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PETROCHEMICALS' DATABASE

UNIDO

Final report

Prepared for the United Nations Industrial Development Organization

by

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Definitions and abbreviations

Owing to the different perception of commonly used concepts below is given explanation and understanding of vocabulary. The definitions have been in principle retrived from the Database concept and are discussed to be changed in the chapter evaluating questionnaire. This vocabulary has been used only for purpose of this report and does not necessarily represents scientifically approved meanings.

DATABASE
- sequenced and organized collection of information (data). Information can be organized by classic or informatic means.

DATA BANK
- organized system of collection, up-date and dissemination of information contained in database. The communication means between database and end user are defined by the structure and accesibility of the database.

ENTERPRISE
- economic and financial entity operating processes of transformation of materials or offering services.

COMPANY
- legally registred entity aiming profitable operation. Company is a legal form of enterprise.

PLANT - specificly located part of enterprise not necessary having financial selfmanagement. Plant may produce several petrochemical products.

PRODUCTION UNIT
- a petrochemical production line for the manufacturing of a given product or products originating form the same unit.

TECHNOLOGICAL PROCESS
- defined physical and chemical parameters and variables of transformation of materials into products. The results of transformations are recorded in the technological profile of the process.

CAPACITY
- defined by the process conditions and hardware structure periodical potential of the installation to produce the products.

PRODUCTION (OUTPUT)
- recorded average amount in a period of time of product from a production unit.

PRODUCT CODES

LDPE - low density polyethylene
LLDPE - linear low density polyethylene
EDC - ethylene dichloride
EO - ethylene oxide
ETHB - ethylbenzene
ACETALD - acetaldehyde
VA - vinyl acetate
VC - vinyl chloride
PVC - polyvinylchloride
PP - polypropylene
PS - polystyrene
EPS - expanded polystyrene
ACN - Acrylonitryle
PAN - polyacrylnitryl fibres
OXOALC - oxoalcohols
PO - propylene oxide
ISPALC - isopropylalcohol
ACRAC - acrylic acid
CYKLOHEX - cyklohexan
ALKBEN - alkylbenzene
NITRB/ANIL - nitrobenzene/aniline
MALANH - maleic anhydride
CHLORBEN - chlorobenzene
o-XYL - o- xylene
p-XYL - p-xylene
m-XYL - m-xylene
THPLSTC - thermoplastics
SYNFIBR - synthetic fibre
SYNRUB - synthetic rubbers

Abstract

Continous growth of petrochemical industry, also in developing countries, implies need for up-dated information concerning the plant capacities, structure of the production of the downstream products for purpose of marketing and investment decision making process. Piloting preparation of the UNIDO Database for Arab countries has shown potential for much wider system of information collection and dissemination directly linked to the petrochemical industry. This report assesses the actual status-quo of the Database implementation and evaluate the options and costs of the establishment of the UNIDO DATA BANK accessible for member petrochemical companies. It has been shown that this system would be efficient for meber organizations as well as would allow UNIDO better fulfill its mandate in the information area.

Introduction

In a period of 1976-1991 UNIDO has prepared number of studies related to the petrochemical industry development. Through the organization of Consultations on the Petrochemical Industry (Istanbul 1981, Vienna 1985, and Bombay 1992) the consensus has been achieved to prepare a Directory of Technological Capabilities in Developing Countries related to the Petrochemical Industry. Also IDB in 1992 recommended preparation of a piloting petrochemical data base for the Arab countries. The availibility of necessary information to petrochemical companies in developing countries would be also discussed at forthcoming Consultations in Tehran in October 1993. A number of UNIDO projects has been aimed to assist selected developing countries to prepare programme of the petrochemical industry development (Algeria, Iran, Brazil and SADAC countries). The part of these projects' resports the statistical review of the petrochemical capacities have been given using different external sources of information, owing the fact that UNIDO had not yet relevant database.

In this report the concept of the establishment of the Petrochemical Data Bank at UNIDO-INTIB is discussed and assessed.

1. Comments on UNIDO Petrochemical Directory

The UNIDO Petrochemical Directory has been prepared during last ten years and up dated in 1991. It is almost complete directory of companies, production capacities of plant when established, listing sources of technology, raw material name as well as the year of operation start up in the developing countries. The actual production data are scarce and difficult to assess (they are "actual" not referring to the particular year). The organization of the directory is subordinated to the alphabetic order of countries and companies. Therefore, direct utilization of the Directory for the analytical purposes (e.g. to calculate the capacities of ethylene in a given region) is cumbersome and unefficient. However, this is only Directory. The reorganization of the data by classic means would be useless, therefore only usefull application of the directory would be use of data to be introduced into computerized Database. The Directory has ommitted all other than developing countries. For the purpose of Directory this ommission can be accepted, however for the Database purposes the missing countries data should be supplemented. The detailed explanation of reasons is given in the Annex I assessing the situation in petrochemical industry worldwide and chapter reviewing the Petrochemical Database concept.

1.1 Assesment of the collected data in Petrochemical Directory

The credilibility of the collected data, following the procedure of collection seems to be adequate. To test the information content the country capacities of the ethylene, propylene and benzene have been compiled in Annex II from Petrochemical Directory and have been compared with other sources of information. The test of the ststistical crediblity has been carried out. The results show that the average discrepancy between two sources is 13 % at standard deviation 13 %. Considering the fact that no statistical source is 100% credible the partition of error must be allowed. Therefore, the discrepancies in principle between data are not substantial, therefore it is recommended to introduce data from Petrochemical Directory into Petrochemical Database and proceed with information confirmation and supplementing from petrochemical companies directly. Several capacities show large difference and these must be clarified separately by Chemical Branch of UNIDO.

1.2 Supplement of the data

Supplement of the capacities of basic petrochemicals in all industrialized countries in alphabetical order for ethylene, propylene and benzene derivatives is given in Annex III.

1.3 Instruction for the transfer of data from "Directory on Technological Capabilities" into Petrochemical Database formats.

Before filling up of the records of questionnaire the necessary cross-references have to be introduced.

In the Directory respective markings were introduced - those are capital letters marking the columns of data:

- company name at the heading of each products list should be introduced into COMPANY.DBF field 2. The address of the company should be taken form Part III of the Directory and introduced respectively to the fields 7, 8, 9, 10, 11 whichever available in the Directory. In the field 1 reference PCdetail.dbf must be introduced. This reference is supplemented in each file at the reference field 1.
- product column should be marked "A" and name of each product should be introduced into Database to the PCPRODFO.DBF to the field 3 (MAINPROD) under the Database code. The company reference number should be introduced into field 1 supplemented by the product code.
- capacity column should be marked "B" and introduced to the file PCPROCFO.DBF under field 5 and 6 (capacities -up and to- are equal). The name of the product should be introduced once more under field 4. In case if no particular process name is given in the Directory the name of product linked with the licensor's name should be introduced into field 2 e.g "Methanol-ICI".
- process licensor column should be marked "D" and introduced to the file PCPROCFO.DBF under field 3.
- the raw material column should be marked "E" and introduced into file PCPROCFO.DBF into field 19.
- in case when the project is not yet operational (expansion or project (column marked in Directory "C" the information should be introduced into file PCPROJFO.DBF in a following manner: the name of product (column "A" of Directory) into the field 4. The name of process if not given separately should be combined from the product and licensor name e.g. "Polyuester fibre-Rhone Poulenc" and introduced into field 3.

The name of company from the heading in Directory should be introduced into field 2. Reference to the company should be introduced to the field 1.

- current production column has been marked "G" and should be introduced whenever available into file PCPRODFO.DBF into field 4. The company code should be introduced into field 1 and name of the product from the column A of Directory into field 3.

The start up year (column F of the Directory has not the respective place in the Database files. The file PCPRODFO.DBF may be extende by one field say field 15 for this date. The following fields should be renumerated on one number higher.

2. Assessment of the Petrochemical Database

Organization of the Database is usually made having in mind future customer and purpose for which it could be used. In programme specification of the PETROCHEMICAL DATABASE document this is not mentioned, therefore usefulness of the collection and dissemination of all information is diffucult to assess. Having that in mind the hypothetical potential users would be discussed and proposed for the selection.

Basically the following customers may be interested in petrochemical Database information:

- the Governments for purpose of strategic planning and issuing the investment approvals and/or accepting certain policy measures;
- the petrochemical companies for purpose of assessment of its position in world and, regional scales as well as for purpose of preliminary business opportunity selection and investment planning.
- the trading companies to find out of the sources of supplies for comptetitive bidding as well as to provide offers for spare parts, catalysts and specialized chemicals;
- the trading companies to find out potential markets.

To satisfy mentioned customers having in mind purposes of their interest the following chapters of information content of the Database are necessary:

(1) Identification (addresses, contact persons)
(2) Production unit information-Technologicalprofile (capacity, origin of the process, periodical-annual production)
(3) Economic parameters of production (this is available in terms of company not plant information)
(4) Trade data

However, to have a complete picture of manufacturing and trade the petrochemical situation review must be related to the world wide scale, not only to the developing countries operations. Given in the Annex I the statistical review of the actual production capacities and projected development would show that limiting the Database information to the developing countries is not purposefull and the lack of information from industrialized countries may limit the number of potential customers as well as decrease the possibility of self-financing modality of the Database operation.

The Database content of information on the items (1) and (2) seems to be adequate, however it could be better organized for filling up purposes without bothering instructions. Respective proposals would be given in the Annex VI.

Also transformed chart should be produced in the format of the Technological Profile allowing all comparative calculations with the new development and new technologies. The technological profile data format is given in the chapter reviewing the questionnaires.
The data format in the economic parametrisation should be specificly oriented towards the information already available in the company which is not confidential (e.g released for example to be given to different local Governement organizations).
The specific proposal will be given in the chapter reviewing the questionnaires. Totally lacking are the trade data (4), which are one of the most important element of the petrochemical Database.
The companies they posses the unique information of the domestic sales and export of their products (not only in values but also in amounts), and customs offices (and national statistical offices) they have information on the imported materials. These two sources should be approached when the database questionnaire would be distributed.

In future these elements would built the demand/supply part of the Database. The respective format proposal is given in the chapter reviewing the questionnaire. However, actually it is more important to start the operation of the data base than polishing its content and organization structure. Improvement of the structure and organization of the Database could follow the first round of contacts with potential suppliers/users.

2.1 Recommendations for end users requirements.

The end users as mentioned above are not only companies supplying the information; also Government organizations, Industrial Associations and Trading Companies are expected customers. However, the companies supplying the information are the most important element of the Database operation. Therefore, having in mind value of the information there are the following possibilities of the collection/dissemination of the information:

(1) UNIDO Industrial Development Board may like to decide in the long term to support the Database by approving the budget i.a the INTIB personnel involved in the Databse operation. Also in this case in each country should be established Focal Point (coordinators) who having the access to the inormation would coordinate filling up of the questionnaires. His annual contribution should be rewarded by UNIDO. The companies, associations and Government organizations may become members of the Data Bank using Petrochemical Database. Membership fee would be differentiated: companies, producers would pay less, other operators would be charged by higher fee. The cost calculation of this option is given in the efficiency evaluation chapter.

(2) The Database and Data Bank operations would be self-sustainable. In this case the Petrochemical Data Bank center should be organized in UNIDO HQ in Vienna. The principles of organization and operation of the center are given in below.

2.2 Organization of the Petrochemical Data Bank Center

1. It has been decided by UNIDO Industrial Dvelopment Board to establish the petrochemical database and make it available to Arab countries.

The decision was not specicific on modalities of the data bank operation. Obviously once upon time preparation of the capacity/production data is not an organization of a database which requires permanent up-dating. Also communication media with Arab countries have not been explained (e.g. direct access by specified organizations to the database by electronic means).

It is also not clear why the database could not be available to other developing countries. Therefore, following the Board recommendations information has been collected and prepared to be disseminated however further modalities must be cleared up.

2. Cosidering large amount work already done and continuous efforts of groups of professionals in UNIDO to establish and operate fully-fledged petrochemical database the concept of the establishment of the UNIDO Centre for Information Collection and Dissemination (Petrochemical Data Base) has been developed.
The Charter of the Center and all necessary accompanying documents have been prepared and are attached (Annex IV).

3. The idea behind the organization of the Centre is based on the need to operate database as a data bank available to all enterprises of the developing countries as well as on the need to develop the UNIDO new role in direct co-operation with the industry.

4. The following elements should be considered when deciding on the proper solution:
- sources of information;
- competitive role of the database to the already existing commercial databases;
- organization of the Centre at UNIDO;
- modalities of financing of the Centre;
- efficiency of the Centre operation for its members.

5. Database must present an up-dated information on all elements of petrochemical industry operation world wide. To have valuable impact on the marketing, trade and investment all producing countries have to be considered as well as consuming countries (non-producers).

To compile, process and disseminate the information Centre must have access to the sources of data. The necessary information would be supplied from developing countries by its members (petrochemical companies) directly or through network of correspondents (regional or national).

The developed countries are producing and publishing enough information that could be incorporated into the database, however if companies of industrialized countries would wish to participate in the Centre they are invited to do so on the common basis. Therefore, annual questionnaires would be prepared, disseminated, collected and introduced into database. Experience shows (e.g. that of ECE) that by June of the next after statistical year information can be available, which is much quicker that from any other source of information.

6. Database would be competitive to the existing commercial databases. However, existing databases they have not direct acces to the information from enteprises. In majority of the cases their source of informationa are either integrated statistical data form Governments or journals/newspapers reviews.

Therefore lot of internal assessment is made and rather trends then accurate data are provided by a commercial database.
On the other hand commercial databases ar providing very costly information (annual review of petrochemical data costs over US $ 30,000). The petrochemical companies from developing countries and especially smal.. processors can not afford this cost.

