibility of manufacturing.

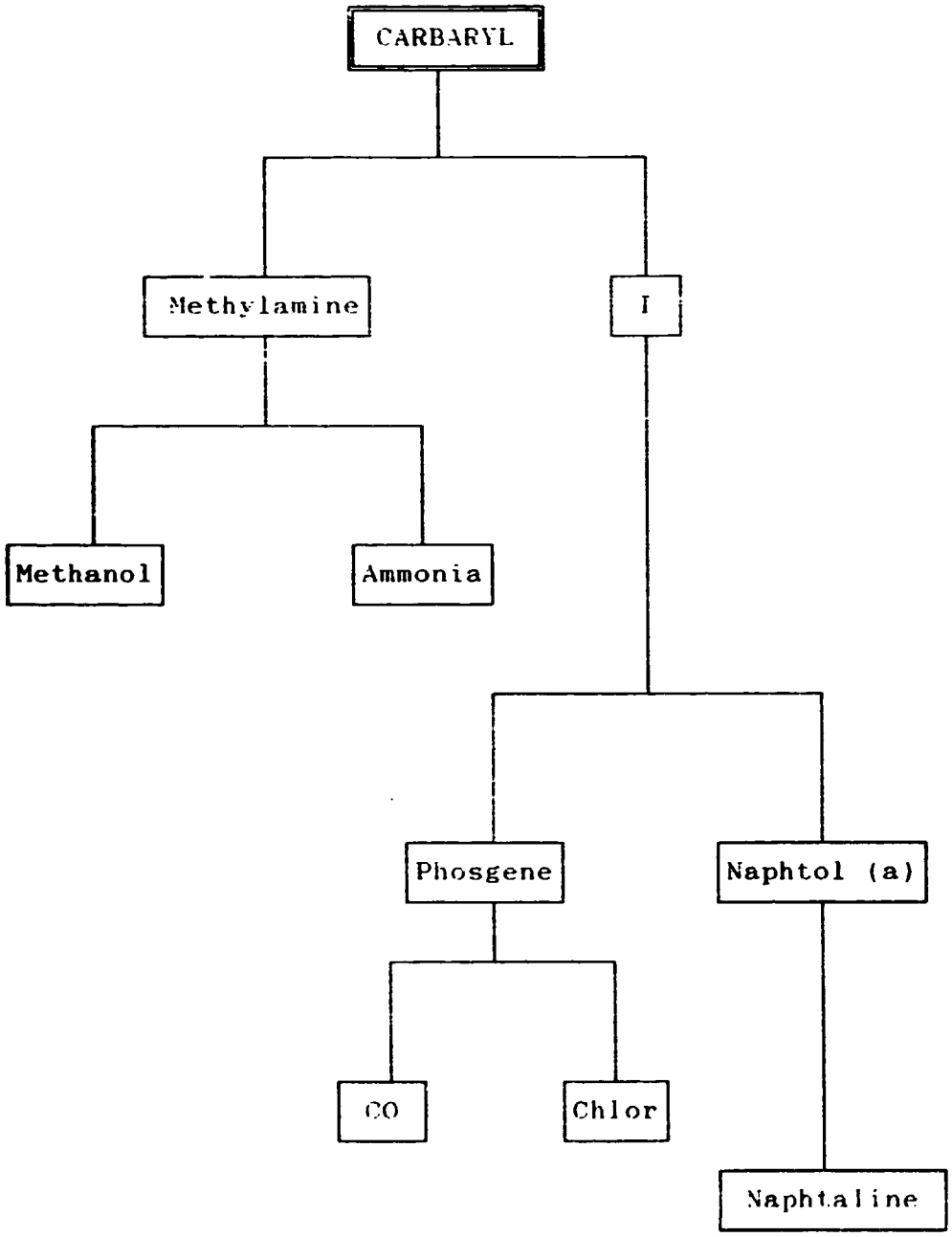
- Drugs. From the essential drugs on the WHO list, the most important and easy to manufacture synthetic products were selected.

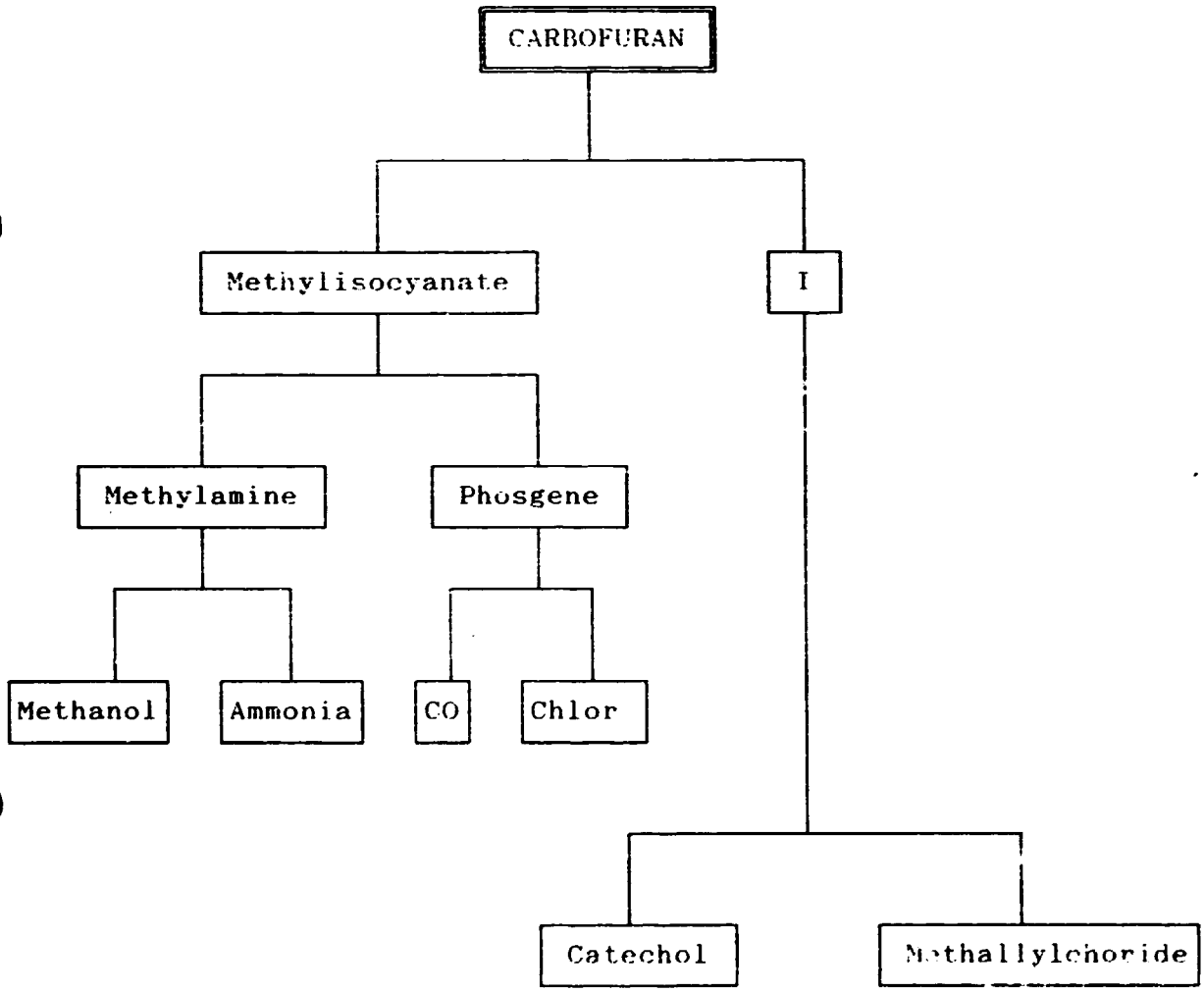
- Fibres, plastics, elastomers. All the important product were included. With the elastomers, the simplest ones, wher only a one step manufacturing process occurs, were omitted (polybutadiene, polyisoprene).

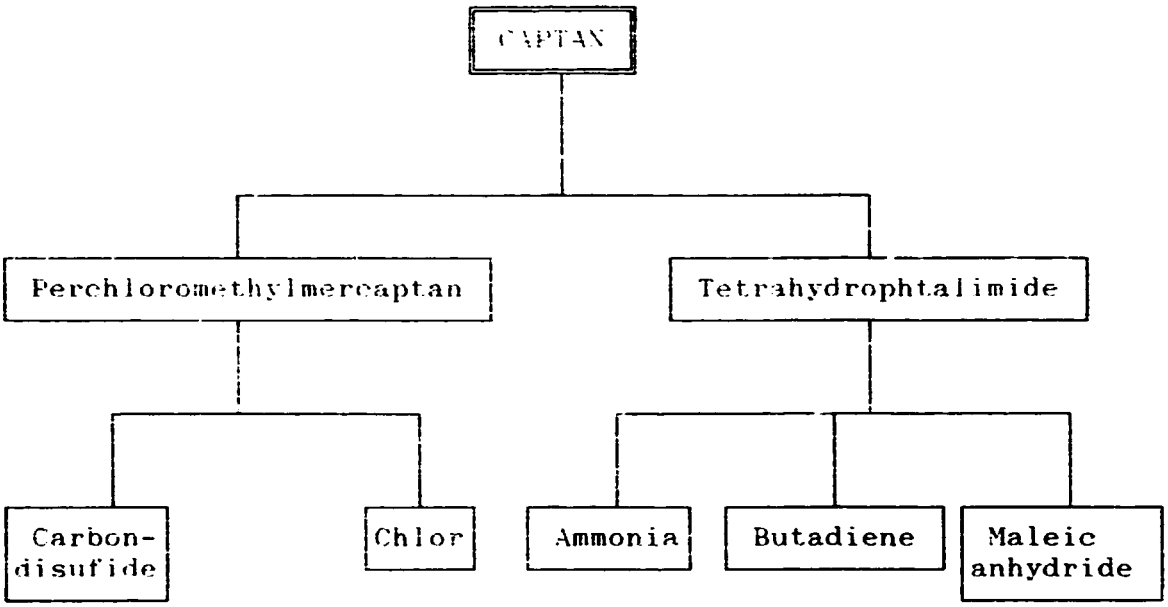
- Surfactants. The two most characteristic and important products were selected.

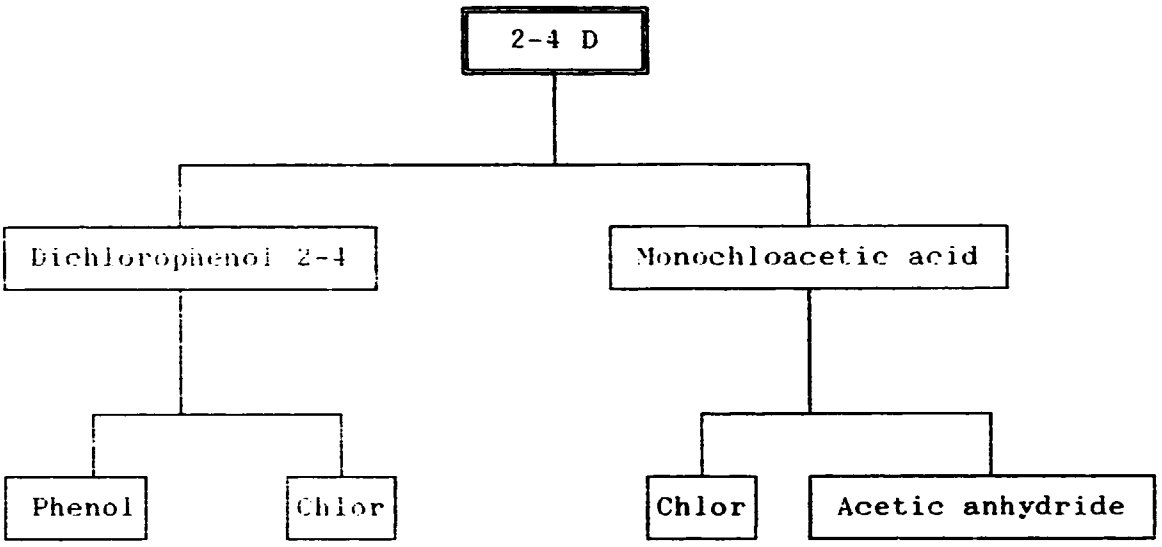

ALACHLOR
Methanol
I
2,6,diethylaniline
Methanol

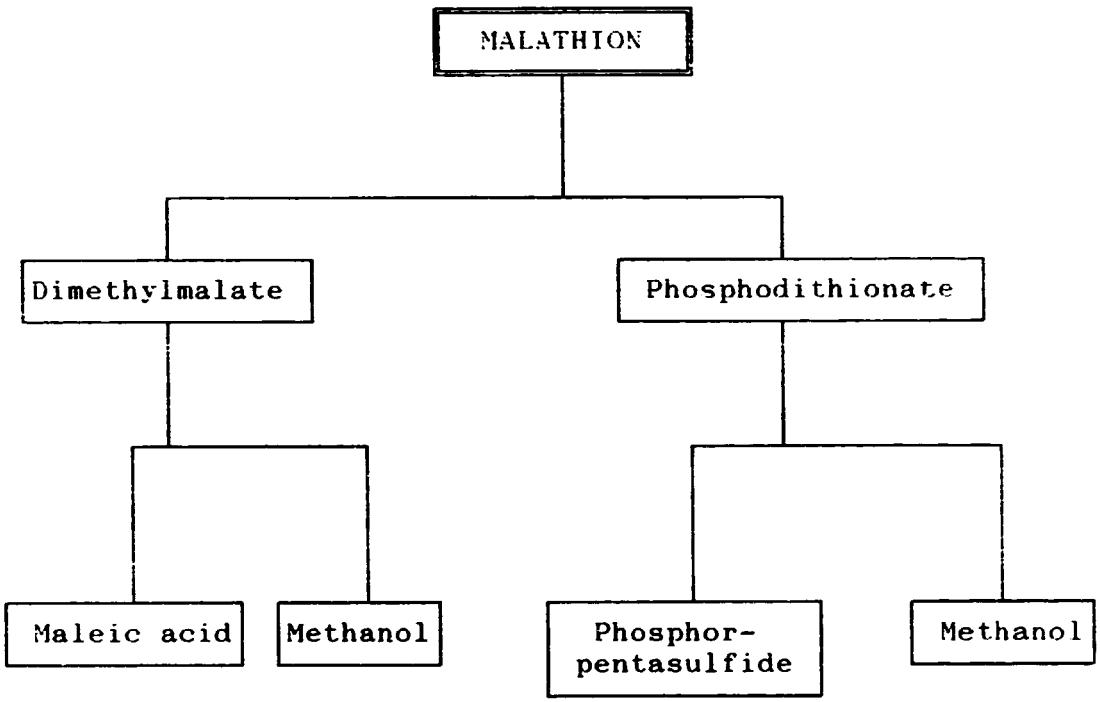

ALDICARB
I 2
Methylisocyanate
Methylmercaptan sodium
I 1
Phosgene
Methylamine
Methanol
Hydrogen
CO
Chlor
Methanol
Ammonia
Hydrochloric acid
Sodium nitrite
Isobutylene

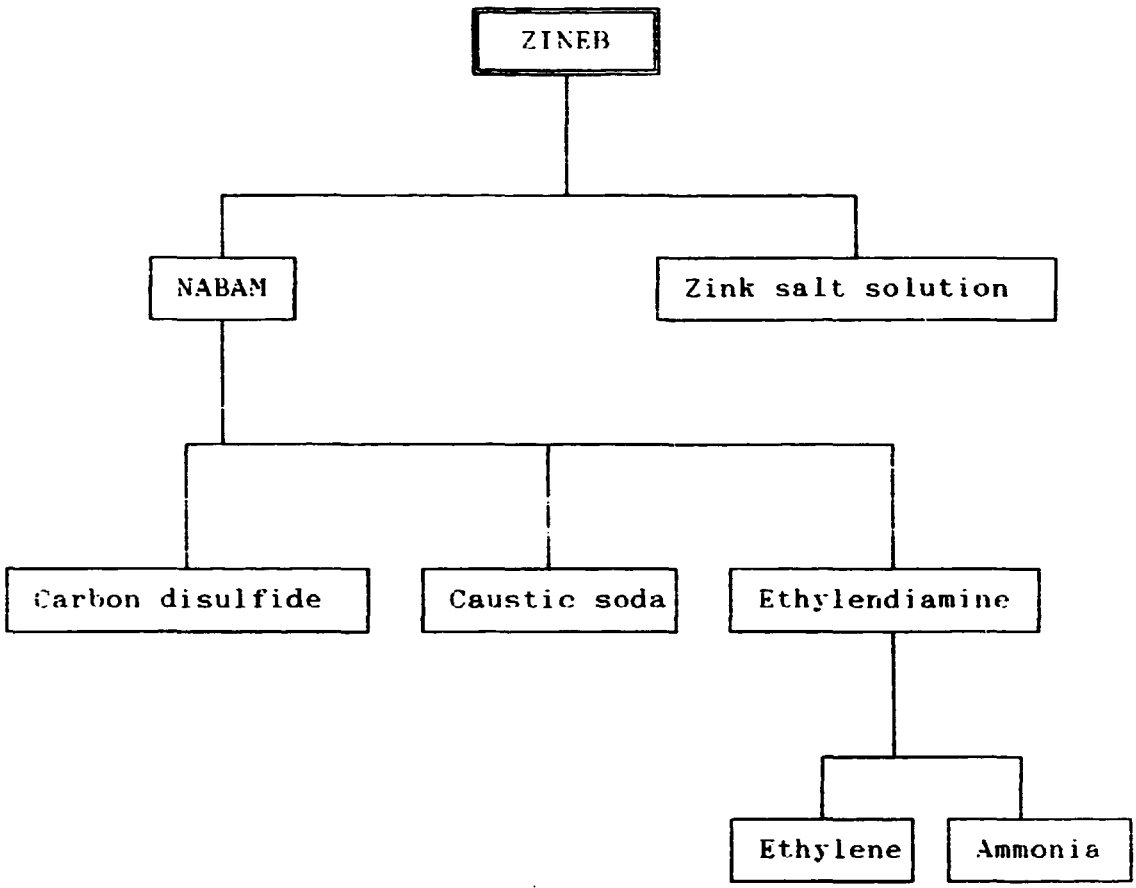

CARBARYL
Methylamine
I
Methanol
Ammonia
Phosgene
Naphtol (a)
CO
Chlor
Naphtaline

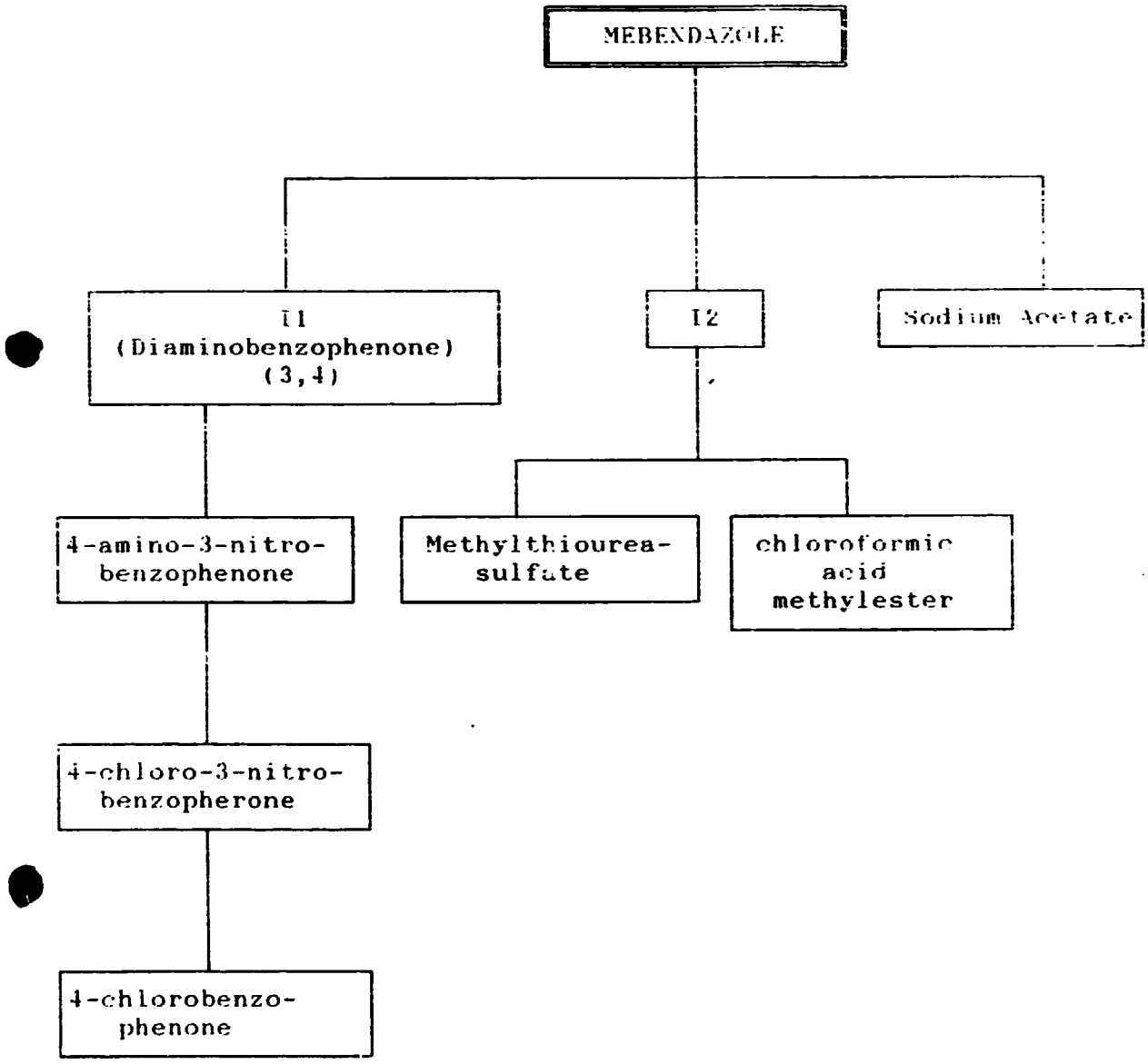

CARBOFURAN
Methylisocyanate
I
Methylamine
Phosgene
Methanol
Ammonia
CO
Chlor
Catechol
Methallylchoride