UNIDO as a non profit organization, having ensured a modest membership fee from each industrial enterprise, could afford delivery of this information practically free of charge (against membership fee).

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7. The Centre organized by UNIDO would operate very efficiently using already available resources and modest staffing of the Centre. It is foreseen that three staff members and one secretary could handle all operation including the periodical Newsletter publishing (perheaps as addendum to existing UNIDO Newsletter). The Centr operations would be incorporated as an Unit into existing INTIB structure. Also consulting services as well as fee for correspondents could be covered from the Centre budget. The transmision of the data through the electronic means (or by informatics' means -diskettes) would be cheap and quick. The annual budget of the Centre is given in the chapter 2.5.3.

8. Center would be financed from the membership fees and donations of countries supporting the project. The number of petrochemical companies world wide is large (above 4,000), therefore even modest membership fee (US $ 200 to US $ 500 depending on the size of the company) should be enough to support the Centre activities. Perheaps at the beginning of the Centre operation some support from UNIDO budget or donor country would be necessary.

9. UNIDO using its library and information from members would supply information in a most efficient way for the member enterprise. Each petrochemical enetrprise to collect necessary information must purchase at least 6-8 journals at the annual cost of US $ 600, employ 2-3 qualified staff to make abstracts from journals and operate own database system. All this job would be made by the Centre and information would be supplied without any additional charge.
It looks like that establishment of the Center may economize petrochemical companies about US $ 40-50 million.

10. Whatever other solution would be choosen to satisfy needs for petrochemical data it must be considered that much higher costs are expected. The international cooperation in this field is the most efficient way to complete the task.

2.3 Modalities of communication between the data bank contributors and users.

2.3.1 Collection and up-dating of information.

Once established structure of the data base requires filling up by the information collected. Collection and up-date of the information may be organized by the following procedures:

- use of accesible public sources of data and evaluation by experts lacking data. This basically is a methodology of the SRI, Economic Commision for Europe, etc.

- direct communication with data owner and reception of the information by private channels. The data owner may be Bureau of Statistics of a given Government or directly company involved. This is basically a procedure of EEC, UN system organizations, OECD etc.

Some information are also collected informally by the intelligence methods.

The highest value for trade and investment decisions have current data and their comparison with time series or other relational variables. Therefore, direct communication is the utmost efficient method of the data collection. Having in mind frequence of information update the suppliers information communicate may be delivered at the special format and this by scanner transferred into data base relevant location and format. By scanning also published information can be supplemented to the data base. However, owner of information must be motivated to supply the data precisly and periodically. The motivation can be established by regular price of data paid by the data bank, or method of trading the data collected by the data bank. In this case data supplier become also data user. The last method requires acceptance of all data suppliers. In this case the data bank organization must ensure for the data supplier/user the following conditions of the data bank operation:

- general interest in trade and investment by the user;
- professional, selective orientation of the data base content;
- direct access to the analytical and integrated information by user;
- economic efficiency of the relations between user and data bank.

Therefore, to establish the inflow of information and organize data base, the data bank owner must establish the principles and technical modalities of the information dissemination. The promotional letter and mebership enrollment form is given in Annex V.

2.3.2 Dissemination modalities of the data to satisfy the supplier/user.

There are numerous methods of cooperation between data bank and information supplier/user. The following were selected for efficiency comparison:

- printed, periodical information dissemination. This method is based on the edition of the periodical NEWSLETTER with in principle agreed between suppliers/users information structure. However, the standard form of the information structure never would be adapted to all cases of data required for different purposes.

Therefore, printed information system must have also separate channel of urgent and non-standard information flow. The estimate of the running cost of this system is given in efficiency comparison chapter.

- direct communication with user by phone modem attched to the data base system. This requires preparation and dissemiantion of the guide manual as well as hardware adaptation of the UNIDO computer system to be accessible by phone line.

Also owing the long distance calls potential disturbances structure of the accessible files must be changed to hierarchical on line communication system providing at each order limited (one line) report with quick direct access to files.

The cost for the user would be substantial as the phone connections are expensive and communication time is rather lengthy. The estimate of the investment by UNIDO and running costs of the system is given in efficiency comparison chapter.

- fax connection based on the telephone digit numbers. The data base information is divided into indexed groups. The index guide is distributed to all suppliers/users. The formalized data set (similar to the case of printed newsletter) is stored in ASCII file and at the communication translated into format of fax transmission. The deficiencies of the system are similar to the modem communication, however the communication distortions are less probable and communication time instead of minutes is limited to dozen of seconds. Organization of the system requires special processing software (e.g Telephone Response Technology Inc. INTELESYS), data base access, script system etc. as well as fax card, dialogue card, record adapter to be inserted into PC system. Number of access lines must be ensured (maximum 36 simultaneous lines per one PC). Obviously the structure of data bank on the output side must be adjusted to the communication technology selected. The estimate of the investment by UNIDO and running costs of the system is given in efficiency comparison chapter.

2.4 Revised Petrochemical Database questionnaire

Obviously opinions related to the structure of the Database and format of questionnaire would differ from expert to expert. However, indpendently of the opinions connected with the background and experience of expert in plant operation and available documentation and its credibility, the questionnaire elements must have precise definition widely accepted by technical, economic and financial science and practise. The vague definitions would result in different interpretations and completely non-compatible information would be supplied.

Having in mind long history of the Database and declared completion of the project the proposed changes are not related to the structure of the Database but only aim precision of definitions as well as absolutly necessary supplementary information.

(a) Measures. Four types of measures were used in the questionnaire:

- logic (yes, no)
No comments
- physical (ton, kwh, m3)
No comments
- time (year)
Hours should be introduced in specific fields
- economic (US $).

The evaluation of economic values in US $ seems inadequate to the information available in company files. In many countries exist different rates of exchange and only official one should be applied. They also change over the year and average should be applied. Therefore, either additional instruction would be given to fill up these fields or local currency would be introduced indicating the year of the value given. UNIDO have annual average official rates of exchange or can have it from the World Bank files and necessary recalculations of values may be done in process of introduction of the information.

The revised Database files (DBF) are given in Annex VI. To identify changes each field with proposed chenge is marked by asterix. Comments are given below:

PCCOMP.DBF

No comments and changes proposed.

PCPLANT.DBF

No comments and changes proposed.

PCPRODFO.DBF

New fields are proposed.

Field Name	Field No Old	New
Exptons	-	5
Old description: None **New description:** Amount of main product exported		
Rawmat 1	-	16
Old description: None **New description:** Name of the raw material 1		
Rawton1	-	17
Old description: None **New description:** Annual amount of raw material 1 used in production unit in t/year		
Rawimp1	-	18
Old description: None **New description:** Annual amount of raw material 2 imported in production unit in t/year		

PCPROJFO.DBF

Order of information has been changed to facilitate completion of form (this is not important). The definitions have been changed (this is important). New fields have been added (this is important).

Field Name	Field No Old	New
Investor	2	10
Old description: Name of company for whom the project is beeing carried out **New description:** Name of parent company to which majority of shares belong or which signed with banks credit allowances		

Process	3	3

Old description:
Name of the process that will be used once plant goes into production.
New description:
Name of the proces that will be used. In case of lack of specific name the name of product and name of licensor's name is given

Engineer	6	8

Old description:
Name of engineering company that is beeing employed at the site
New description:
Name of the engineering company that designed the technological part of the production unit

Contractor	7	9

Old description:
Name of the contractor that is beeing employed at the site
New description:
Name of the main (general) contractor responsible for production unit construction.

Capacity	8	4

Old desription: Capacity of the plant in metric tons/year
New description: Name plate capacity of the plant in metric tons per year mentioned in the licensing contract

Investment	9	5

Old description:
Investment in millions of USD in the project
New description:
Fixed investment cost in local currency in millions of units

Phaseofpro	10	14

Old description:
Phase of the project: P-in preparation, D-in design, U-under construction, S-start-up, C-completed
New description:
Year in which given activity (P-in preparation, D-in design, U-under construction, S-start-up, C-completed) has been completed

NEW FIELDS		
Working capital	-	6

New description:
Working capital to operate the production unit in local currency in million of units

Operator	-	11

New description:
Name of company operating production unit

Location	-	12

New description:
Address of location where production unit is beeing established

Comments on new and erased fields:
New fields:
Operator has been introduced as a local enterprise operating production unit.
Location has been introduced to define the address of operator.
Working capital has been introduced to cover total investment cost composed from fixed investment cost given under field **INVESTMNT** and working capital.

PCPROCFO.DBF

Order of information has been changed to facilitate completion of form (this is not important). The definitions have been changed (this is important). New fields have been added (this is important) and some fields have ben erased (this is important).

Field Name	Field No Old	New
Process	3	3
Old description: Name of the process that will be used once plant goes into production. **New description:** Name of the proces that will be used.In case of lack of specific name the name of product and name of licensor's name is given		
Capacifrom	6	4
Old description: Production capacity in tons/year in a range from **New description:** **New description:** Name plate capacity of the plant in metric tons per year mentioned in the licensing contract or in extension project basic engineering		
Investment	8	6
Old description: Investment in millions of USD in the project **New description:** Fixed investment cost in local currency in millions of units		
Rawprod5	27	26
Old description: Name of raw product 5 **New description:** Auxiliary materials		
Rawton5	28	27
Old description: No. of tons of raw product 5 that are required per ton of main product. **New description:** Cost of auxiliary raw materials that are required per ton of main product expressed in national currency LC/t		

NEW FIELDS

Working capital - 7
New description:
Working capital to operate the production unit in local currency in million of units

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Operation time - 5
New description:
Operating time of installation given in licensing contract of in basic engineering.

Inertgas - 32
New description:
Amount of inert gas that is required per ton of main product in 1000Nm3/t

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Workers - 34
New description:
Number of workers operating production unit

Staff - 35
New description:
Number of engineers and managers operating production unit

DELETED FIELDS

Capacito 6 -
Old description:
Production capacity in tons/yesr in a range to
New description:
Deleted

Capacistd 7 -
Old desription: Average capacity in tons/year that is achieved in the particular production unit using the above technology
New description: Deleted

==========

Comments on new and erased fields:
Erased: Capacity is not a concept for which can be given range of values. Capacity is a standard amount of the product which at the designed time and at designed parameters can be produced on the production unit. Production capacity is given in the basic engineering and can be changed by extension project accordingly to the new basic engineering.

Annual production can be lower then capacity form the market or maintenance reasons. Annual production can be also higher then capacity if operating time is longer then designed or production parameters are intesified.

Also introduction to the questionnaire the concept of standard capacity to be judged by each company changes the concept of standard itself. There are not any standards defining the"standard" capacity.

Only known concept is a minimum economic capacity, when production unit operating at given capacity shows the breakeven point in cost calculation.

New fields:
Operating time has been introduced as a measure of effciency of the process.
Working capital has been introduced to cover total investment cost composed from fixed investment cost given under field INVESTMNT and working capital.
Inert gas consumption has been added to the utilities consumption figures. In many technologies use of inert gas limits the operation of technology.
Rawprod5 and Rawton 5 have changed meaning: there exists always a group of auxiliary materials which are added in a small amount. The group could be numerous and prices high, therefore they may not be listed in five raw materials required for production purposes. Therefore, exists a practice to combine all auxiliary materials in one group of raw materials and calculate the cost of their consumption per ton of main product.
Workers. The number of workers operating production unit has been added. This number would be different from all data on employment collected in other files (there they are given for whole company not the production unit).
Staff. The number of technical and managerial personnel operating production unit has been added.
This number would be different from all data on employment collected in other files (there they are given for whole company not the production unit).

PCCOTURN.DBF

Order of information has not been changed. The definitions have been changed (this is important). New fields have been added (this is important).

Field Name	Field No Old	New
Year	2	2
Old description: None		
New description: Year for which data are reported.		
Grossprof	3	3
Old description: Gross profit (in million of USD)		
New description: The profit before taxes denoted by the company in a reported year in a national currency millions units		

Field Name	Field No Old	New
Addedval	4	4

Old description:
Added value (in millions USD)
New description:
Added Value calculated from company inputs and outputs (enterprise method) in national currency in millions units

RDexpend	5	5

Old description:
R&D expenditure (in millions of USD)
New description:
Amount of R&D expenditures of company disbursed in reported year in national currency in million of units

Invexend	6	6

Old desription: Investment expenditure (in millions USD)
New description: Investment expenidtures of company disbursed in reported year in national currency in million of units

Sales	7	7

Old description:
Sales (in millions of USD)
New description:
Annual sales in reported year in national currency in million of units

Export	8	8

Old description:
Export (in millions USD)
New description:
Annual exports of company in reported year in national currency in million of units

Comments:
More detailed definitions have been given as well as the evalaution of parameters proposed in national currency.

PCPLTURN.DBF

Order of information has not been changed. The definitions have been changed (this is important). New fields have been added (this is important).

Field Name	Field No Old	New
Year	2	2

Old description:
None
New description:
Year for which data are reported.

Grossprof 3 3
Old description:
Gross profit (in million of USD)
New description:
The profit before taxes denoted by the plant in a reported year in a national currency millions units

---

Addedval 4 4
Old description:
Added value (in millions USD)
New description:
Added Value calculated from plant inputs and outputs (enterprise method) in national currency in millions units

---

RDexpend 5 5
Old description:
R&D expenditure (in millions of USD)
New description:
Amount of R&D expenditures of plant disbursed in reported year in national currency in million of units

---

Invexend 6 6
Old desription: Investment expenditure (in millions USD)
New description: Investment expenidtures of plant disbursed in reported year in national currency in million of units

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Sales 7 7
Old description:
Sales (in millions of USD)
New description:
Annual sales of plant in reported year in national currency in million of units

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Export 8 8
Old description:
Export (in millions USD)
New description:
Annual exports of plant in reported year in national currency in million of units

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Comments:
More detailed definitions have been given as well as the evalaution of parameters proposed in national currency.

2.5 Efficiency of the data bank operation

The following alternatives would be analysed:

- income side.

Combined financing from UNIDO (budget,trust fund or donors) and membership fee. For the first three years of operation the annual income from membership fees is estimated in amount of US $ 300,000 (20% of developing countries petrochemical companies and 5% of industrialized countries companies). This figure can be tested by distribution of the membership enrollment form.

After three years of demonstration operation the Data Bank either would be self-financing (1150 companies from developing countries and 2000 companies from industrialized countries) with income of US $ 945,000 annually (at US $ 300 average mebership fee), or would cease its operation.

- expenditures of Data Bank holder (UNIDO).
The three alternatives of operation are considered:
-- classical means information distribution;
-- phone modem type operation;
-- fax transmission type of operation.
The alternative costs for Centre member would be also assessed having in mind the following options:
(a) individual collection of data (own data base)
(b) classical form of data transmission;
(c) phone modem form of data transmission;
(d) fax data transmission form.

2.5.1 Costs of the data bank establishment and operation

2.5.1.1 UNIDO annual costs
There are following costs which are common for each of alternatives:
- UNIDO HQ personnel
Having in mind staffing of the similar Data Banks is is proposed to have four permanent staff employed:
- data bank operator (P3) 12m/m;
- abstractor (scanning modality of abstracting) (P3) 12m/m;
- trainer (manuals, guidelines, methodological instructions) (P5) 12m/m;
- secretary 12 m/m;
The trainer would be Chief of the Unit (Centre).

The HQ personnel costs: US $ 280,000.

- country coordinators.
To ensure quality of the data received by the data bank the focal points of INTIB should be used and country coordinators on data collection should be established. Accordingly to the Petrochemical Directory the 45 countries need country coordinator. He would be employed by SSA annually for four weeks to assess, combine and expedite the compnies data. Considering the salaries in the developing countries SSA cost would be US $ 3,000.

The coordinators costs: US $ 135,000

- start-up costs(distribution of charter, membership enrollment form, introduction of data from UNIDO sources to the Data Base)	**US $ 35,000**
- consultancy costs	**US $ 60,000**
- equipment (scanner)	**US $ 3,000**
- miscellaneous costs	**US $ 15,000**
- UNIDO overheads costs (13%)	**US $ 66,000**
Total	US $ 554,000

Above these costs for each alternative different investment costs are necessary:

- classical information distribution:

Cost of NEWSLETTERS (two editions monthly, eight pages edition, 2000 exemplares):	US $ 150,000
Cost of ad hoc information (four advisory reports monthly, four pages, 200 exeplares):	US $ 15,000
Total	US $ 165,000

- phone modem transmission method:

PC system adjustment:	US $ 3,000
Software adjustment:	US $ 30,000
Operation cost:	US $ 2,000
Total	US $ 35,000

- fax transmission method;

Hardware adjustment	US $ 6,000
Software adjustment	US $ 25,000
Operation cost:	US $ 2,000
Total	US $ 33,000

2.5.1.2 Members' costs

The cost of the PC has not been considered in members costs because all petrochemical companies have adequate number od PCs that can be used for interconnection with UNIDO Data Bank.

The mebers costs are composed from the following elements:

(a) Constant for each technical communication option:

Membership fee US $ 200 - 500

The fee would depend on the company annual sales.

(b) Variable for each communication option

- individual data bank alternative. (Three staff members abstracting at least six petrochemical journals, editing, printing and distrubution)

- personnel costs	US $ 36,000
- journals	US $ 1,000
- miscellaneous	US $ 1,000
Total	US $ 38,000

- UNIDO Data bank alternative

- classical method:

- personnel (one staff meber)	US $12,000

- phone modem transmission method:

- adjustment of PC	US $ 3,000

- cost of communication (The standard NEWSLETTERS composition of information would be about 800 pages annually. The phone modem communication requires 1-2 minutes for one page communication transmission -connection time, operators time, transmission time.) The normal cost of one minute communication from developing countries is abot US $ 3.)

	US $ 5,000
- advisory notes	US $ 500
- personnel	US $12,000
Total	US $20,500

- fax transmission method:	
- adjustment of PC (fax card)	US $ 2,000
- cost of communication	US $ 1,000
- advisory notes	US $ 100
- personnel	US $12,000
Total	US $15,100

2.5.1.3 The integrated costs of Data Bank establishment and operation

UNIDO costs

Establishment costs:

	UNIDO Data Bank		
Individual	Classical	Phone modem	Fax transmission
-	35,000	68,000	66,000

Operation costs:

	UNIDO Data Bank		
Item	Classical	Phone modem	Fax transmission
Consultants	60,000	60,000	60,000
UNIDO coordinators	135,000	135,000	135,000
UNIDO staff	280,000	280,000	280,000
Equipment	3,000	3,000	3,000
Data transmission	150,000	3,000	2,000
Ad-hoc transmissions	15,000	3,000	2,000
Total	583,000	484,000	482,000
First year costs	628,000	552,000	548,000
Second year costs	583,000	484,000	482,000

Member cost:

Establishment costs:

	UNIDO Data Bank		
Item	Classical	Phone modem	Fax transmission
Software			
Hardware	3,000	3,000	2,000

Operation costs:			
Personnel	12,000	12,000	12,000
Transmission dissemination	15,000	5,500	1,100
Membership fee	500	500	500
Total	27,500	18,000	13,600
First year operation	30,500	21,000	15,600
Second year operation	27,500	18,000	13,600

The efficiency of the fax transmission communication modality is the most efficient for members as well as for UNIDO and this is recommended for implementation. The savings of one company participating in the Data Bank are about US $ 25,000 annually and for all members US $ 25-28 million (only developing countries).

The UNIDO project for the fax transmission method is attached. (Annex VIII).

3. List of petrochemical companies: information suppliers to which questionnaire should be sent.

Considering the number of potential members of the Centre it is advisable to carry out the recruitment action in two stages. In the first stage all petrochemical companies should be contacted producing primary petrochemicals (ethylene, propylene, benzene, xylenes) and only if satisfactory response would be received, then in the second stage producers of downstream petrochemicals should be recruited as a members of a Centre. The list of primary petrochemicals producers is attached. (Annex VII).

Conclusions and Recommendations

Conclusions

(1) The UNIDO project on Petrochemical Database should be considered successful and results should be made available to all developing countries.

(2) Transformation of the Petrochemical Database into Data Bank available to all interested parties is an efficient economic venture.

(3) Organization forms were analysed and it was concluded that Petrochemical Data Bank should be organized as a UNIDO Centre. All petrochemical companies from developing countries should become a members of the Centre. The developed countries industry is also welcomed to join the Centre.

(4) Having in mind interest of future customers urgently the export import database files should be established as an piloting stage to the demand/supply database chapter.

Recommendations

(1) INTIB should prepare an issue paper to be presented at the UNIDO PBC and UNIDO Board proposing organization of the UNIDO Centre-Petrochemical Data Bank. Relevant project proposal for the first three years of Centre operation should be submitted to donor countries or considered in the next biennium budget.

(2) Urgently information from Petrochemical Directory should be filled up into Petrochemical Database and first round of questionnaires printed out and with necessary explanatory documents from this report submitted to all companies concerned.

(3) Arab countries are recommended as the piloting companies to complete and use the data bank.

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Annex I Petrochemical industry assessment

The collection of the data and organization of the Data Bank depends very much on the size and the importance of the industry for world economy. The petrochemical industry fulfills this condition. Below is given short review of the petrochemical industry worldwide.

Table 1 World and regional production of ethylene

Regions	Years			Rate %
	1984	1988	1993	per year
	Million tons/year			
EUROPE	17.2	20.5	23.4	3.47
AFRICA	0.2	0.5	0.6	12.90
MIDDLE EAST	0.4	2.1	3.5	9 times
ASIA	6.6	8.4	12.3	7.16
NORTH AMERICA	16.3	20.2	23.2	2.35
SOUTH&CENTRAL AMERICA	1.7	1.9	2.8	5.70
OCEANIA	0.3	0.3	0.5	5.83
WORLD	42.7	53.9	66.3	5.00

Source: ECE reports and own calculations

Table 2 World and regional production of propylene

Regions	Years			Rate %
	1984	1988	1993	per year
	Million tons/year			
EUROPE	9.3	11.3	13.1	3.88
AFRICA	0.03	0.15	0.5	16 times
MIDDLE EAST	0.02	0.02	0.3	15 times
ASIA	4.2	5.5	8.0	7.42
NORTH AMERICA	7.9	9.5	11.9	4.65
SOUTH&CENTRAL AMERICA	0.7	0.8	1.6	9.62
OCEANIA	0.2	0.2	0.2	.
WORLD	22.35	27.47	35.5	5.30

Source: ECE reports and own calculations

Table 3 World and regional production of benzene

Regions	Years 1984	1988	1993	Rate % per year
	Million tons/year			
EUROPE	83.4	9.3	10.2	2.31
AFRICA	0.05	0.1	0.1	2 times
MIDDLE EAST	0.02	0.3	0.4	20 times
ASIA	3.2	4.0	5.8	6.83
NORTH AMERICA	5.3	7.0	7.8	4.38
SOUTH&CENTRAL AMERIC	0.7	0.7	1.1	4.04
OCEANIA	0.04	0.04	0.07	6.41
WORLD	17.61	21.44	25.47	4.18

Source: ECE reports and own calculations

Table 4 World and regional production of xylenes

Regions	Years 1984	1988	1993	Rate % per year
	Million tons/year			
EUROPE	3.5	4.2	4.5	2.83
AFRICA	0.02	0.12	0.13	6 times
MIDDLE EAST	-	0.02	0.05	.
ASIA	2.0	3.1	4.9	11.04
NORTH AMERICA	3.0	3.8	4.5	4.60
SOUTH&CENTRAL AMERICA	0.5	0.5	0.6	2.04
OCEANIA	- -	-	-	
WORLD	9.02	11.74	14.68	5.55

Source: ECE reports and own calculations

The remaining block-building monomers are playing smaller role in world petrochemical balance. The butadiene production in 1988 achieved 7.2 million tons from which 50% were produced in Europe, remaining divided more less equally between Asia (Japan) and North America.

Petrochemicals get their way to the market through downstream derivatives. The structure of petrochemical industry is based on large scale petrochemical complexes, many of them linked by pipelines with customers/producers of downstream derivatives. National and international grids of ethylene pipelines are now common in Europe and USA. Therefore, to analyse markets for petrochemicals it is necessary to identify consumption structure of block-building products.

Table 5 Consumption structure of ethylene (1990)

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Ethylene	100	38.5	36.8	0.6	3.6	16.0	3.7	0.7
LDPE/LLDPE	34.1	36.3	30.6	52.9	45.7	29.8	50.2	40.5
HDPE	19.7	17.3	21.7	27.3	7.1	23.5	19.3	30.3
EDC	15.1	17.1	13.2	19.8	13.9	14.8	15.3	8.0
EO	12.4	10.7	14.8	-	18.8	11.2	6.5	7.5
ETHB	7.0	6.7	7.5	-	4.6	7.9	7.0	-
ETHANOL	2.1	3.6	0.9	-	9.9	-	.	-
ACETALD	1.9	2.6	1.5	-	-	2.6	-	2.7
VA	1.6	0.1	2.3	-	-	2.6	1.2	1.3
Other	6.1	5.6	7.5	-	-	7.6	0.5	0.7

Source: SRI reports and own calculations

Table 6 Consumption structure of propylene (1990)

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Propylene	100	40.7	35.0	0.15	0.15	20.4	2.9	0.7
PP	40.5	36.5	37.5	100	-	52.6	40.1	84.3
ACN	16.3	17.4	14.2	-	-	19.2	11.9	-
OXOALC	10.2	13.1	7.6	-	-	8.7	10.6	3.2
PO	8.8	8.8	10.8	-	-	4.7	13.8	-
CUMENE	8.4	10.2	8.5	-	-	5.2	7.0	5.9
ISPALC	4.9	5.3	5.9	-	-	2.4	5.5	-
C7"/C"11	4.0	2.1	7.7	-	-	-	-	-
ACRAC	1.5	0.7	3.6	-	-	-	-	-
Other	5.4	5.9	4.2	-	-	7.2	11.1	6.6

Source: SRI reports and own calculations

Table 7 Consumption structure of benzene

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Benzene	100	42.5	33.5	0.2	1.2	18.8	3.3	0.5
ETHB	48.3	41.7	55.5	-	-	47.2	50.4	76.2
CUMENE	19.3	21.9	21.2	-	-	12.9	13.1	16.8
CYKLOHEKX	14.7	14.6	12.7	-	93.6	19.4	16.6	-
ALKBEN	3.8	3.9	2.3	42.5	5.6	4.2	10.4	6.2
NITRB/ANIL	5.1	7.0	5.3	-	-	5.2	3.4	0.6
MALANH	1.6	2.5	0.2	-	-	0.1	-	-
CHLORBEN	1.7	2.5	1.7	-	-	0.1	-	-
Other	5.5	5.9	1.1	57.5	0.8	10.9	6.1	0.2

Source: SRI reports and own calculations

Table 8 Consumption structure of xylenes

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Xylenes	100	35.2	30.6	0.4	0.2	30.0	3.4	0.2
o-XYL	20.4	28.3	18.2	-	100	11.4	41.7	-
p-XYL	58.4	43.9	74.2	21.3	-	63.9	31.2	-
m-XYL	1.9	2.9	1.5	-	-	1.5	-	-
MIXED	19.3	24.9	6.1	78.7	-	23.2	27.5	100

Source: SRI reports and own calculations

Message given by the statistical figures is self-explanatory. Over 70% of block-building petrochemicals is produced and consumed in developed countries. The consumption structure overthere is diversified to serve other subsectors of industry. In developing countries concentration is observed on one or two products. Selection of these products depends on local strategies and perheaps on the avilability of the appriopriate technology. The consumption structure of petrochemicals is a clear reflection of GDP per capita in given country and consumption potential of existing industrial structure.