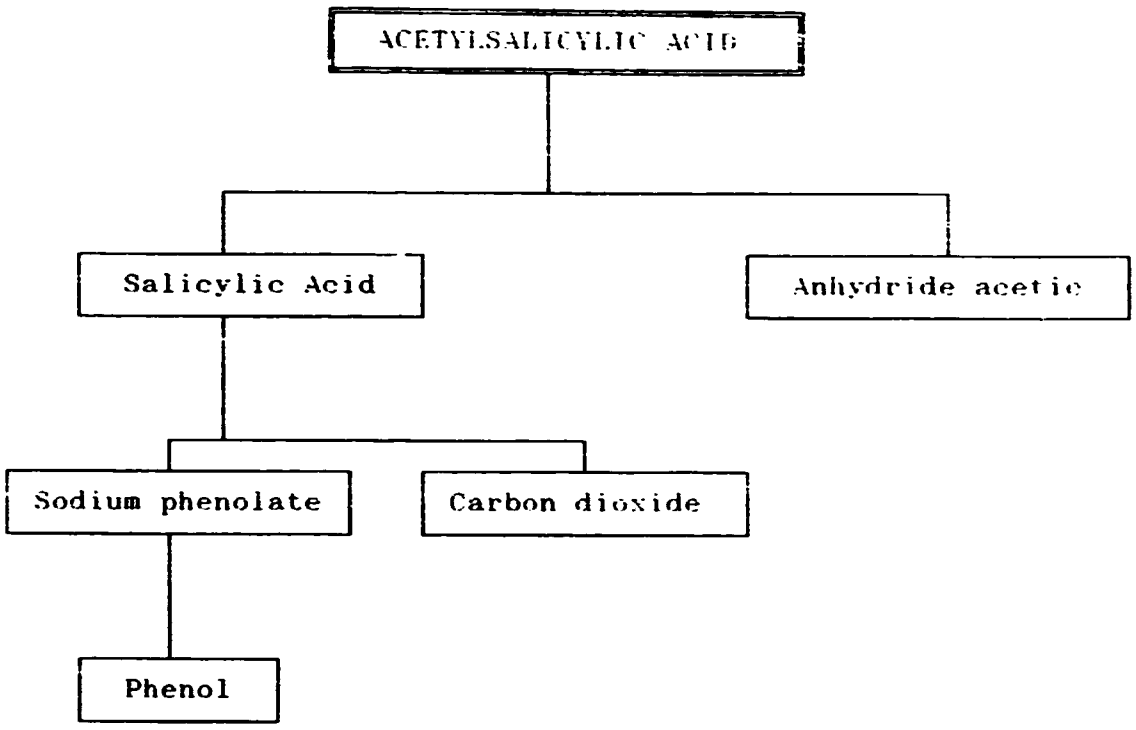

CAPTAN
Perchloromethylmercaptan
Tetrahydrophtalimide
Carbon-disufide
Chlor
Ammonia
Butadiene
Maleic anhydride

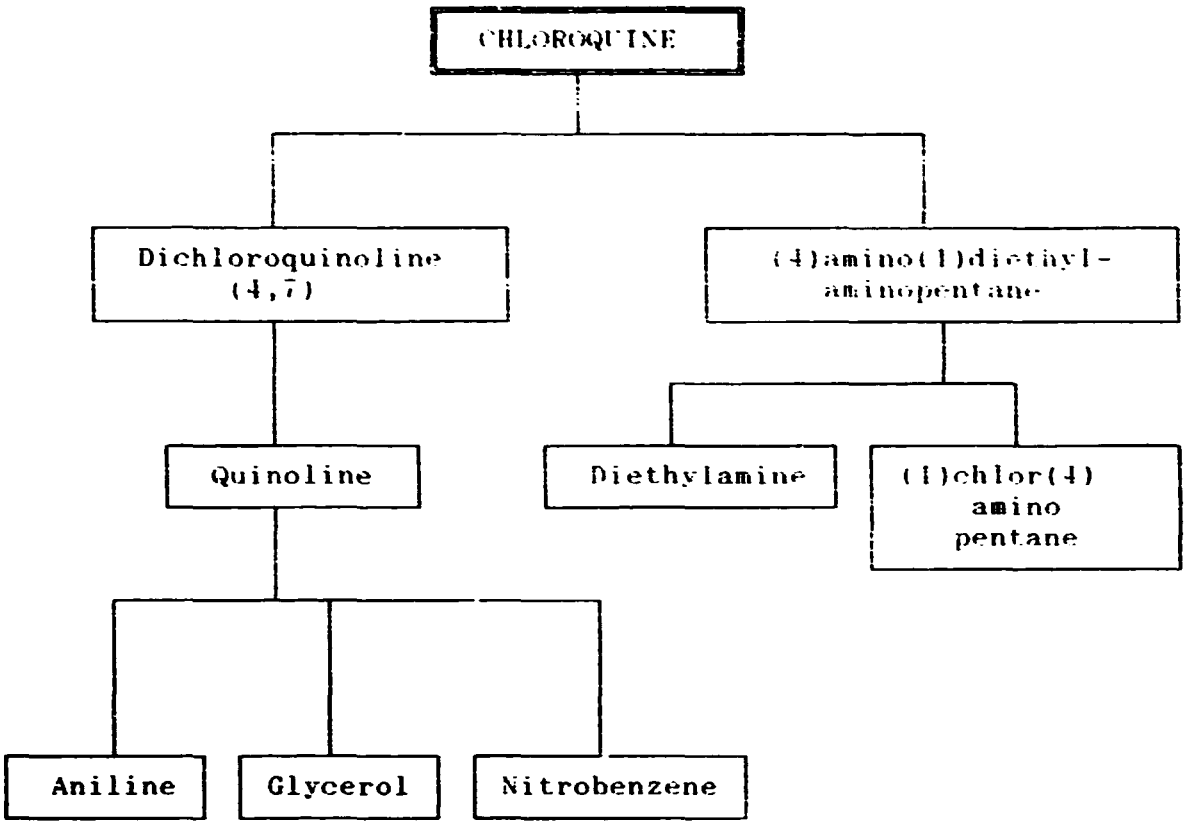

2-4 D
Dichlorophenol 2-4
Monochloacetic acid
Phenol
Chlor
Chlor
Acetic anhydride

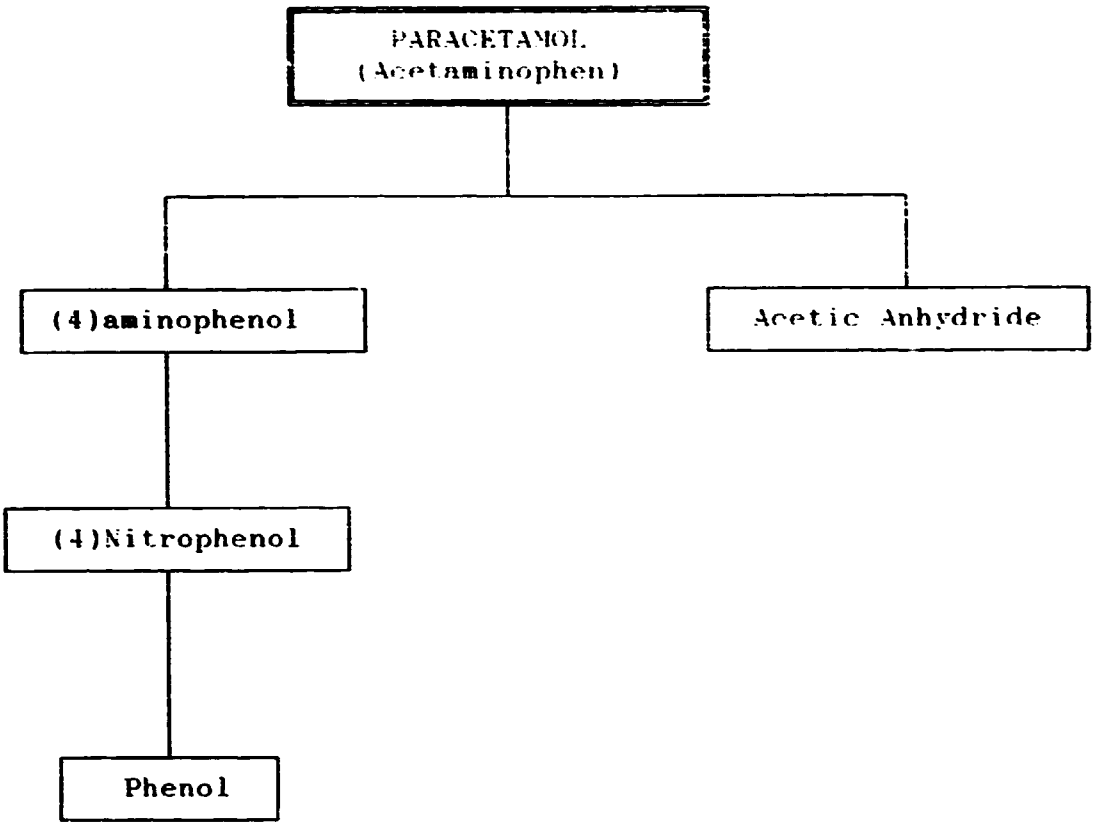

MALATHION
Dimethylmalate
Phosphodithionate
Maleic acid
Methanol
Phosphor-
pentasulfide
Methanol

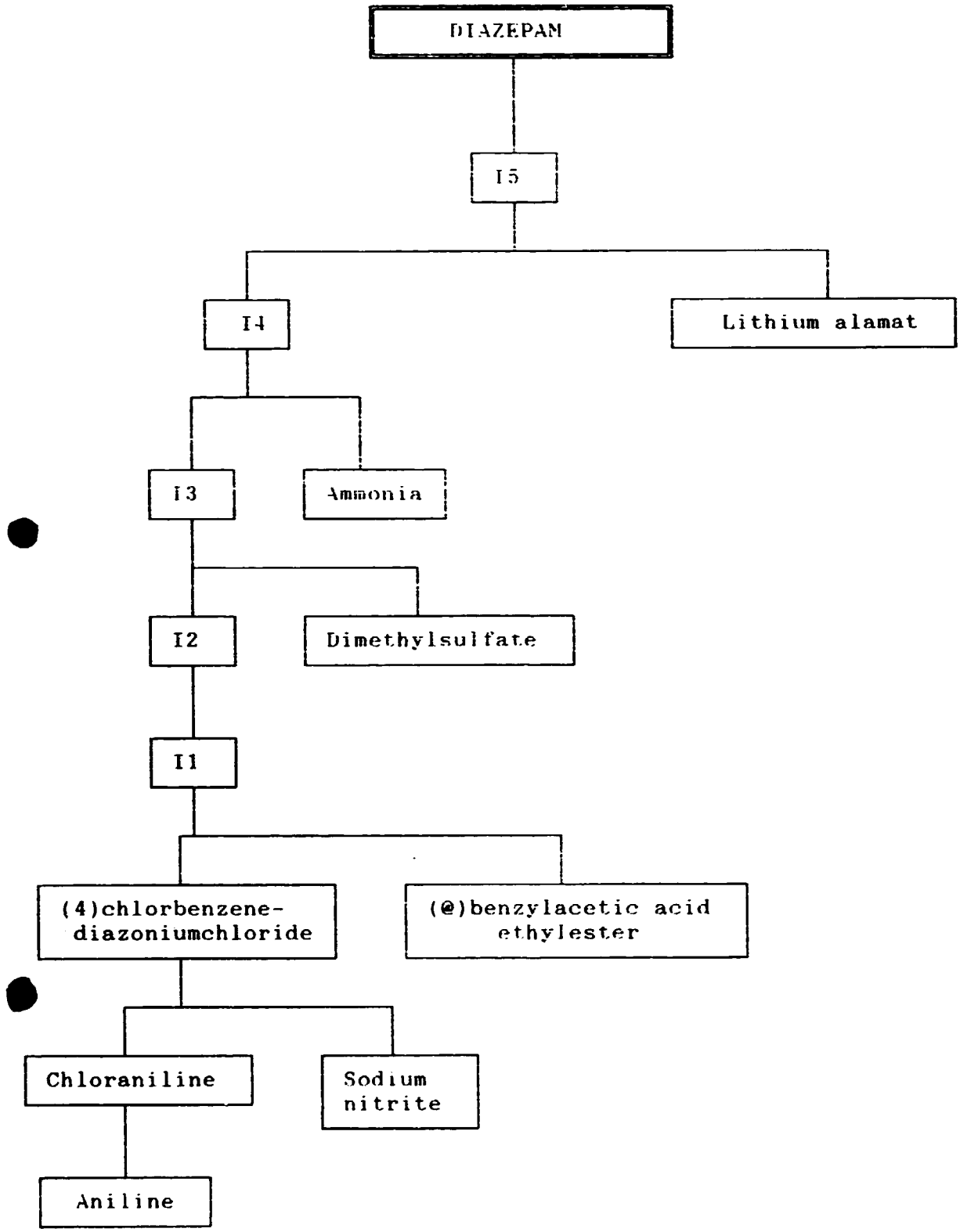

ZINEB
NABAM
Zink salt solution
Carbon disulfide
Caustic soda
Ethylendiamine
Ethylene
Ammonia