Over 2/3 of block-building petrochemicals are transformed into thermoplastics, synthetic fibres and synthetic rubbers.

Their consumption is directly related to the consumer market through the production of the automotive industry, packaging industry, furniture industry, textile industry etc. The regional split of production of thermoplastics is given in the following table.

Table 9 Production structure of downstream derivatives

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	Million ton/year (1989)							
THPLSTC 1\	60.2	21.7	18.6	0.6	0.6	15.4	2.6	0.7
SYNFIBR 2\	12.5	3.2	3.4	0.15	0.1	5.1	0.5	0.05
SYNRUB	6.22	2.1	2.1	0.04	0.03	1.5	0.4	0.05

Source: UN statistics and own calculations
1/ Polyethylene, polypropylene, PVC, polystyrene
2/ Polyacrylonitryl, polyester, polyamide.

The pattern of production of downstream derivatives is similar to the block-building petrochemicals: 75 % of the production capacities is located in industrialized countries, where they found local/regional market.

However, the production data should be supplemented by the trade information. Obviously the substantial amount of petrochemical derivatives, downstream products is consumed in producer's country. However, about 1/4 of the production of plastics, rubbers and fiibers is traded among the producers/consumers. Having in mind very high volume of this trade it is important for any collection of data to analyse also these trade data.

The world trade of chemical products in the year 1990 was over 200 billion US $ (the value of exports and equivalent amount of imports). Trade statistics are dealing with the groups of products defined by SITC and extraction of volume/value of trade in petrochemicals requires large scale statistical effort. The available data in data banks can be purchased by individual contracts and very few data are published. Therefore any results of analytical approach should be taken as obviously approximate especially when dissusing regional trade.

In the following tables are given data collected by UNIDO for:

- block-building petrochemicals: ethylene, propylene benzene;
- downstream derivatives: thermoplastics and synthetic fibres. e.

Table 10 Trade structure of the block-building petrochemicals

Products	Regions						
	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	Kt year (1989)						
Benzene							
- export	1623	230	48	40	285	105	-
- import	723	260	-	-	170	12	50
Ethylene							
- export	1723	90	250	180	160	10	-
- import	1913	100	35	25	460	50	-
Propylene							
- export	1220	250	125	250	195	40	-
- import	1834	220	5	220	440	-	-

Source: SRI reports and own calculations

Traded amounts of block-building petrochemicals are small in comparison with their production. Production of benzene in Europe amounts over 10 million tons, therefore exports and imports are respectively 16% and 7% of the production. Even smaller trade ratio is observed in ethylene; Europe exports 8% of the production and imports 9.5% of yearly production. Transportation difficulties of the liquid etylene are rather limiting trade to products transported by pipe line system.

Small amounts are sold in liquid form either to make balance of derivatives production or in case of usage in fine chemicals industry. Trade in other regions is insignificant in comparison with Europe.

Opposite is observed in downstream derivatives.

Table 11 World wide trade in thermoplastics (1989)

Product	Value in US $ million	Ratio export/production %
LDPE/LLDPE	4,800	28
HDPE	2,600	26
PP	2,840	27
PVC	3,050	18
PS	1,800	22

Source: UN satistics and own calculations

Value of trade in thermoplastics equals about 7.5 % of the overall trade in chemicals and this is a highest ratio for one commodity group.

The trade in synthetic fibres is smaller, however overall ratio of the export to the production is over 20%. The particular fibres data are given in the following table.

Table 12 World wide trade in synthetic fibres (1989)

Product	Value US $ million	Ratio export/production %
PAN	900	28
Nylon	550	15
Polyester fibres	1,350	18

Economies of developed countries denoted recession which started late 1990 and which in specific areas still continues. In 1989 process of reconversion of centrally planned economies to the market system has started and in the following years these countries denoted large scale decrease of local production and overall consumption. Also reliable production statistics from developing countries are delivered with two-three years delay. Therefore, for structural analysis it seems that years 1988-1989 may be representative. For other purposes like estimate of trends and projections the data from 1988 should be reviewed and analytical review of situation is requried.
Therefore, selected data for years 1984, 1988 as well as the projection for the forthcoming year 1993 will be presented.

Also in early eighties the petrochemical industry of developed countries has been restructurized. The reasons for restructuring were as follows:

- mutiple installations constructed in sixites have shown lk of competitiviness on international market;
- dispersion of processes among multiple producers was an obstacle for further technology development;
- lower than expected demand, originated overcapacity in certain products;
- loss of markets in Latin America and Asia due to the development of national petrochemical industries and entrance on the international market producers from Middle East countries.

At the first step closures of selected capacities have been negotiated. It is estimated that in period between 1981 and 1984 production capacity of thermoplasics in Western Europe has been reduced by about 2 million tons followed by reduction of number of producers.

Table 12 Reduction of number of commodity plastics producers (1980-1984) in Western Europe

Product	Number of producers 1980	1984
HDPE	20	15
LDPE	25	19
PVC	28	18
PS/EPS	19	17
PP	18	16

Source: Chemical News, 1988

Development of production of petrochemicals depends on the following factors:

1) macroeconomic:
   - GDP growth;
   - new applications of downstream derivatives;
   - general availability of capital;
   - general trade and tarrifs world situation.
2) microeconomic:
   - industrial restructuring in developed countries;
   - programmes supported by local Governments of developing countries by capital participation;
   - possibility of the development of certain packages of industrial policies by investing countries;
   - advantegous microeconomic conditions for foreign investors (tax holidays, profit repatriation conditions, credit subsidies for infrastructural and environment protection elements of the petrochemical complex, import tarrifs, etc.)

The elasticity growth coefficient for downstream derivatives production denotes historically value over 1 and in many cases is 10 % - 20% higher than rate of growth of GDP.

However, it should be mentioned that this macroeconomic relations can be used for testing of the results of more detailed demand assessment, which stability depends on the local industrial structure. Quick growth of local demand of down-stream derivatives will be always observed when local e.g. housing construction, automotive and packaging industries will be developed. Then, previously limited by import barrier amount of used materials grows quickly, not only substituting imports but also covering demand in multiple new applications.

Also technological break-throughs in new application may change overall cosnumption pattern of plastics, fibres and rubbers. This was observed when automotive industry drastically increased application of plastics and when preservation and packaging of food substituted paper and glass by plastics.

The expected consumption growth of petrochemicals' downstream derivatives, following the correlation between the GDP and down-stream derivatives consumption pattern is given in the following table.

Table 13 Projection of the world production of petrochemicals (optimistic scenario)

Product	Year 1995	2000	2010
	million ton		
Plastics	75.9	92.3	136.6
Fibres	14.9	17.3	23.2
Synthetic rubbers	7.0	7.7	9.4
Ethylene	72.5	85.7	100.0

Source: Own assessment

The regional distribution of added capacities is expected to be divided as follows:

Table 14 Regional ratios of the new capacities in petrochemicals (Year 2000)

Products	Regions Europe	Africa and ME	NA	Asia	S&C America	Oceania
	% of added capacities					
Plastics	20	10	20	25	20	5
Fibres	5	15	10	40	25	5
Rubbers	20	35	15	5	15	10
Ethylene	20	12	18	35	10	5

Source: Own assessment

Projected increase of capacities will require large amount of capital investments. Assessment of financial resources required is very difficult. The reasons of diffficulties are obvious

The future monetary situation is impossible to forecast, rate of exchange are not stable and rate of interest are inpredictable. However, taking into acount optimistic scenario of the world development the required financial resources to support world wide petrochemical industry development is given in the following table.

Table 15 Capital investment cost of the petrochemical industry developemnt by the year 2000

Product	Region Europe	Africa and ME	NA	Asia	S&C America	Oceania
	US $ million (1990 prices)					
Plastics	7800	1955	7800	14600	15600	1950
Fibres	1080	4880	2170	13100	10800	1100
Rubbers	1700	4540	1300	650	1950	430
Surfactants	1140	2560	1140	6850	4560	570
Organics	12000	3000	12000	8000	8000	2000
Total	23720	16935	24410	43200	40910	6050

Source: Own calculations

Amount of capital is obviously large. For cumulative investment during next decade above US $ 150 billion have to be spent only for petrochemical industry. It is to large to be afforded only by private companies without support of international financial institutions and local Governments. To compare these figures with the private investment, respective data have been collected. Data are given in the following table.

Table 16 World wide private investment in chemical industry

Region	Years		
	1988	1989	1990
	Ecu billion		
Europe	16.8	19.5	20.5
USA	16.4	9.4	8.9
Japan	11.5	13.2	13.4
Total	44.7	42.1	42.8

Source:CEFIC report 1991

Therefore, whatever has been published promoting involvement of the private companies into the development of petrochemical industry remains rather wishfull thinking than reality.

Trade regulations will have important impact on the implementation of presented scenario.

Two conditions of GATT agreement are crucial for subsequent succesfull development of petrochemical industry:

- temporary policy measures defending local markets of developing countries should be allowed;
- markets of developed countries should remain open in terms of competitive price.

These conditions will largely improve the trade balance between the North and South, changing the financial flows from donations to the comparable value of trade balance.

The presented scenario of development is considering specific situation of the petrochemical industry in both developed and developing countries. To pursue the possible line of development one should consider two elements:

- the maturity of Europen petrochemical industry;
- programme of development of petrochemical industry in leading countries.

Obviously, the petrochemical industry in Europe and USA require restructuring. The process of restructuring, which started in early 80-ties is not yet completed. Actual maturity of selected Europen installations is given in the following table.

Table 17 Maturity of petrochemical industry in selected European countries

Regions	Cracker capacities in operation over 20 years	15 years	10 years	New
	thousands t/year			
Benelux	2500	525	-	1050
France	1350	1180	-	-
Germany	850	480	300	940
Italy	840	350	700	-
Nordic	600	400	-	-
Portugal	-	-	300	-
Spain	240	810	-	-
U.K.	385	1115	-	1000
Total	6765	4860	1300	2990
%	42.5	30.5	8.2	18.8

Source: Chemical Week International March, 1990

The sample of the capacities is small (12%) howvere it allows to judge over the maturity of the world petrochemical industry. It seems that in developed countries (Europe, USA, Japan) maturity of petrochemical industry by the year 2000 will reach the critical value of 20 years of operation. Therefore, restructuring will be necessary and actually programme of rehabilitation and extension of capacity over 1350 thousand tons of ethylene, only in Europe, is under execution.

Considering this situation, the net value of capacities to be revamped or closed by the year 2000 in Europe may reach value of 10 millions ton of ethylene per year.

The world wide figure will be easily 20 million tons per year. It seems that at least 50% of investors would consider foreign investment at the condition of availability of ethylene in the European/USA pipe line system. This is a good chance for North African countries.

Similar conditions are in USA, creating oportunity for Mexican and Canadian petrochemical industries. Japaneese industry is figthing the battle between the sustainable projects proposals and MITI regulations. Already prepared and under prelimianry steps of implementation are projects of 3.0 million tons of ethylene new capacities (about 9% of new capacities). However, the conservative policy of MITI will allow perheaps additions less than 1 million t/year with the emphasis of the ethylene export (Showa Denko project).

The situation in developing countries is different. Only few enetred, or are under the way to enter, the club of petrochemicals producers. The pattern of reasons which caused establishment of the petrochemical industry are diversified, however, basic impact is due to the national industrial policies and not "the free-market invisible hand".

The historical data on production and production and projections for selected developing countries are given in the following table.

Table 18 Trend of ethylene production in developing countries

Countries	Year 1985	1990	2000*/
	Kt/year		
AFRICA			
Algeria	100	120	120
Libya	330	330	600
Nigeria	-	-	300
South Africa	220	330	450
MIDDLE EAST			
Kuwait	-	-	750
Quatar	280	280	280
Saudi Arabia	1600	2200	3200
ASIA			
China	960	2170	4200
India	250	550	1700
Indonesia	-	-	500
Korea Republic	500	1150	3300
Malesia	-	-	350
Singapore	300	430	800
Taiwan Province	900	950	1200
Thailand	-	-	400
S&C AMERICA			
Argentina	230	300	700
Brazil	1430	1540	2500
Colombia	115	150	450
Ecuador	-	-	300
Venezuela	150	180	600
NORTH AMERICA			
Mexico	950	1400	1800
Total	8315	12080	24000
Total world	55600	65100	85700
% of world capacities	14.9	18.5	28.0

*/ including projects under planning and negotiation stage

Source: UNIDO statistics and own calculations

In Africa only advanced project is in Nigeria at Port Harcourt were capacity of ethylene cracker, based on LPG, will be added to existing aromatics production. Expansion of SASOL planned in South Africa may be revised, after embargo on hydrocarbons will be raised.

In Middle East SABIC project in Saudi Arabi is fairly advanced, however decision to use naphta as raw material is questioned. The decision of that change in raw material source is based on intention to extend downstream derivatives profile to polypropylene and aromatics products.

However, this decision may put SABIC in cost disadvategous production cost position even if the price for LPG will be raised to 1 $ per mln Btu. Original project in Kuwait may be postponed due to the post-war rehabilitation programme of oil fields and refining capacities.

However, in this place long discussed petrochemical complex in Abu Dhabi may be realized. The Gulf Cooperation Council decided to establish trading company (marketing/shipping) to avoid unnecessary competition between member states but it seems that SABIC will have decisive position in all Middle East petrochemical trade.

In Asia, China is the dominating producer among developing countries. However, huge local market constrains the development of a large scale export oriented petrochemical industry. Possibility to achieve production of about 4 million tons per year of ethylene with further processing stages will depend on intiative and furter development of special economic zones where foreign capital may decide to participate in investment programme of downstream derivatives.