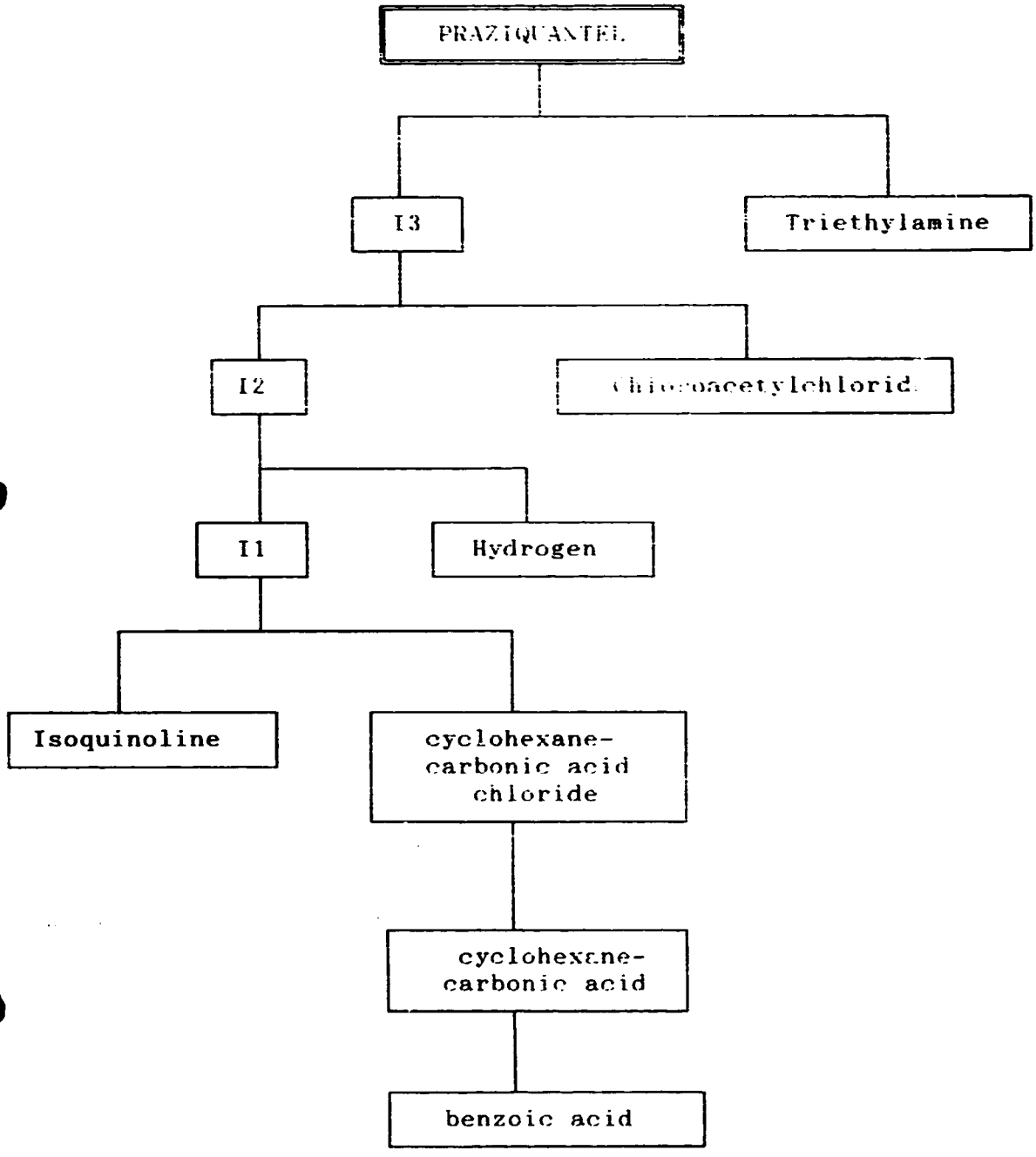

MEBENDAZOLE
I1
(Diaminobenzophenone)
(3,4)
I2
Sodium Acetate
4-amino-3-nitro-
benzophenone
Methylthiourea-
sulfate
chloroformic
acid
methylester
4-chloro-3-nitro-
benzopherone
4-chlorobenzo-
phenone

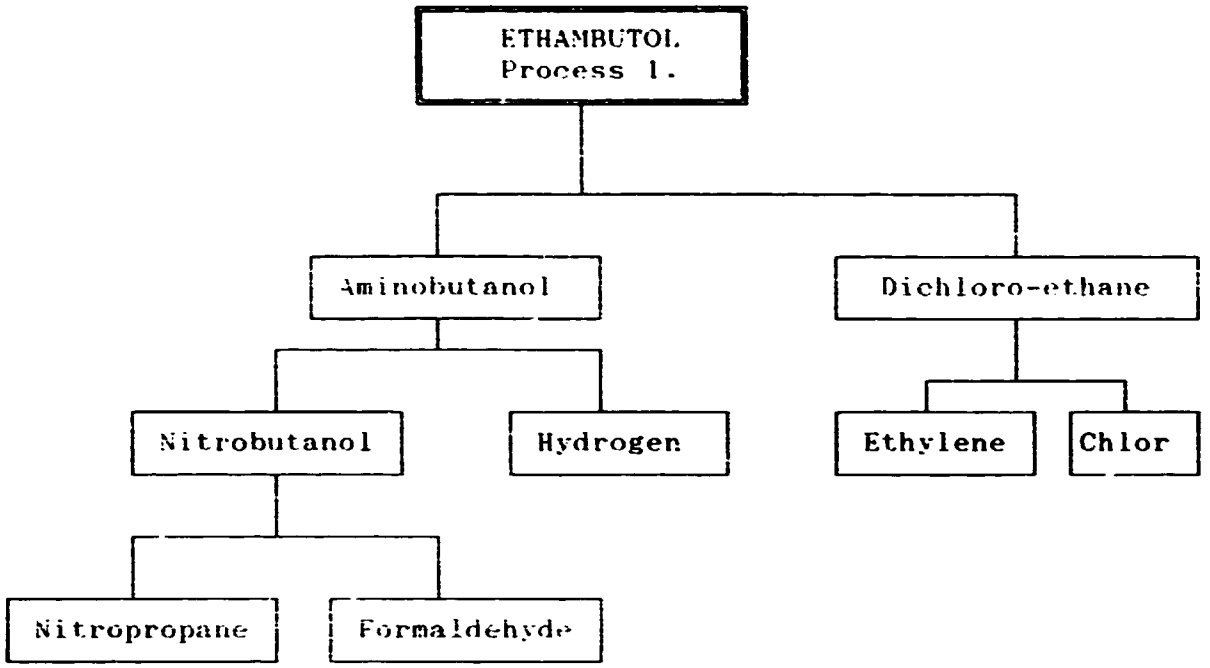

ACETYLSALICYLIC ACID
Salicylic Acid
Anhydride acetic
Sodium phenolate
Carbon dioxide
Phenol

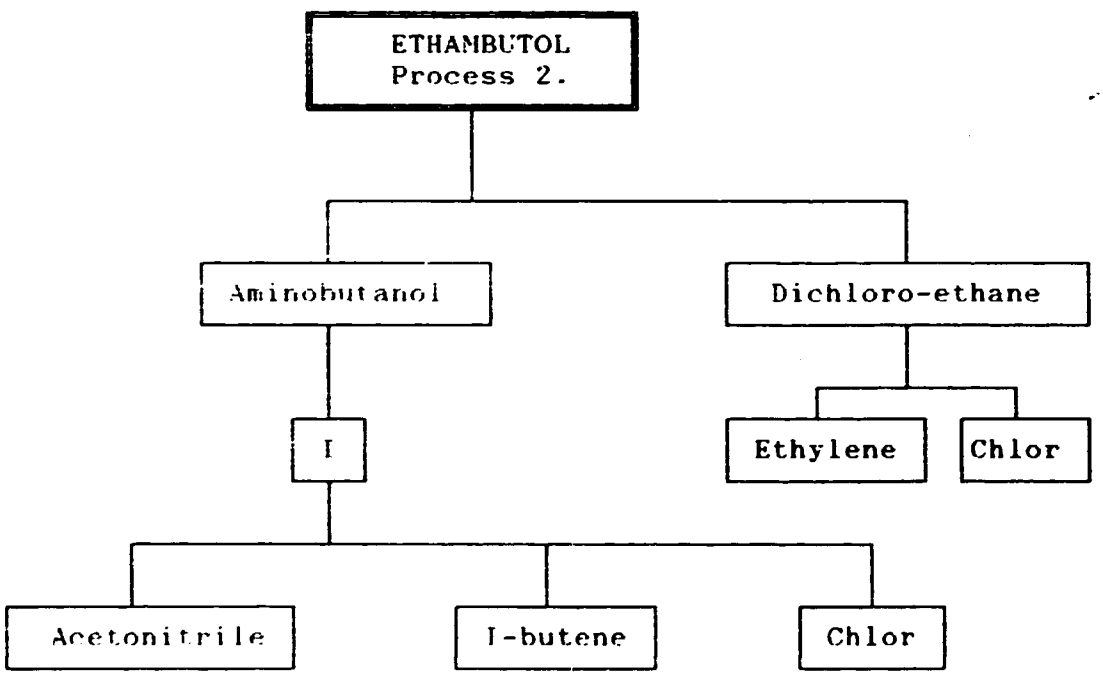

CHLOROQUINE
Dichloroquinoline (4,7)
(4)amino(1)diethyl-aminopentane
Quinoline
Diethylamine
(1)chlor(4) amino pentane
Aniline
Glycerol
Nitrobenzene