India is considered the petrochemical dwarf of the continent. Lack of the local refining capacities in naphta feedstock (used for other purposes) was always hampering development of petrochemical industry. Current study prepared for the Government shows the demand for ethylene and propylene (conservative projection) respectively above 2 million tons and 880 thousand tons. Some preparations to move ahead with petrochemicals have been observed in Madras refinery where private capital is expected to participate.

In Republic of Korea growing up deficit of ethylene and propylene has motivated Government to lower tariffs on the imported products from 10% to 2% as downstream derivatives production has accelerated. The growing deficit of ethylene and propylene will allow at the end of the century to revamp existing and establish new petrochemical capacities. Similar situation is observed in Taiwan Province which is a major importer of petrochemicals (over 30% of demand is covered by imports). Production capacities of downstream derivatives are constantly underused due to the lack of ethylene and sixth naphta cracker is urgently needed.

New producers will also emerge by the year 2000, namely Thailand, Malasia and Indonesia. In Thailand lenghty discussions about the needs of Eastern Sea Board petrochemical complex and its feasibility has terminated by creation of international financing consortium and preparatory works already started.

Indonesia plans to start petrochemical industry have been postponed and lower then expected capacities will be established. The lack of Government financial resources was the original reason of this decision. However, it seems that by the year 2000 at least one large scale petrochemical complex will be established.

In South and Central America establishment of new crackers is expected in several countries. In Argentina new petrochemical complex in Nequen state is supposed to be established, and not extension of already existing production facilities in Bahia Blanca.

Currently the feedstock prices established in Argentina are perheaps lowest in the world (30 cents per 1 million BTU). Still privatization of the Bahia Blanca cracker has been postponed due to the political reasons.

Brazil is one of the success stories in petrochemical industry. Development of three petrochemical complexes (COPENE, PETROBRAS and COPESUL) is under the way and COPENE which seems to be the largest petrochemical complex world wide, started further expansion form internal cash flow.

The fourth complex in Rio de Janeiro is under advanced stage of negotiations. This decision has been largely discussed and doubts expressed about need of establishment of the new petrochemical pole instead of expansion of existing ones.

However, as financing banks have been interested in conversion of country debt into equity of the new pole, it seems that fourth petrochemical pole in Brazil will be established and US $ 1.6 billion expeditures has been approved in the Government plan. It is to wait and see the implementation of the project.

In Venezuela small scale revamping of the El Tablazo cracker has been completed. The major expansion of this petrochemical complex to the capacity of 250,000 ton/year will be completed after new cracker (350,000 t/year) will come on-line. This capacity would not allow Venezuela to enter international market with downstream derivatives as practically all products will be consumed domestically.

Columbia and Ecuador are two pctential newcomers in the petrochemical family of producers, however the production programmes are not yet approved and financing for the petrochemical projects is still sought.

In North America, Mexico practically completed the petrochemical expansion projects and production is expected to meet mainly domestic demand. It is expected that revamping and restructuring programme of United States petrochemical industry, which is expected during middle of 90-ties, after signature of the common market agreement, will attract American investors to Mexico.

Annex II

DIRECTORY TEST
Ethylene

Country	Capacity in directory Kt/year	Capacity test
AFRICA		
Algeria	120	120
Libya	330	330
South Africa	.	225
ASIA & PACIFIC		
China	2810	2600
India	916	655
Korea Republic of	1955	1555
Singapore	400	430
Thailand	315	315
Taiwan Province	899	953
SOUTH & CENTRAL AMERICA		
Argentina	260	306
Brazil	1468	1542
Colombia	220	150
Mexico	2663	1928
Peru	5	5
Venezuela	500	450
MIDDLE EAST		
Qatar	280	280
Saudi Arabia	1924	2130
Turkey	358	380

DIRECTORY TEST
Propylene

Country	Capacity in directory Kt/year	Capacity test
AFRICA		
Libya	171	170
South Africa	.	
ASIA & PACIFIC		
China	766	1065
India	200	380
Korea Republic of	678	698
Singapore	200	190
Thailand	105	105
Taiwan Province	485	437
SOUTH & CENTRAL AMERICA		
Argentina	96	187
Brazil	709	850
Colombia	20	35
Mexico	714	737
Venezuela	224	225
MIDDLE EAST		
Iran	50	50
Saudi Arabia	275	200
Turkey	190	203

DIRECTORY TEST
Benzene

Country	Capacity in directory Kt/year	Capacity test
AFRICA		
Algeria	90	60
Egypt	29	32
Libya	141	150
South Africa	.	36
ASIA & PACIFIC		
China	973	1096
India	209	235
Indonesia	123	123
Korea Republic of	483	799
Singapore	80	80
Taiwan Province	294	410
SOUTH & CENTRAL AMERICA		
Argentina	204	186
Brazil	585	673
Colombia	45	74
Mexico	538	407
Trinidad	86	69
MIDDLE EAST		
Saudi Arabia	135	245
Turkey	124	142

Annex III

Supplement of the petrochemical capacities
in industrialized countries
by the year 1990

(A) ETHYLNE DERIVATIVES

AUSTRIALIA

Product	Production capacity Kt/year
ABS/SAN	27
Acetic acid	19
Ethylbenzne	138
Ethylene	470
EDC	100
Ethylene Glycol	7
Ethylene Oxide	36
HDPE	80
LDPE	210
PE fibers	8
Polystyrene	60
PVC	180
SBR	45
Styrene	120
VC	60

AUSTRIA

Product	Production capacity Kt/year
ABS/SAN	.
Acetic acid	9
Ethylbenzne	.
Ethylene	320
EDC	.
Ethylene Glycol	.
Ethylene Oxide	.
HDPE	80
LDPE	320
PE fibers	22
Polystyrene	10
PVC	60
SBR	20
Styrene	.
VC	.

BENELUX

Product	Production capacity Kt/year
ABS/SAN	282
Acetic acid	2
Ethylbenzne	1540
Ethylene	3385
EDC	2160
Ethylene Glycol	510
Ethylene Oxide	600
HDPE	475
LDPE	1600
PE fibers	60
Polystyrene	720
PVC	675
SBR	270
Styrene	1275
VC	1300

BULGARIA

Product	Production capacity Kt/year
ABS/SAN	.
Acetic acid	2
Ethylbenzne	75
Ethylene	550
EDC	120
Ethylene Glycol	120
Ethylene Oxide	90
HDPE	30
LDPE	80
PE fibers	85
Polystyrene	24
PVC	35
SBR	32
Styrene	70
VC	35

CANADA

Product	Production capacity Kt/year
ABS/SAN	70
Acetic acid	70
Ethylbenzne	940
Ethylene	2400
EDC	880
Ethylene Glycol	500
Ethylene Oxide	420
HDPE	360
LDPE	110
PE fibers	60
Polystyrene	200
PVC	520
SBR	100
Styrene	810
VC	420

CZECHOSLOVAKIA (before the division)

Product	Production capcity Kt/year
ABS/SAN	18
Acetic acid	20
Ethylbenzne	125
Ethylene	760
EDC	280
Ethylene Glycol	60
Ethylene Oxide	40
HDPE	110
LDPE	150
PE fibers	100
Polystyrene	80
PVC	240
SBR	85
Styrene	110
VC	220

DENMARK

Product	Production capacity Kt/year
ABS/SAN	12
Acetic acid	2
Ethylbenzne	i
Ethylene	i
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	i
PE fibers	i
Polystyrene	i
PVC	i
SBR	i
Styrene	i
VC	i

FINLAND

Product	Production capacity Kt/year
ABS/SAN	.
Acetic acid	6
Ethylbenzne	.
Ethylene	230
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	210
PE fibers	i
Polystyrene	35
PVC	85
SBR	50
Styrene	i
VC	i

FRANCE

Product	Production capacity Kt/year
ABS/SAN	60
Acetic acid	230
Ethylbenzne	720
Ethylene	2600
EDC	1600
Ethylene Glycol	100
Ethylene Oxide	150
HDPE	280
LDPE	1100
PE fibers	85
Polystyrene	650
PVC	1150
SBR	350
Styrene	650
VC	980

GERMANY

Product	Production capacity Kt/year
ABS/SAN	215
Acetic acid	560
Ethylbenzne	545
Ethylene	3450
EDC	2635
Ethylene Glycol	510
Ethylene Oxide	720
HDPE	830
LDPE	1080
PE fibers	420
Polystyrene	715
PVC	1920
SBR	640
Styrene	1350
VC	1770

GREECE

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	i
Ethylbenzne	i
Ethylene	15
EDC	50
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	45
LDPE	i
PE fibers	10
Polystyrene	30
PVC	70
SBR	i
Styrene	i
VC	i

HUNGARY

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	5
Ethylbenzne	i
Ethylene	275
EDC	265
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	260
PE fibers	i
Polystyrene	70
PVC	220
SBR	i
Styrene	i
VC	200

IRELAND

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	i
Ethylbenzne	i
Ethylene	i
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	i
PE fibers	47
Polystyrene	i
PVC	i
SBR	i
Styrene	i
VC	i

ITALY

Product	Production capacity Kt/year
ABS/SAN	100
Acetic acid	70
Ethylbenzne	460
Ethylene	1500
EDC	1600
Ethylene Glycol	60
Ethylene Oxide	70
HDPE	530
LDPE	550
PE fibers	160
Polystyrene	340
PVC	730
SBR	320
Styrene	500
VC	730

JAPAN

Product	Production capacity Kt/year
ABS/SAN	750
Acetic acid	620
Ethylbenzne	2200
Ethylene	5900
EDC	3100
Ethylene Glycol	670
Ethylene Oxide	740
HDPE	1000
LDPE	1900
PE fibers	770
Polystyrene	1550
PVC	2100
SBR	880
Styrene	2200
VC	2400

NEW ZEALAND

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	i
Ethylbenzne	i
Ethylene	i
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	i
PE fibers	i
Polystyrerne	i
PVC	i
SBR	i
Styrene	i
VC	i

NORWAY

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	i
Ethylbenzne	i
Ethylene	390
EDC	620
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	80
LDPE	130
PE fibers	i
Polystyrene	20
PVC	85
SBR	i
Styrene	i
VC	420

POLAND

Product	Production capacity Kt/year
ABS/SAN	5
Acetic acid	20
Ethylbenzne	75
Ethylene	420
EDC	400
Ethylene Glycol	80
Ethylene Oxide	90
HDPE	i
LDPE	140
PE fibers	100
Polystyrene	30
PVC	360
SBR	120
Styrene	40
VC	320

PORTUGAL

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	i
Ethylbenzne	i
Ethylene	300
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	75
LDPE	135
PE fibers	40
Polystyrene	i
PVC	90
SBR	i
Styrene	i
VC	i

ROMANIA

Product	Production capacity Kt/year
ABS/SAN	5
Acetic acid	100
Ethylbenzne	160
Ethylene	800
EDC	330
Ethylene Glycol	60
Ethylene Oxide	80
HDPE	200
LDPE	145
PE fibers	130
Polystyrene	60
PVC	240
SBR	120
Styrene	125
VC	240

SPAIN

Product	Production capacity Kt/year
ABS/SAN	45
Acetic acid	100
Ethylbenzne	130
Ethylene	1100
EDC	600
Ethylene Glycol	75
Ethylene Oxide	100
HDPE	350
LDPE	550
PE fibers	160
Polystyrene	140
PVC	320
SBR	100
Styrene	110
VC	370

SWEDEN

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	12
Ethylbenzne	i
Ethylene	400
EDC	280
Ethylene Glycol	20
Ethylene Oxide	40
HDPE	150
LDPE	290
PE fibers	i
Polystyrene	60
PVC	120
SBR	30
Styrene	i
VC	110

SWITZERLAND

Product	Production capacity Kt/year
ABS/SAN	i
Acetic acid	45
Ethylbenzne	i
Ethylene	30
EDC	i
Ethylene Glycol	i
Ethylene Oxide	i
HDPE	i
LDPE	i
PE fibers	75
Polystyrene	i
PVC	45
SBR	i
Styrene	i
VC	i

UNITED KINGDOM

Product	Pproduction capacity Kt/year
ABS/SAN	70
Acetic acid	570
Ethylbenzne	370
Ethylene	2100
EDC	900
Ethylene Glycol	180
Ethylene Oxide	240
HDPE	250
LDPE	350
PE fibers	28
Polystyrerne	300
PVC	370
SBR	300
Styrene	220
VC	400

USA

Product	Production capacity Kt/year
ABS/SAN	880
Acetic acid	1650
Ethylbenzne	5200
Ethylene	20700
EDC	8900
Ethylene Glycol	2800
Ethylene Oxide	3200
HDPE	4100
LDPE	7200
PE fibers	1800
Polystyrene	3000
PVC	5200
SBR	1950
Styrene	4800
VC	5400

FORMER SOVIET UNION

Product	Production capacit_ Kt/year
ABS/SAN	40
Acetic acid	410
Ethylbenzne	1300
Ethylene	4000
EDC	1200
Ethylene Glycol	250
Ethylene Oxide	460
HDPE	350
LDPE	850
PE fibers	350
Polystyrene	450
PVC	1000
SBR	750
Styrene	1200
VC	1200

(B) PROPYLENE DERIVATIVES

AUSTRALIA

Product	Production capacity Kt/year
Acetone	12
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	28
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	35
Phenol	20
Polypropylene	200
Propylene	260
Propylene oxide	i

AUSTRIA

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	75
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	220
Propylene	230
Propylene oxide	i

BENELUX

Product	Production capacity Kt/year
Acetone	100
Acrylic acid/esters	i
Acrylic fibers	i
ACN	170
Cumene	340
Isopropyl alkohol	250
Methyl methacrylate	i
Oxo alcohols	i
Phenol	110
Polypropylene	1200
Propylene	2000
Propylene oxide	370