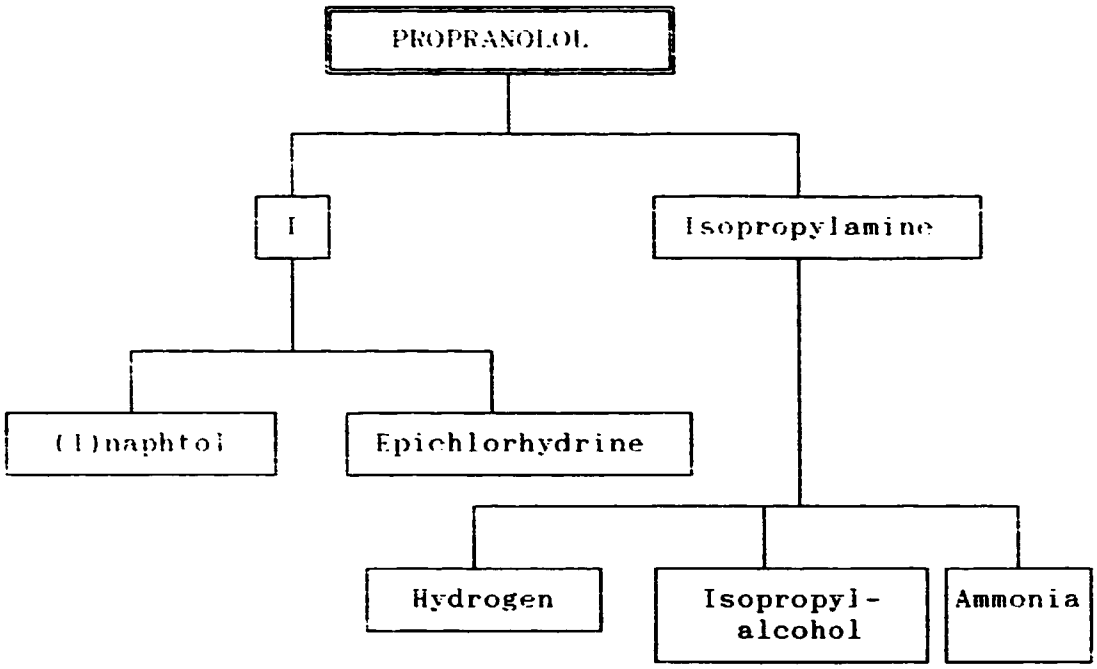

PARACETAMOL
(Acetaminophen)
(4)aminophenol
Acetic Anhydride
(4)Nitrophenol
Phenol

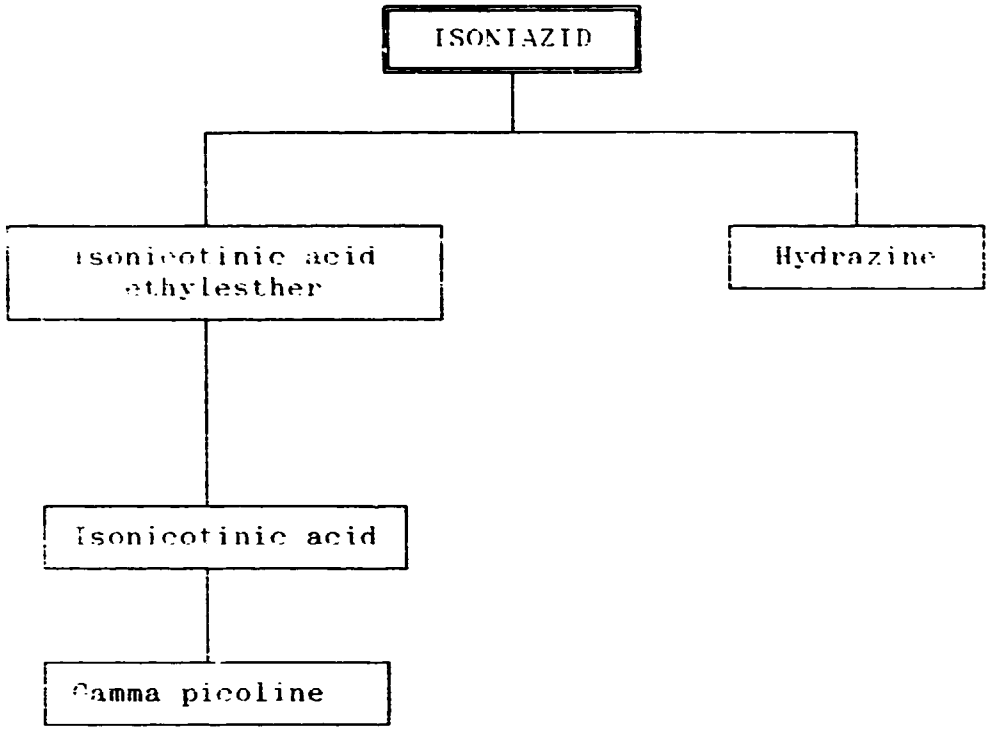

DIAZEPAM
I5
I4
Lithium alamat
I3
Ammonia
I2
Dimethylsulfate
I1
(4)chlorbenzene-diazoniumchloride
(@)benzylacetic acid ethylester
Chloraniline
Sodium nitrite
Aniline

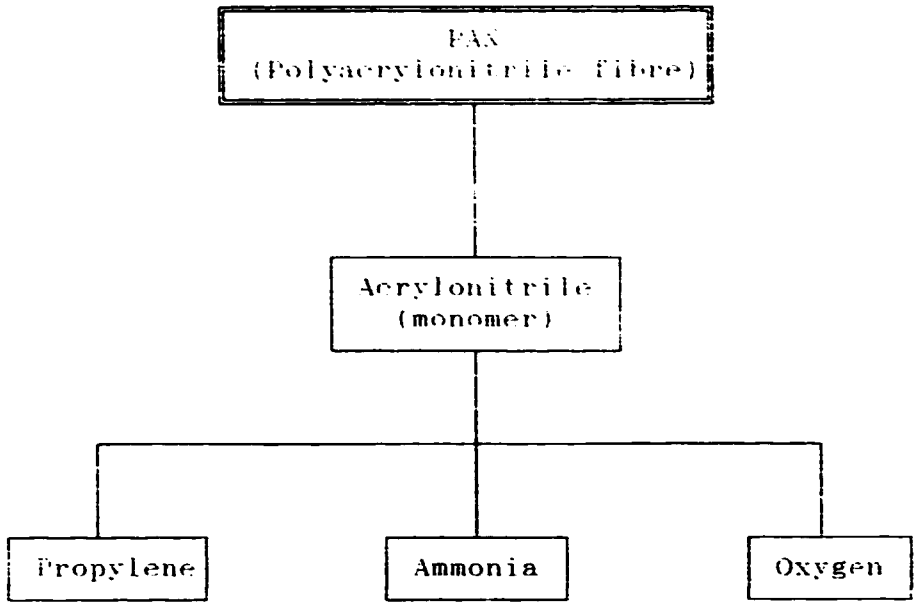

PRAZIQUANTEL
I3
Triethylamine
I2
Chloroacetylchloride
I1
Hydrogen
Isoquinoline
cyclohexane-carbonic acid chloride
cyclohexane-carbonic acid
benzoic acid

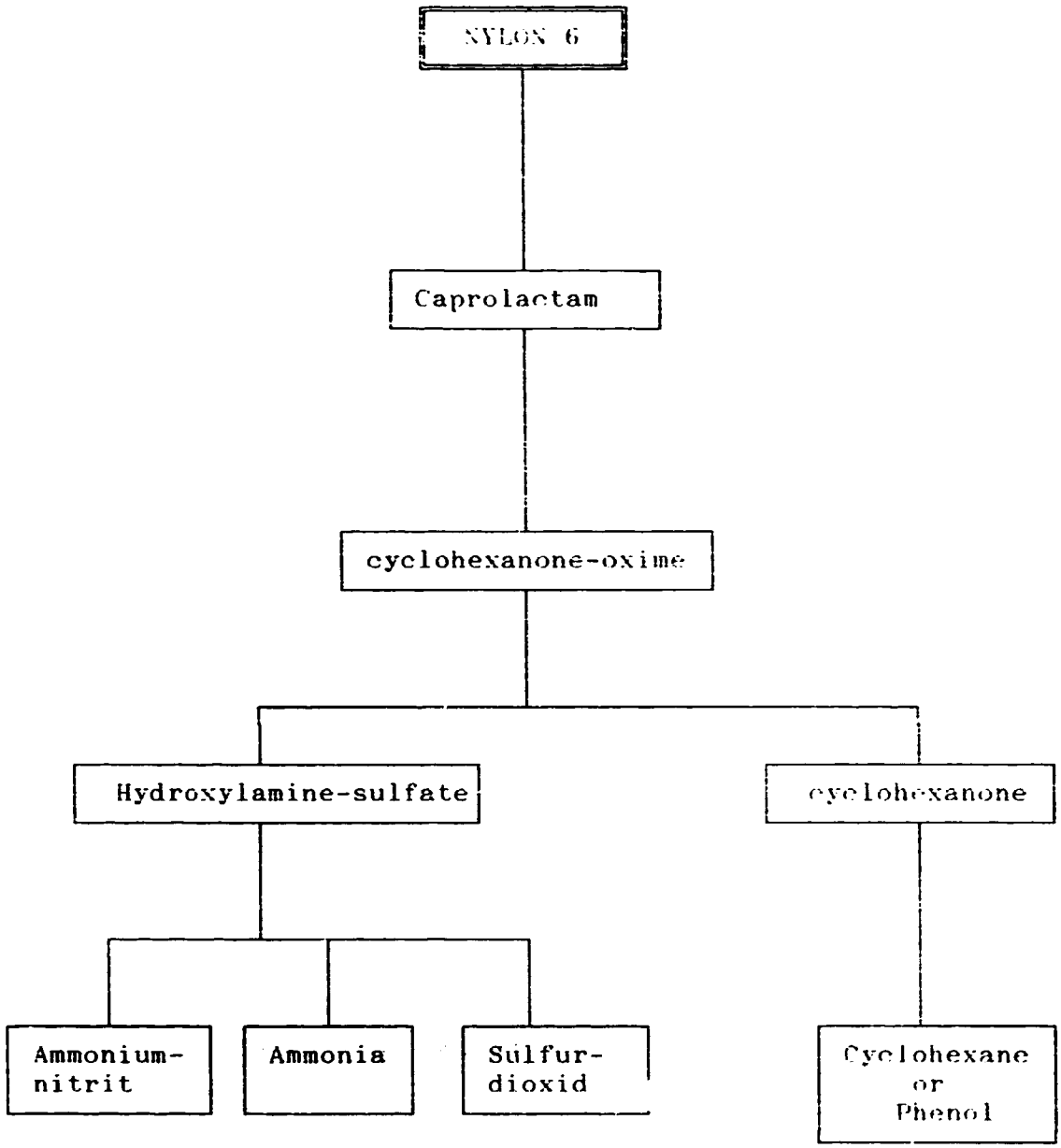

ETHAMBUTOL
Process 1.
Aminobutanol
Dichloro-ethane
Nitrobutanol
Hydrogen
Ethylene
Chlor
Nitropropane
Formaldehyde

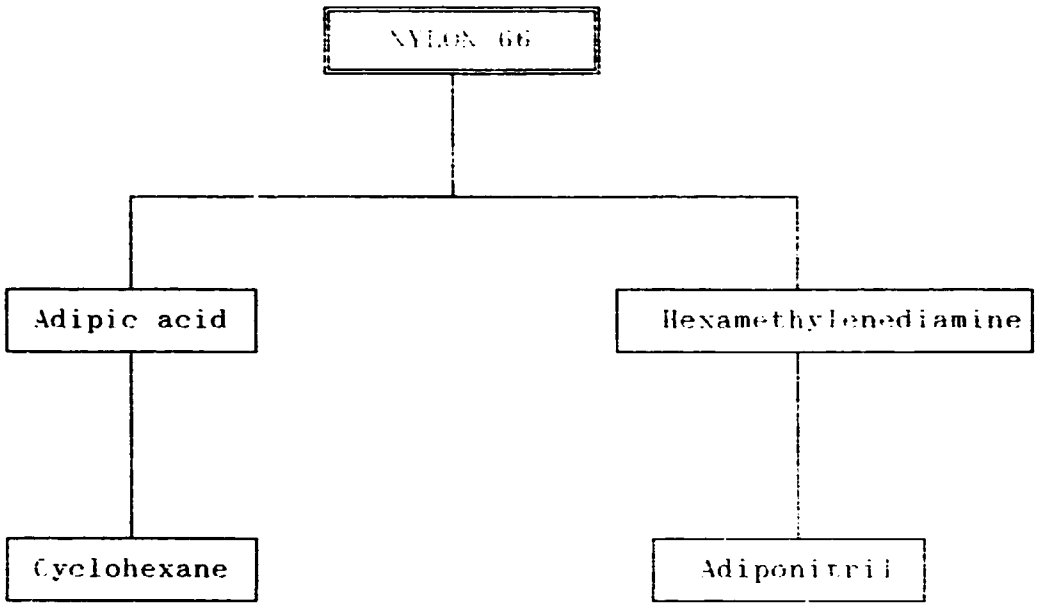

ETHAMBUTOL
Process 2.
Aminobutanol
Dichloro-ethane
I
Ethylene
Chlor
Acetonitrile
I-butene
Chlor


PROPRANOLOL
I
Isopropylamine
(1)naphtol
Epichlorhydrine
Hydrogen
Isopropyl-
alcohol
Ammonia

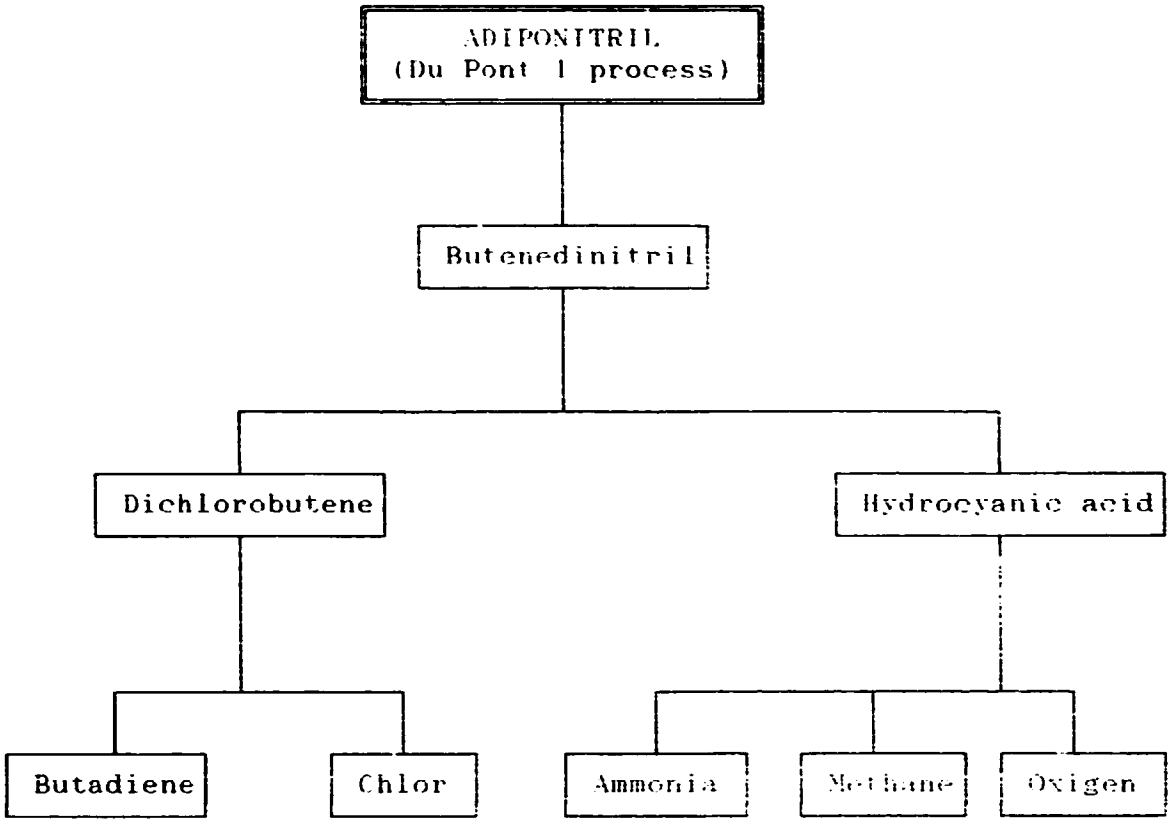

ISONIAZID
Isonicotinic acid ethylesther
Hydrazine
Isonicotinic acid
Gamma picoline

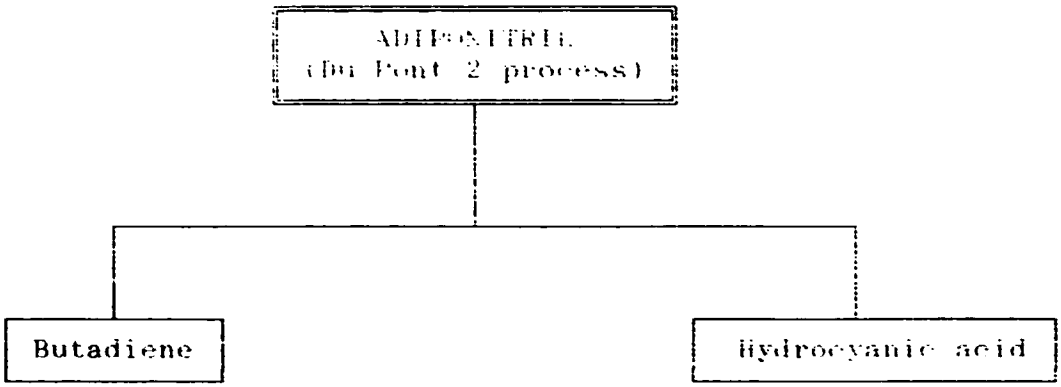

PAN
(Polyacrylonitrile fibre)
Acrylonitrile
(monomer)
Propylene
Ammonia
Oxygen

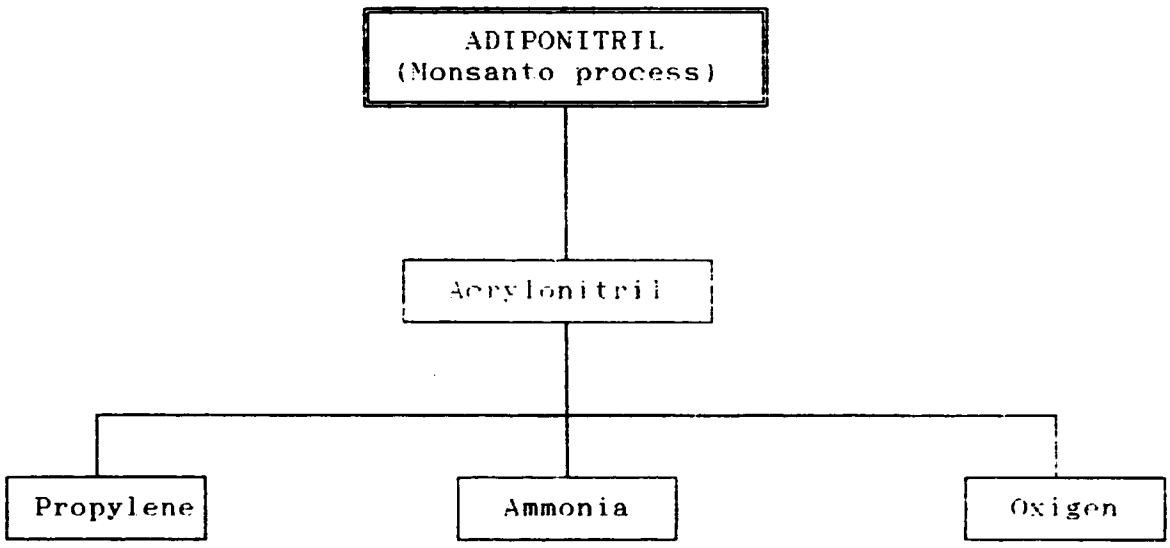

NYLON 6
Caprolactam
cyclohexanone-oxime
Hydroxylamine-sulfate
cyclohexanone
Ammonium-nitrit
Ammonia
Sulfur-dioxid
Cyclohexane or Phenol