BULGARIA

Product	Production capacity Kt/year
Acetone	18
Acrylic acid/esters	I
Acrylic fibers	31
ACN	170
Cumene	48
Isopropyl alkohol	i
Methyl methacrylate	5
Oxo alcohols	40
Phenol	45
Polypropylene	100
Propylene	160
Propylene oxide	12

CANADA

Product	Production capacity Kt/year
Acetone	44
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	52
Isopropyl alkohol	90
Methyl methacrylate	i
Oxo alcohols	i
Phenol	40
Polypropylene	300
Propylene	850
Propylene oxide	75

CZECHOSLOVAKIA (before division)

Product	Production capacity Kt/year
Acetone	38
Acrylic acid/esters	20
Acrylic fibers	i
ACN	i
Cumene	100
Isopropyl alkohol	i
Methyl methacrylate	15
Oxo alcohols	40
Phenol	75
Polypropylene	180
Propylene	500
Propylene oxide	i

DENMARK

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	i
Propylene	i
Propylene oxide	i

FINLAND

Product	Production capacity Kt/year
Acetone	45
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	140
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	75
Polypropylene	120
Propylene	170
Propylene oxide	i

FRANCE

Product	Production capacity Kt/year
Acetone	140
Acrylic acid/esters	220
Acrylic fibers	60
ACN	90
Cumene	180
Isopropyl alcohol	110
Methyl methacrylate	60
Oxo alcohols	170
Phenol	120
Polypropylene	650
Propylene	1650
Propylene oxide	150

GERMANY

Product	Production capacity Kt/year
Acetone	400
Acrylic acid/esters	300
Acrylic fibers	310
ACN	390
Cumene	625
Isopropyl alkohol	250
Methyl methacrylate	200
Oxo alcohols	1000
Phenol	600
Polypropylene	540
Propylene	2400
Propylene oxide	650

GREECE

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	12
ACN	15
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	i
Propylene	i
Propylene oxide	i

HUNGARY

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	30
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	170
Propylene	180
Propylene oxide	i

IRELAND

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	20
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	i
Propylene	i
Propylene oxide	i

ITALY

Product	Production capacity Kt/year
Acetone	220
Acrylic acid/esters	i
Acrylic fibers	300
ACN	180
Cumene	720
Isopropyl alkohol	i
Methyl methacrylate	65
Oxo alcohols	i
Phenol	360
Polypropylene	550
Propylene	1000
Propylene oxide	50

JAPAN

Product	Production capacity Kt/year
Acetone	450
Acrylic acid/esters	330
Acrylic fibers	400
ACN	600
Cumene	670
Isopropyl alkohol	130
Methyl methacrylate	400
Oxo alcohols	i
Phenol	530
Polypropylene	1800
Propylene	4300
Propylene oxide	350

NERW ZEALAND

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	i
Propylene	i
Propylene oxide	i

NORWAY

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	90
Propylene	85
Propylene oxide	i

POLAND

Product	Production capacity Kt/year
Acetone	23
Acrylic acid/esters	i
Acrylic fibers	12
ACN	16
Cumene	50
Isopropyl alkohol	4
Methyl methacrylate	5
Oxo alcohols	130
Phenol	58
Polypropylene	60
Propylene	180
Propylene oxide	12

PORTUGAL

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	40
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	60
Propylene	150
Propylene oxide	i

ROMANIA

Product	Production capacity Kt/year
Acetone	60
Acrylic acid/esters	25
Acrylic fibers	65
ACN	130
Cumene	140
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	190
Phenol	90
Polypropylene	120
Propylene	400
Propylene oxide	70

SPAIN

Product	Production capacity Kt/year
Acetone	80
Acrylic acid/esters	25
Acrylic fibers	120
ACN	90
Cumene	170
Isopropyl alkohol	36
Methyl methacrylate	60
Oxo alcohols	50
Phenol	120
Polypropylene	320
Propylene	700
Propylene oxide	50

SWEDEN

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	200
Phenol	i
Polypropylene	i
Propylene	200
Propylene oxide	i

SWITZERLAND

Product	Production capacity Kt/year
Acetone	i
Acrylic acid/esters	i
Acrylic fibers	i
ACN	i
Cumene	i
Isopropyl alkohol	i
Methyl methacrylate	i
Oxo alcohols	i
Phenol	i
Polypropylene	i
Propylene	i
Propylene oxide	i

UNITED KINGDOM

Product	Production capacity Kt/year
Acetone	145
Acrylic acid/esters	120
Acrylic fibers	125
ACN	270
Cumene	125
Isopropyl alkohol	190
Methyl methacrylate	100
Oxo alcohols	45
Phenol	80
Polypropylene	420
Propylene	1000
Propylene oxide	45

USA

Product	Production capacity Kt/year
Acetone	1200
Acrylic acid/esters	650
Acrylic fibers	290
ACN	1400
Cumene	2600
Isopropyl alkohol	1000
Methyl methacrylate	600
Oxo alcohols	1000
Phenol	1800
Polypropylene	4600
Propylene	12500
Propylene oxide	1500

FORMER SOVIET UNION

Product	Production capacity Kt/year
Acetone	300
Acrylic acid/esters	65
Acrylic fibers	200
ACN	300
Cumene	400
Isopropyl alkohol	135
Methyl methacrylate	120
Oxo alcohols	250
Phenol	250
Polypropylene	300
Propylene	1700
Propylene oxide	60

(3) BENZENE/XYLENES DERIVATIVES

AUSTRALIA

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	18
Benzene	90
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	27
Phtalic anhydride	27
TPA	i
TDI	i
o-xylene	i
p-xylene	i

AUSTRIA

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	20
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	20
Nylon fibers	i
Phtalic anhydride	40
TPA	i
TDI	i
o-xylene	i
p-xylene	i

BENELUX

Products	Production capacity Kt/year
Adipic acid	25
Alkylbenzens	I
Benzene	1400
Caprolactam	520
Cyklohexane	300
DMT	100
HMDA	i
Maleic anhydride	30
Nylon fibers	120
Phtalic anhydride	140
TPA	i
TDI	30
o-xylene	100
p-xylene	150

BULGARIA

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	180
Caprolactam	30
Cyklohexane	32
DMT	35
HMDA	i
Maleic anhydride	i
Nylon fibers	36
Phtalic anhydride	15
TPA	i
TDI	i
o-xylene	20
p-xylene	12

CANADA

Products	Production capacity Kt/year
Adipic acid	120
Alkylbenzens	i
Benzene	930
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	45
Maleic anhydride	20
Nylon fibers	120
Phtalic anhydride	40
TPA	i
TDI	i
o-xylene	52
p-xylene	180

CZECHOSLOVAKIA

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	500
Caprolactam	85
Cyklohexane	80
DMT	45
HMDA	i
Maleic anhydride	i
Nylon fibers	50
Phtalic anhydride	25
TPA	i
TDI	i
o-xylene	15
p-xylene	40

DENMARK

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	i
TPA	i
TDI	i
o-xylene	i
p-xylene	i

FINLAND

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	120
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	20
TPA	i
TDI	i
o-xylene	i
p-xylene	i

FRANCE

Products	Production capacity Kt/year
Adipic acid	260
Alkylbenzens	i
Benzene	820
Caprolactam	i
Cyklohexane	55
DMT	65
HMDA	190
Maleic anhydride	35
Nylon fibers	75
Phtalic anhydride	75
TPA	65
TDI	120
o-xylene	80
p-xylene	90

GERMANY

Products	Production capacity Kt/year
Adipic acid	300
Alkylbenzens	i
Benzene	2220
Caprolactam	225
Cyklohexane	250
DMT	580
HMDA	i
Maleic anhydride	60
Nylon fibers	260
Phtalic anhydride	320
TPA	i
TDI	140
o-xylene	260
p-xylene	300

GREECE

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	2
Phtalic anhydride	i
TPA	i
TDI	i
o-xylene	i
p-xylene	i

HUNGARY

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	110
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	25
Nylon fibers	7
Phtalic anhydride	24
TPA	i
TDI/MDI	25
o-xylene	50
p-xylene	i

IRELAND

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	4
Phtalic anhydride	i
TPA	i
TDI	i
o-xylene	i
p-xylene	i

ITALY

Products	Production capacity Kt/year
Adipic acid	20
Alkylbenzens	i
Benzene	850
Caprolactam	210
Cyklohexane	70
DMT	180
HMDA	i
Maleic anhydrioe	100
Nylon fibers	180
Phtalic anhydride	160
TPA	90
TDI/MDI	150
o-xylene	210
p-xylene	300

JAPAN

Products	Production capacity Kt/year
Adipic acid	90
Alkylbenzens	220
Benzene	3600
Caprolactam	490
Cyklohexane	650
DMT	400
HMDA	45
Maleic anhydride	120
Nylon fibers	350
Phtalic anhydride	310
TPA	1400
TDI/MDI	400
o-xylene	300
p-xylene	2000

NEW ZEALAND

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	i
TPA	i
TDI/MDI	i
o-xylene	i
p-xylene	i

NORWAY

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	i
TPA	i
TDI/MDI	i
o-xylene	i
p-xylene	i

POLAND

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	18
Benzene	300
Caprolactam	130
Cyklohexane	100
DMT	90
HMDA	i
Maleic anhydride	5
Nylon fibers	80
Phtalic anhydride	40
TPA	i
TDI/MDI	12
o-xylene	37
p-xylene	50

PORTUGAL

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	I
Benzene	55
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	15
TPA	i
TDI/MDI	50
o-xylene	50
p-xylene	110

ROMANIA

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	550
Caprolactam	40
Cyklohexane	20
DMT	190
HMDA	i
Maleic anhydride	12
Nylon fibers	58
Phtalic anhydride	36
TPA	i
TDI/MDI	i
o-xylene	44
p-xylene	30

SPAIN

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	350
Caprolactam	55
Cyklohexane	80
DMT	90
HMDA	i
Maleic anhydride	40
Nylon fibers	85
Phtalic anhydride	80
TPA	200
TDI/MDI	30
o-xylene	40
p-xylene	30

SWEDEN

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	i
Phtalic anhydride	20
TPA	i
TDI/MDI	i
o-xylene	i
p-xylene	i

SWITZERLAND

Products	Production capacity Kt/year
Adipic acid	i
Alkylbenzens	i
Benzene	i
Caprolactam	i
Cyklohexane	i
DMT	i
HMDA	i
Maleic anhydride	i
Nylon fibers	72
Phtalic anhydride	i
TPA	i
TDI/MDI	i
o-xylene	i
p-xylene	i

UNITED KINGDOM

Products	Production capacity Kt/year
Adipic acid	300
Alkylbenzens	90
Benzene	1350
Caprolactam	i
Cyklohexane	300
DMT	i
HMDA	165
Maleic anhydride	30
Nylon fibers	190
Phtalic anhydride	80
TPA	550
TDI/MDI	i
o-xylene	i
p-xylene	500

USA

Products	Production capacity Kt/year
Adipic acid	840
Alkylbenzens	400
Benzene	8100
Caprolactam	600
Cyklohexane	1150
DMT	1500
HMDA	600
Maleic anhydride	230
Nylon fibers	1400
Phtalic anhydride	500
TPA	2100
TDI/MDI	360
o-xylene	430
p-xylene	2900

FORMER SOVIET UNION

Products	Production capacity Kt/year
Adipic acid	12
Alkylbenzens	75
Benzene	3000
Caprolactam	630
Cyklohexane	46
DMT	390
HMDA	i
Maleic anhydride	9
Nylon fibers	180
Phtalic anhydride	200
TPA	30
TDI/MDI	21
o-xylene	400
p-xylene	500

Annex IV

DRAFT

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
INDUSTRIAL AND TECHNOLOGICAL INFORMATION BANK (INTIB)
CENTRE FOR INFORMATION COLLECTION AND DISSEMINATION
PETROCHEMICAL DATA BASE

THE CHARTER
OF THE CENTRE FOR PETROCHEMICAL INFORMATION COLLECTION AND DISSEMINATION PDB-INTIB

Considering the importance of timely delivered information related to the basic petrochemicals production, consumption and new technology implementation and environmentally safe operation of the petrochemical installations and acknolwedging the leading role of the international cooperation in this aspect the UNIDO Centre for Petrochemical Information collection and Dissemination - Petrochemical Data Bank (PDB-INTIB) has been established.

& 1 Goal and Tasks of the Centre

1. The Centre has been established by joint effort of the UNIDO and member enterprises.

2. The Centre is a non-profit, non-commercial, UNIDO unit. This status has been given to the Centre by organizing bodies.

3. The basic goal of the Centre is to provide reliable information on petrochemicals production, consumption and available technological options for further industrial development to all its members.

4. This goal Centre is going to achieve through implementation of the following tasks:

- collection and dissemination of the information on petrochemicals production/consumption, technologies implemented and operational achievements of the industry;
- dissemination of the good managerial practices of the petrochemical installation operation;
- information relevant to smooth transfer of the technology and its improvement later carried out on commercial base with selected partners.

& 2 Membership

1. Memebership of the Centre is accessible for all petrochemical enterprises worldwide.

2. Membership is acknowledged by signature of membership certificate.

3. Non-members may receive information on the commercial basis.

3. The Member of the Centre has the following rights:
   - to receive information collected by the data base;
   - to receive information from other members;
   - to propose organization of any event enhancing the activity of the Center;
   - to receive consultation on its programme of the technology development or revamping.

The cost of information supplied to the member is covered by its membership fee.

4. The Member of the Centre has the following obligations:
   - to supply the information on the technology operated accordingly to the periodically disseminated questionnaire;
   - to provide names of its experts ready to visit other members for the purpose of the technology development and revamping;
   - to provide the list of technologies which member is ready to share on a commercial basis;

The information supplied to the Center is free of charge.

5. The member of the Centre pays yearly membership contribution accordingly to the signed declaration.

& 3 Activities of the Center

1. Center is a clearing house for all activities programmed for the purpose of the collection an dissemination of the information related to the operation of the petrochemical industry.

2. The Center will issue regular Newsletter and other casual publications.

3. The Center will establish data base accordingly to the international format and will supply information to its members by request by classical or electronic means.

4. The Center will be responsible for organization of workshops/seminars on the purpose of its activities.

5. The Center will provide opportunity for its memebrs to discuss and agree on commercial modalities of the improved technology transfer and technical support contribution.

6. The Centre will operate in project wise modality, registering each case of request and contribution as well as the resulting commercial contracts.

& 4 Administration of the Center

1. Center is organized by Industrial and Technological Information Data Bank (INTIB) of UNIDO.

2. UNIDO will ensure the necessary management staff of the Center.

3. The Board of Trustees of the Center (9 members + 4 UNIDO staff members) will be established from delegates of its members selected by general election.
The general election procedure is attached.

4. The Board of Trustees of the Center will be responsible for the following actions:
- approval of the organization chart of Centre and its staffing;
- approval of the yearly programme of the Centre activities;
- assessment of the yearly reports of the Centre;
- extension of the Centre activities in the frames of the approved budget;
- initiation of the changes and improvements of the statuatory role of the Centre.

The Board of Trustees of the Center approves its Rules of Action at the first meeting.

5. Financing of the Board meetings (travel and DSA) will be provided from the Centre budget.

6. Management of the Center (Chief Officer of INTIB) will be responsible for the implementation of the programme approved by the Board and other obligations resulting from the statute.

& 5 Centre Financing

1. Establishment of the data base is financed from the UNIDO regular budget.

2. All operational expenses of the Centre are covered from membership fees.
UNIDO will open special account on which fees will be collected and disposed from.

3. Salaries of the Centre staff are covered from membership fees and up to time of their collection are credited by UNIDO.

4. The self-financing mode of operation would not change any of the Centre obligations and modalities of operation as international organization.

& 6 Centre Location

1. Centre is organized at the Unitaed Nations Industrial Development Organization in Vienna. If found necessary and co-contribution of interested parties would be ensured, Centre can organize Regional Units.

& 7 General Clause

1. It is understood that each member signing membership application has approved the above stated Charter and undertook obligations mentioned in the membership enrollment form.

Attached:
1. Election modalities of the centre board members

MODALITIES OF THE ELECTION OF THE CENTER BOARD

1. Every member enterprise which signed membership enrollment form has a right to propose a candididate to the Board.

2. Candidate must be graduated in chemical technology or informatics and should have at least 5 years experience in operation of information center or data bank.

3. Member organization should submit proposed candidate short CV accordingly to the UNIDO F10 form not later then 2 months after proclamation of election by UNIDO. The target date will be mentioned on UNIDO distribution letter.

4. All submissions are analysed by UNIDO and all candidates names with short CV, fulfilling the criteria, are resubmitted to all members with nomination form.

5. Each member has one vote.

6. Each member selects one candidiate, by filling up nomination form. UNIDO may wish to provide advise to members of the most suitable candidates, however members have fully free choice of candidate.

7. UNIDO should receive members' selected candidates not later then 2 months after dissemiantion of the list of candidates. The target date will be mentioned on the UNIDO distribution letter.

8. Director General of UNIDO will nominate three election officers (election commission) who will be responsible for scrutinizing of the election results.

9. Nine candidates receiving absolute majority of votes would be considered elected Centre Board members fo consecutive four years. Three candidates following on the list are considered pre-elected Center Board members and will enter into full member capacity in case of unexpected abandoning of the post by the full member. Election commision will prepare report on election results and will provide it to Director General of UNIDO for approval. The election results will be published and disseminated to all members.

10. UNIDO Director General will issue nominations for elected Board members as well for four UNIDO staff members.

Annex V
Promotional letter to the Petrochemical Company and membership enrollment form

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
INDUSTRIAL AND TECHNOLOGICAL INFORMATION BANK (INTIB)
CENTRE FOR INFORMATION COLLECTION AND DISSEMINATION
PETROCHEMICAL DATA BASE

PETROCHEMICAL TECHNOLOGY FLUORISHING AND COMPETITIVE

Are you for?

You need ten minutes only to read and decide!

Petrochemical industry status-quo - carry on or change?

The steady trend of the permanent development of the production of petrochemicals during last 30 years has been denoted. The production of petrochemical derivatives reached the volume of the steel production. During the decade of 90-ties it is expected to reach the growth of production over 20%. However, only 28% of the additions will be realized in the developing countries. Development of technological processes in petrochemical industry resulted in large scale industrial unit capacities establishment. Therefore, now and in near future to enter the club of petrochemical producers would require large amount of capital. The industrial restructuring in developed countries may change the projected additions location distribution. However, developing countries with chances to establish petrochemical complexes have to apply packages of well adapted policy measures, to ensure availability of local raw materials, market and economic/financial profitability of the projects i.a through the full capacity operation.

Establishment of the petrochemical complex requires development of the infrastructure and logistic conditions. Large scale expenditures to establish proper infrastructure require involvement of the local Governments and public funds. Sustainable long term development of the petrochemical industry can be achieved only by applying policies supporting the following strategies:

- export promotion strategy;
- domestic consumption increase;
- well balanced and selective foreign investments;

To ensure efficient operation of existing petrochemical industry in developing countries, consultative networks have to be regionally organized. The main task of these networks would be to ensure full capacity operation of petrochemical complexes.

Newcomers to the petrochemical production have to use all opportunities provided by the international community to ensure proper selection of the production profile of the petrochemical complex and appriopriate technology. UNIDO can be instrumental in this process.

Special efforts are required to disclose the methodology of the special policy measures packages development. Special training and simulation exercises are necessary to provide local decision makers with necessary instrumentation and experience. UNIDO should be also instrumental in organization of this assistance programme.

The information of the market actual and projected demand, the distribution of the capacities and relevance between production and consumpiton location and comparative advantages is crucial for any of investment decisions in developing countries. This information is available by commercial databases. However, the commercial data bases have two deficiencies:

(1) they have not reliable sources of information, therefore many of data received should be reconfirmed through other channels;

(2) the cost of regular information supply is high. The annual cost of complex information of 40 selected petrochemicals (production, demand, capcities) amounts US $ 30,000 or more. The developing countries enterprises can not afford that expences and therefore remain handicapped against other decision makers in developed countries.

Above that decision makers in developing countries may need assistance as the development of their installations is also deficient:

- information on possible technological options are not always available and sources of technology casual and dependent in many cases on action of intermediaries;
- deficiencies of own technologies are not fully acknowledged and improvement is not properly prepared;
- new regulations on environment protection cause large scale penalties, decreasing already mediocre economic efficiency of operation;
- good managerial practices are not adequately known. In many cases through simple managerial actions one can improve the technology safety and efficiency operation.

The proposed self-financing scheme of the UNIDO petrochemical data base has not these deficiencies.

Therefore, it has been found that organization of the Centre with the function of clearing house in this area of action could be beneficial for both : licensees and licensors and serve the cause of implementation of technology safe for man and environment.

How it will work?

This Centre will operate under auspices of UNIDO which will establish the level of credibility of actions as well as would allow to use many years experience in the technical assistance services.

Centre may establish a network of regional/national focal points. The national focal point which will be responsible for coordination of dissemination of information, organization of local workshops etc. will be nominated by Governments.

Each petrochemical industry enterprise from developing and developed countries may become a member of the Centre and profit from the information and services.

What kind of activities will serve the purpose?

The specific activities of the Centre will be organized around the following axes:

(1) identification: the data base is under establishment and will be ready for information dissemination soon. The data base will provide basic information on the production, capacities, sources of technology and deficiencies of operation and potential improvements of technology. This information will be widely disseminated, through all existing channels of communication.

(2) training: leading technical managers will be trained in the programme of using the data base and preparation of programming: revamping and development studies. Having in mind that intensive research is carried out in developed countries, the Centre will prepare the transformation programme of the technologies to the inherently safe state of art.

(3) services: Centre will provide direct assistance to enterprises in preparation of programming studies based on the data base information, selection of the technologies for revamping and development, as well as feasibility studies within the UNIDO infrastructure.
Also HAZOP studies, preparation of Environmnet Impact Assessment, emergency plans, contingency plans etc. for the petrochemical industry may be prepared. The modalities of preparation of such studies will depend upon local potential.

Who will benefit?

The direct target beneficiaries of this project will be the petrochemical industry enterprises aiming to revamp technology with concern of competitevity, market adjustment and the environment protection.
The Centre will provide the following services to members:

(i) free of charge:
- regular edition of Newsletter;
- participation in the training workshops
- information on markets/production and capacities worldwide of about 40 petrochemicals;
- guidelines on preparation of a programming studies, sources and selection of the technologies and assiatnce in preparation of feasibility studies in particular of revamping cases.
- facilitated access to the regular UNIDO publications related to the technology and its development;
- facilitated access to the services offered by UNIDO;
- direct communication between members.

(ii) services at discounted rates:
- experts identification services;
- preparation of the demonstration projects (technology audits), technology revamping projects etc.);
- co-operative projects among Center members (identified joint interest for similar technology revamping).

Do you want to become a member of the Centre?

Please, fill the attached enrollment form!

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
INDUSTRIAL AND TECHNOLOGICAL INFORMATION BANK (INTIB)
CENTRE FOR INFOMATION COLLECTION AND DISSEMINATION
PETROCHEMICAL DATA BASE

MEMBERSHIP ENROLLMENT FORM

This questionnaire has a purpose to identify members of the Global Centre for Information Collection and Dissemination - Petrochemical Database (PDB-INTIB) organized by UNIDO within framework of its mandate.

Please, tick the respective items, sign and return.

1. Enterprise (company):

Name.....
.....
Address: Country.....
City:..... City code:.....
Street:.....
Tel.(area code) N..... Telex.....
Fax (area code) N.....
Name of the contact person:.....

2. Production profile of the enterprise:

- basic petrochemicals [ ]
- plastics, fibers rubbers [ ]
- other downstream chemicals [ ]
- plastics, rubber and fibres processing [ ]

3. Enterprise declares access to the PETROCHEMICAL DATA BASE (PDB-INTIB) of UNIDO.

The enterprise would fulfill all obligations stated in the Charter (attached) of the PDB-INTIB and:

(a) expect to receive all relevant information in respect of technology.....
.....
(please list technologies)

(b) is ready to provide information in form of technological profile and other data base data in respect of technology.....
.....
(please list the technologies)

4. Which kind of services from Centre your enterprise would prefer:

Data on world wide production of petrochemicals [ ]
Projections of particular products consumption [ ]
Data on modern technology safe for men and environment [ ]
Data on economic aspects of petrochemical industry operation [ ]
Training in good managerial practices [ ]
Advisory services to prepare revamping programme, selection of technology, feasibility study, HAZOP study, Environment Impact Assessment, Emergency Plan [ ]

Information of pollution abatement by revamping or waste processing [ ]
- in particular plastics recycling [ ]
- other (specify).....[ ]
Regular newsletter [ ]
Other: (please mention your preference).....
.....

5. We declare to pay yearly mebership fee in amount equivalent to US $:
1000 [ ] 1/ 500 [ ] 2/ 300 [ ] 3/

1/ Enterprises with annual sales over US $ 100 million
2/ Enterprises with annual sales over US $ 50 million
3/ Enterprises with annual sales under US $ 30 million
You wish to pay the mebership fee in:
National currency [ ] Exchangable currency [ ]

Signatures:

....
President of the Board (or equivalent) Chief Executive Officer

Date..... Location.....

Remarks:

Attached: PBD-INTIB Charter
Information note
Please fill up the questionnaire and put it into attached envelope and send to : UNIDO
A -1400 Vienna, AUSTRIA
P.O.Box 300
Wagramer str. 5
IPCT/TP/INF
Att. Mr. V.Podshibyakin D 1931
or fax it directly: (0431) 232156

Revised Database files

PCPROJFO.BDF

The file is to be filled out for all production units either in construction or in operation. These operational become status completed (C).