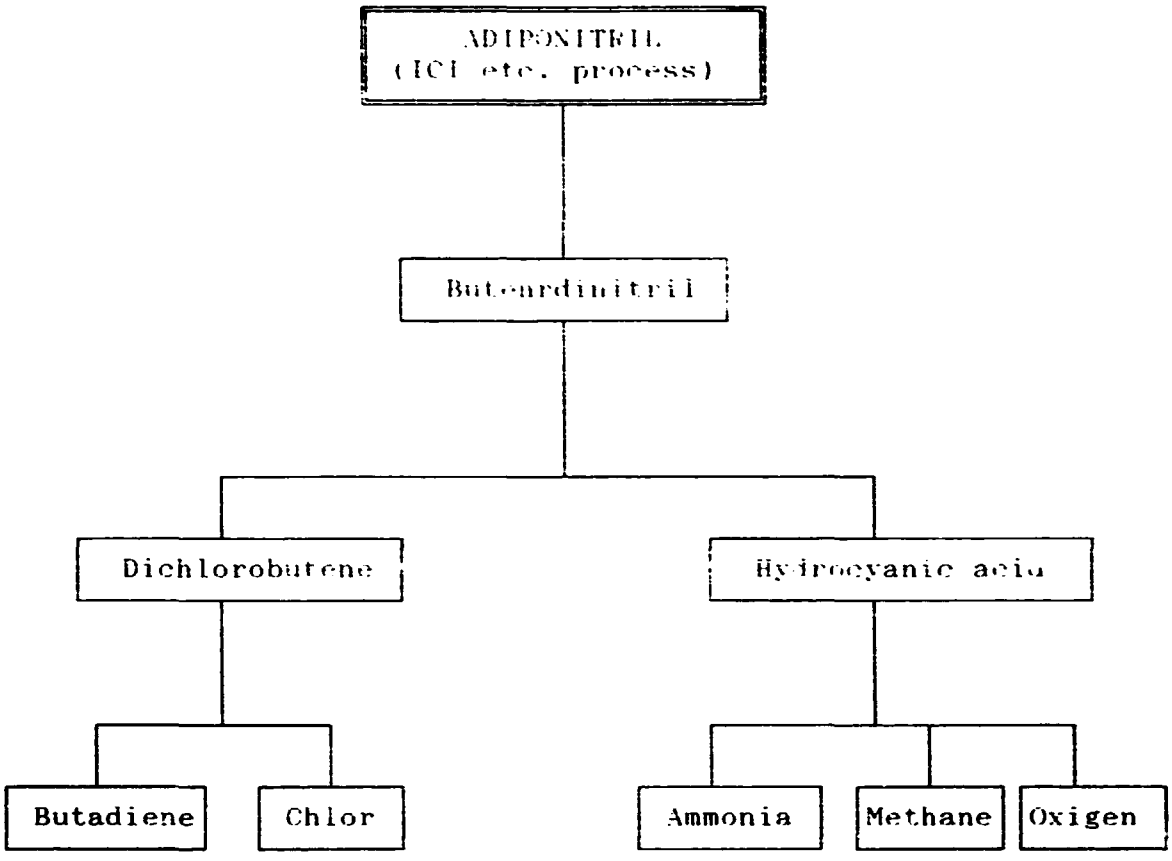


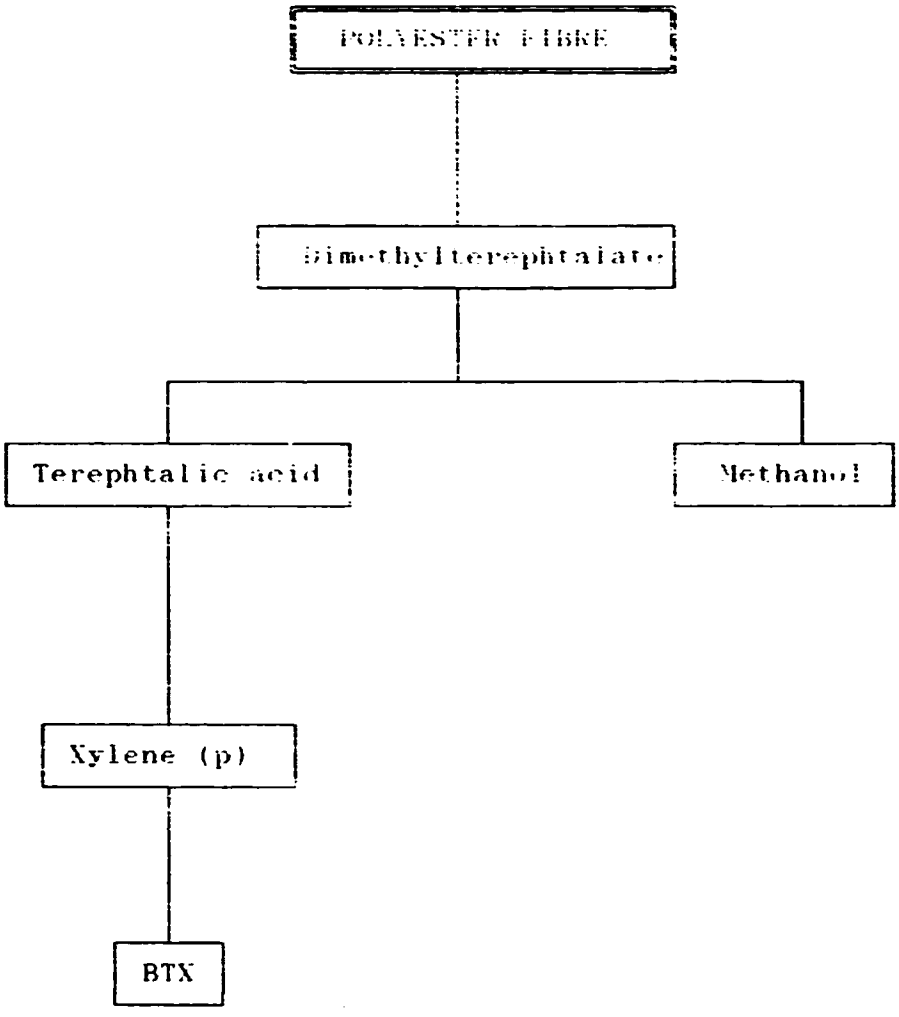
For adiponitril, see separate trees!

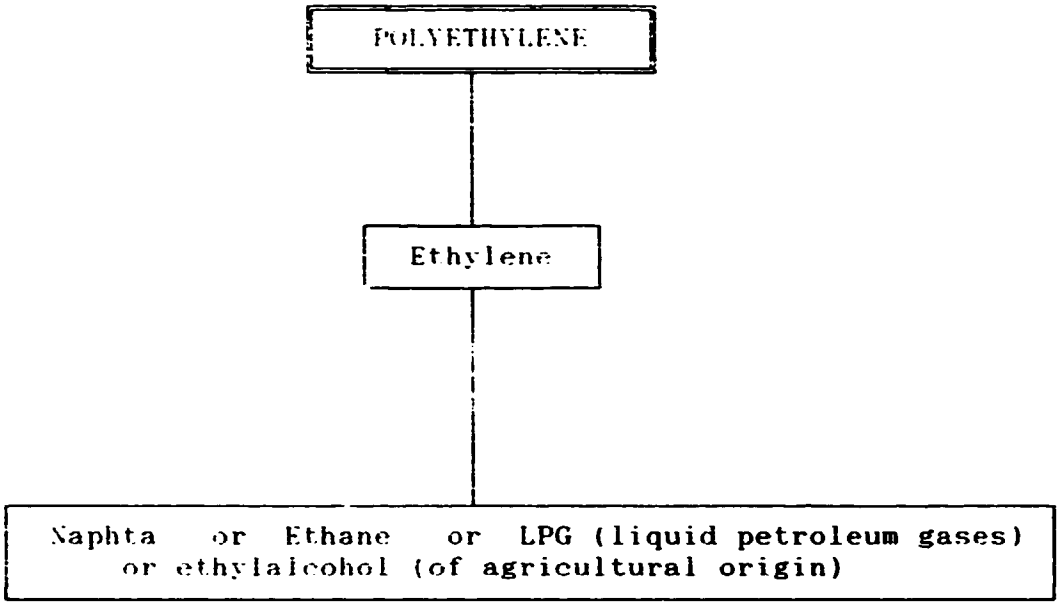

ADIPONITRIL
(Du Pont I process)
Butenedinitril
Dichlorobutene
Hydrocyanic acid
Butadiene
Chlor
Ammonia
Methane
Oxigen

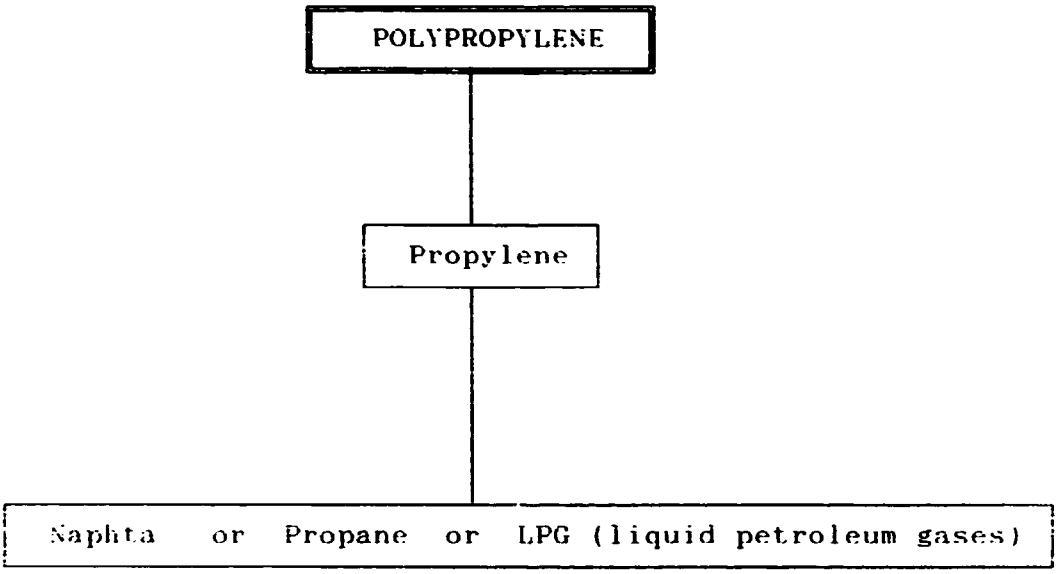

ADIPONITRIL
(Du Pont 2 process)
Butadiene
Hydrocyanic acid

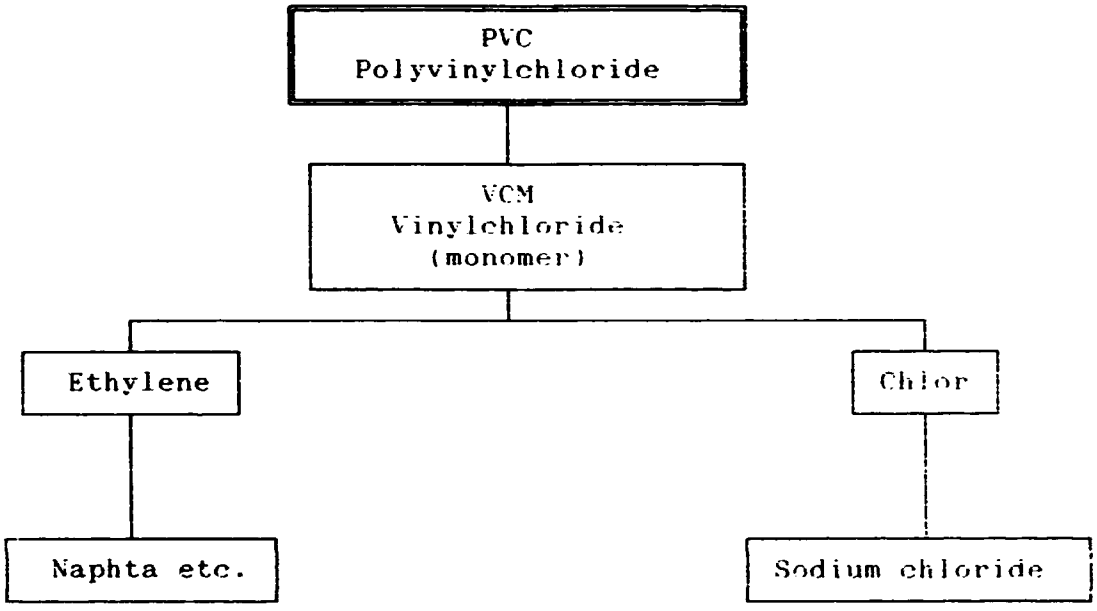

ADIPONITRIL
(Monsanto process)
Acrylonitril
Propylene
Ammonia
Oxigen

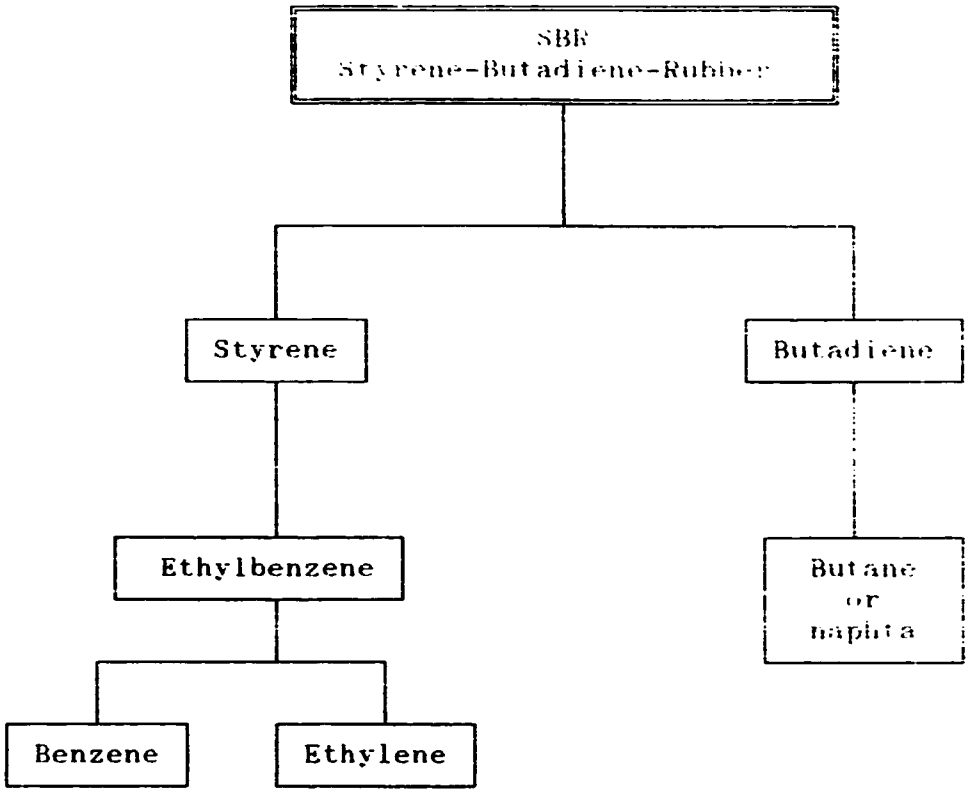

ADIPONITRIL
(ICI etc. process)
But-en-dinitril
Dichlorobutene
Hydrocyanic acid
Butadiene
Chlor
Ammonia
Methane
Oxigen

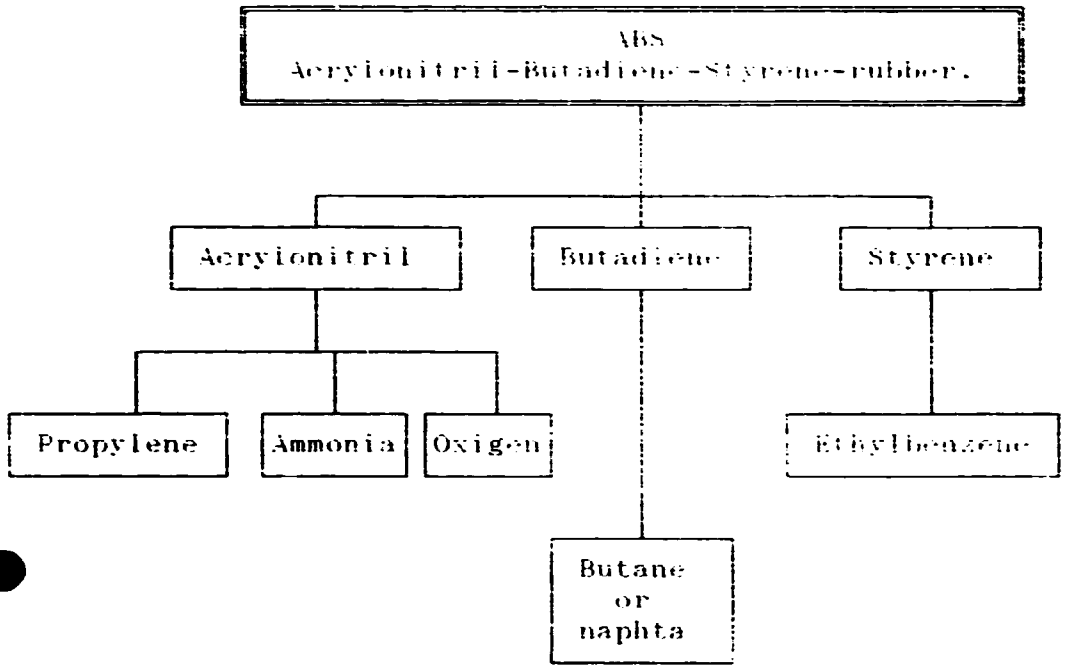

POLYESTER FIBRE
Dimethylterephtalate
Terephtalic acid
Methanol
Xylene (p)
BTX

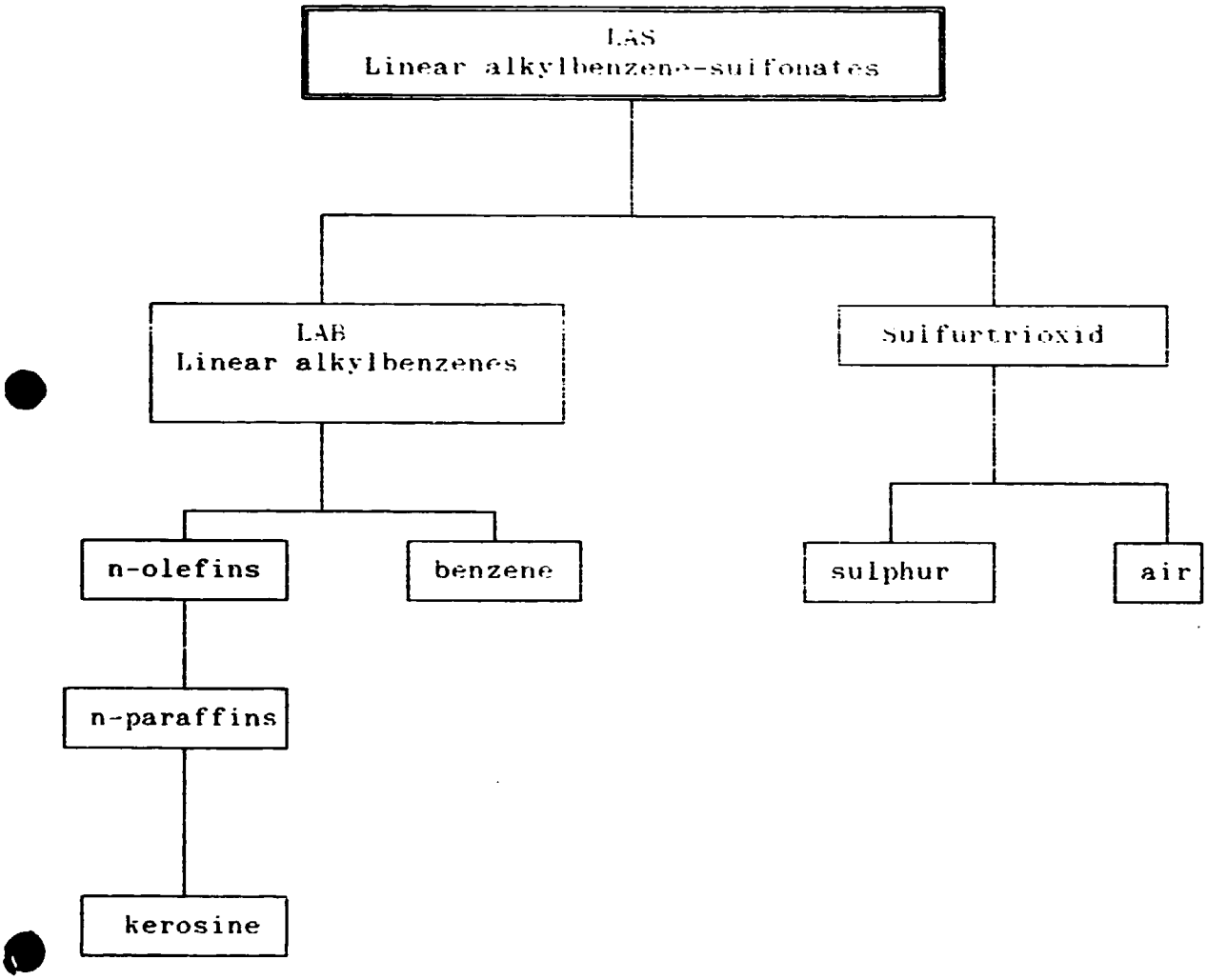

POLYETHYLENE
Ethylene
Naphta or Ethane or LPG (liquid petroleum gases)
or ethylalcohol (of agricultural origin)

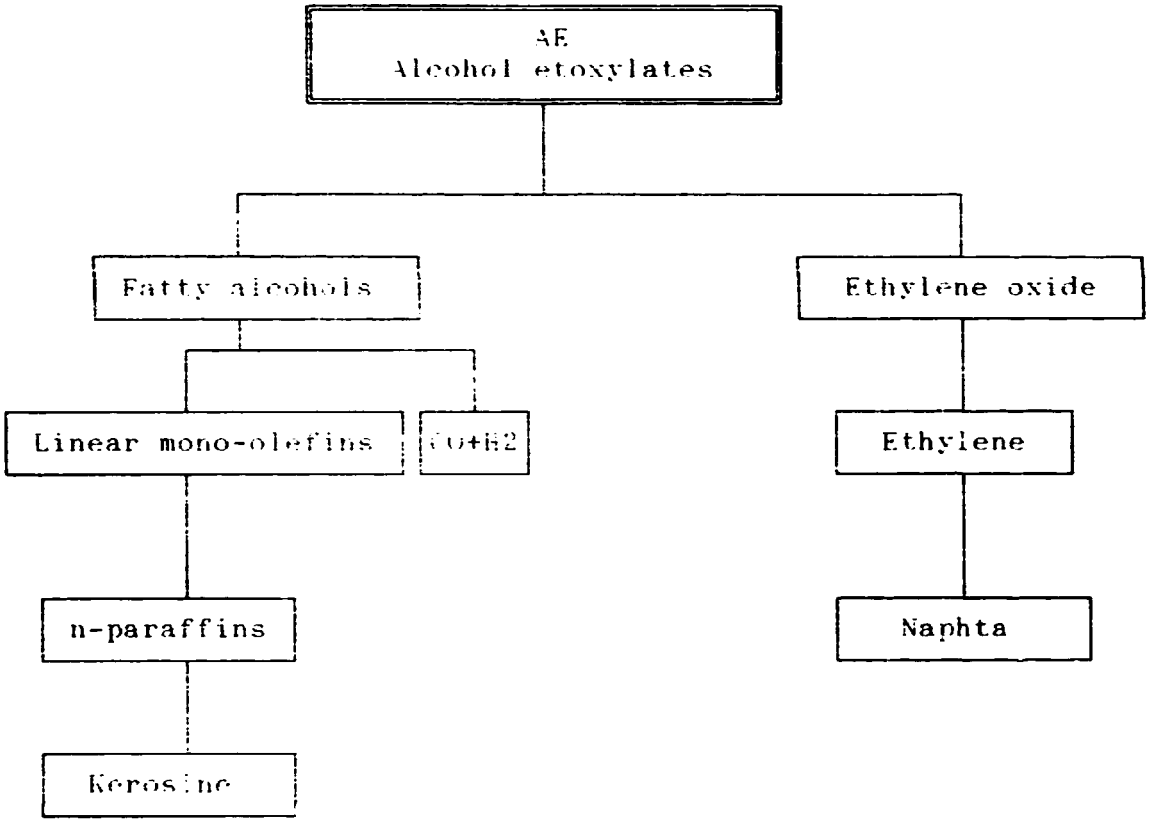

POLYPROPYLENE
Propylene
Naphta or Propane or LPG (liquid petroleum gases)


PVC
Polyvinylchloride
VCM
Vinylchloride
(monomer)
Ethylene
Chlor
Naphta etc.
Sodium chloride


SBR
Styrene-Butadiene-Rubber
Styrene
Butadiene
Ethylbenzene
Butane
or
napiita
Benzene
Ethylene


ABS
Acrylonitril-Butadiene-Styrene-rubber.
Acrylonitril
Butadiene
Styrene
Propylene
Ammonia
Oxigen
Ethylbenzene
Butane
or
naphta


LAS
Linear alkylbenzene-sulfonates
LAB
Linear alkylbenzenes
Sulfurtrioxid
n-olefins
benzene
sulphur
air
n-paraffins
kerosine


AE
Alcohol etoxylates
Fatty alcohols
Ethylene oxide
Linear mono-olefins
Ethylene
n-paraffins
Naphta
Kerosine