Field	Field name	Type	Width	Dec	Description
1	Reference	Character	12		Index key that connects records in this database to those in COMPANY.DBF.
2	Product	Character	50		Name of the main product that will be manufactured
* 3	Process	Character	50		Name of the proces that will be used. In case of lack of specific name the name of product and name of licensor is given
* 4	Capacity	Number	7		Name plate capacity of the plant in metric tons per year mentioned in the licensing contract
* 5	Investment	Number	12		Fixed investment cost in local currency in million of units
* 6	Working capital	Number	12		Working capital to operate the production unit in local currency in million of units
7	Licensor	Character	50		Name of the licensor's company of the process that is beeing implemented
* 8	Engineer	Character	50		Name of the engineering company that designed the technological part of the production unit

* 9	Contractor	Character	50	Name of the main (general) contractor responsible for production unit construction
* 10	Investor	Character	50	Name of parent company to which majority of shares belong or which signed with banks credit allowances
* 11	Operator	Character	50	Name of company operating production unit
* 12	Locatio	Character	50	Address of location where production unit is beeing established

PCPROJFO.BDF

13	Typeofpro	Character	1	Type of project: C-capacity extension, R-revamping, N-new investment on existing site, G-grass-root project
* 14	Phaseofpro	Number	4	Year in which given activity has been completed
15	Input-dt	Date	8	Date of entrance
16	Update-dt	Date	8	Date of up-dating
17	Update-tm	Character	8	
18	Update-by	Character	14	
19	Source	Character	3	Source of information (SOURCE.DBF)

Field name	Index Expression	Order
REFERENCE	INDEX ON reference to pcprjref	1

PCPROCFO.BDF

Field	Field name	Type	Width	Dec	Description
1	Reference	Character	12		Index ket that connects records in this database to those in COMPANY.DBF.
2	Product	Character	50		Name of the main product that will be manufactured at the production unit
* 3	Process	Character	50		Name of the proces that will be used. In case of lack of specific name the name of product and name of licensor is given
* 4	Capacity	Number	7		Name plate capacity of the plant in metric tons per year mentioned in the licensing contract or established in the extension/revamping basic engineering
* 5	Opertime	Number	4		Number of hours in year of production unit operation given in the basic engineering.
* 6	Investment	Number	12		Fixed investment cost in local currency in million of units

PCPROCFO.DBF (continued)

* 7	Working capital	Number	12	Working capital to operate the production unit in local currency in million of units
8	Licensor	Character	50	Name of the licensor's company of the process that is beeing implemented
9	Byprod1	Character	20	Name of byproduct 1
10	Byton1	Number	7	No.of tons of byproduct 1 that are obtained per ton of main product
11	Byprod2	Character	20	Name of byproduct 2
12	Byton2	Number	7	No.of tons of byproduct 2 that are obtained per ton of main product
13	Byprod3	Character	20	Name of byproduct 3
14	Byton3	Number	7	No.of tons of byproduct 3 that are obtained per ton of main product
15	Byprod4	Character	20	Name of byproduct 4
14	Byton4	Number	7	No.of tons of byproduct 4 that are obtained per ton of main product
16	Byprod5	Character	20	Name of byproduct 5
17	Byton5	Number	7	No.of tons of byproduct 5 that are obtained per ton of main product
* 18	Rawprod1	Character	20	Name of raw material 1

PCPROCFO.DBF (continued)

19	Rawton1	Number	7	No.of tons of raw materiall that are required per ton of main product
* 20	Rawprod2	Character	20	Name of raw material 2
21	Rawton2	Number	7	No.of tons of raw material 2 that are required per ton of main product
* 22	Rawprod3	Character	20	Name of raw material 3
23	Rawton3	Number	7	No.of tons of raw material 3 that are required per ton of main product
* 24	Rawprod4	Character	20	Name of raw material 4
25	Rawton4	Number	7	No.of tons of raw material 4 that are required per ton of main product
* 26	Rawprod5	Character	20	Auxiliary materials
27	Rawton5	Number	7	Cost of auxiliary raw materials that are required per ton of main product expressed in national currency
28	Power	Number	7	Electric power required per ton of main product in kWh/t
29	Steam	Number	7	Amount of steam of all pressures that is required per ton of main product in tons/t
30	Procwater	Number	7	Amount of process water that is required per ton of main product in m3/t

PCPROCFO.DBF (continued)

31	Coolwater	Number	7	Amount of cooling water that is required per ton of main product in m3/t
32	Inertgas	Number	7	Amount of inert gas that is required per ton of main product in 1000Nm3/t
33	Otherener	Number	7	Amount of other energy sources that is required per ton of main product in Mjoule/t
34	Workers	Number	3	Amount of workers operating production unit.

PCPRODFO.BDF

Field	Field name	Type	Width	Dec	Description
1	Reference	Character	12		Index ket that connects records in this database to those in COMPANY.DBF.
2	Year	Number	4		Year of report
3	Mainprod	Character	50		Name of main product manufactured at this production unit
4	Maintons	Number	7		Production of main product in reported year in tons/year

PCPRODFO.DBF (continued)

5	Exptons	Number	7	Export of main product in the reported year in tons/year
6	Byprod1	Character	20	Name of byproduct 1
7	Bytons1	Number	7	Production byproduct 1 in tons/year
8	Byprod2	Character	20	Name of byproduct 2
9	Bytons2	Number	7	Production byproduct 2 in tons/year
10	Byprod3	Character	20	Name of byproduct 3
11	Bytons3	Number	7	Production of byproduct 3 in tons/year
12	Byprod4	Character	20	Name of byproduct 4
13	Bytons4	Number	7	Production of byproduct 4 in tons/year
14	Byprod5	Character	20	Name of byproduct 5
15	Bytons5	Number	7	Production of byproduct 5 in tons/year obtained per ton of main product
* 16	Rawmat1	Character	20	Name of raw material 1
* 17	Rawton1	Number	7	Annual amount of raw material 1 that is used in production unit in t/year

PCPRODFO.DBF (continued)

* 18	Rawimp1	Number	7	Annual amount of raw material 1 that is imported in production unit in t/year
* 19	Rawmat2	Character	20	Name of raw material 2
* 20	Rawton2	Number	7	Annual amount of raw material 1 that is used in production unit in t/year
* 21	Rawimp2	Number	7	Annual amount of raw material 1 that is imported in production unit in t/year
22	Input-dt	Date	8	
23	Update-dt	Date	8	
24	Update-tm	Character	8	
25	Update-by	Character	14	
26	Source	Character	3	Source of information (SOURCE.DBF)

Field name	Index Expression	Order
REFERENCE	INDEX ON reference to pcpltref	1

PCOTURN.BDF

Field	Field name	Type	Width	Dec	Description
1	Reference	Character	12		Index ket that connects records in this database to those in COMPANY.DBF.
2	Year	Character	4		Year for which data are reproted
3	Grossprof	Number	12		The profit before taxes denoted by company in a reported year in a national currency millions
4	Addedval	Number	12		Added Value calculated from company inputs and outputs (enterprise method) in national currency in million units
5	RDexpend	Number	12		Amount of R&D expenditures of company disbursed in reported year in national currency in million units
6	Invexpend	Number	12		Investment expenidtures of company disbursed in reprted year in national currency in million units
7	Sales	Number	12		Annual sales in reported year in a national currency in million units
8	Exports	Number	12		Annual exports of company in reported year in national currency in million units
9	Input-dt	Date	8		

PCOTURN.DBF (continued)

10	Update-dt	Date	8	
11	Update-tm	Character	8	
12	Update-by	Character	14	
13	Source	Character	3	Source of information (SOURCE.DBF)

Field name	Index Expression	Order
REFERENCE	INDEX ON reference to pccotref	1

PCPLTURN.DBF

Field	Field name	Type	Width	Dec	Description
1	Reference	Character	12		Index ket that connects records in this database to those in COMPANY.DBF.
2	Year	Character	4		Year for which data are reproted
3	Grossprof	Number	12		The profit before taxes denoted by the plant in a reported year in a national currency millions
4	Addedval	Number	12		Added Value calculated from company inputs and outputs (enterprise method) in national currency in million units on plant production

PCPLPTURN.DBF (continued)

5	RDexpend	Number	12	Amount of R&D expenditures of plant disbursed in reported year in national currency in million units
6	Invexpend	Number	12	Investment expenidtures of plant disbursed in reported year in national currency in million of units
7	Sales	Number	12	Annual sales in reported year of plant in national currency in million units
8	Exports	Number	12	Annual exports of plant in reported year in national currency in million units
9	Input-dt	Date	8	
10	Update-dt	Date	8	
11	Update-tm	Character	8	
12	Update-by	Character	14	
13	Source	Character	3	Source of information (SOURCE.DBF)

Field name	Index Expression	Order
REFERENCE	INDEX ON reference to pccotref	1

Annex VII

List of petrochemical companies to fill up the questionnaire at the first stage of implementation of Database

ALGERIA
Enterprise Nationale des Industries Petrochimiques

LIBYA
Ras Lanuf Oil and Gas Processing Co.

NIGERIA
Nigerian National Petroleum Corporation

CHINA
China Petrochemical Corporation
China National Technical Import Company
Lanzhou Chemical Corporation
Shanghai Petrochemical Complex
Yangzi Petrochemical Corporation

INDIA
Indian Petrochemical Corporation
Madras Refinery

INDONESIA
Pertamina

KOREA REPUBLIC of
Daelim Industrial Co.
Hyundai Petrochemical Company
Lucky Petrochemical Company
Samsung General Chemicals Company
Youkong Limited

SINGAPORE
Petrochemical Corporation of Singapore

THAILAND
National Petrochemical Corporation

TAIWAN PROVINCE
Chinese Petroleum Corproation
Formosa Platics Corporation

ARGENTINA
Petrochimica Bahia Blanc SAIC

BRAZIL
Compania Petrochimica de Sul COPESUL
Petrobras
Petrochimica Triunfo SA COPENE
Petrochimica Uniao SA
Petrochimica de Nordeste SA COPENE

COLOMBIA
Empresa Colombiana de Petroleos Ecopetrol
Poliolefinas Colombianas SA

MEXICO
Petrloeos Mexicanos SA PEMEX

VENEZUELA
Olefinas del Zulia
Petrochimica de Venezuela

IRAN
Arak Petrochimical complex
Bandar e Immam Petrochemical Company
Esfahan Petrochimical Company

KUWAIT
Petrochimical Industries Company

QUATAR
Quuatar Petrochemical Co.

SAUDI ARABIA
Arabian Petrochemical Co.
Saudi Petrochemical Co.
Saudi Yanbu Petrochemical Co.

TURKEY
Petkim Petrochemical Holding Company

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project Document Transmittal Sheet

Number: ../GLO/93/.....

Country: Global

Title: Establishment and operation of the Centre-Petrochemical Data Bank by INTIB

Total budget: US $ 719,000

Official Government request:.....Date:.....

Endorsement by the
UNDP Resident Representative: Date:.....

Backstopping Branch: INTIB PE code:

Submitted through.....Date:

Submitted by .....Date:

.....Date:

Cleared by:.....Date:

Brief description: Project is intended to establish and operate a Centre: INTIB Petrochemical Data Bank. Growing petrochemical industry in the developing countries requires up-dated information concerning the plant capacities, structure of the production of the downstream products for purposes of marketing, investment decision making process etc. Piloting preparation of the petrochemical data base for the Arab countries has shown potential for much wider system of the information collection and dissemination related to the petrochemical industry. This system would be organized as a Centre- Data Bank operating for its members - petrochemical companies. It has been shown that this system would be efficient for member organizations as well as for UNIDO.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

IDF

Project document

Title: Establishment and operation of the INTIB Centre-Petrochemical Data Bank

Number: .../GLO/.../93

Country: Global

Total UNIDO budget: US$ 719,000

Estimated starting date: January 1994

Planned duration: Three years

Backstopping Branch: INTIB P.E. code:

Government Implementing Agency: Petrochemical companies in developing countries

Official Government request: Non-relevant

Endorsement the UNDP Resident Representative: Non-relevant

PART A. Context

1. Description of subsector

The collection of the data and organization of the Data Bank depends very much on the size and the importance of the industry for world economy. The petrochemical industry fulfills this condition. Below is given short review of the petrochemical industry worldwide.

Table 1 World and regional production of ethylene

Regions	Years			Rate
	1984	1988	1993	%
	Million tons/year			per year
EUROPE	17.2	20.5	23.4	3.47
AFRICA	0.2	0.5	0.6	12.90
MIDDLE EAST	0.4	2.1	3.5	9 times
ASIA	6.6	8.4	12.3	7.16
NORTH AMERICA	16.3	20.2	23.2	2.35
SOUTH&CENTRAL AMERICA	1.7	1.9	2.8	5.70
OCEANIA	0.3	0.3	0.5	5.83
WORLD	42.7	53.9	66.3	5.00

Source: ECE reports and own calculations

Table 2 World and regional production of propylene

Regions	Years			Rate
	1984	1988	1993	%
	Million tons/year			per year
EUROPE	9.3	11.3	13.1	3.88
AFRICA	0.03	0.15	0.5	16 times
MIDDLE EAST	0.02	0.02	0.3	15 times
ASIA	4.2	5.5	8.0	7.42
NORTH AMERICA	7.9	9.5	11.9	4.65
SOUTH&CENTRAL AMERICA	0.7	0.8	1.6	9.62
OCEANIA	0.2	0.2	0.2	.
WORLD	22.35	27.47	35.5	5.30

Source: ECE reports and own calculations

Table 3 World and regional production of benzene

Regions	Years			Rate
	1984	1988	1993	%
	Million tons/year			per year
EUROPE	83.4	9.3	10.2	2.31
AFRICA	0.05	0.1	0.1	2 times
MIDDLE EAST	0.02	0.3	0.4	20 times
ASIA	3.2	4.0	5.8	6.83
NORTH AMERICA	5.3	7.0	7.8	4.38
SOUTH&CENTRAL AMERIC	0.7	0.7	1.1	4.04
OCEANIA	0.04	0.04	0.07	6.41
WORLD	17.61	21.44	25.47	4.18

Source: ECE reports and own calculations

Table 4 World and regional production of xylenes

Regions	Years			Rate
	1984	1988	1993	%
	Million tons/year			per year
EUROPE	3.5	4.2	4.5	2.83
AFRICA	0.02	0.12	0.13	6 times
MIDDLE EAST	-	0.02	0.05	.
ASIA	2.0	3.1	4.9	11.04
NORTH AMERICA	3.0	3.8	4.5	4.60
SOUTH&CENTRAL AMERICA	0.5	0.5	0.6	2.04
OCEANIA	-	-	-	-
WORLD	9.02	11.74	14.68	5.55

Source: ECE reports and own calculations

The remaining block-building monomers are playing smaller role in world petrochemical balance. The butadiene production in 1988 achieved 7.2 million tons from which 50% were produced in Europe, remaining divided more less equally between Asia (Japan) and North America.

Petrochemicals get their way to the market through downstream derivatives. The structure of petrochemical industry is based on large scale petrochemical complexes, many of them linked by pipelines with customers/producers of downstream derivatives. National and international grids of ethylene pipelines are now common in Europe and USA. Therefore, to analyse markets for petrochemicals it is necessary to identify consumption structure of block-building products.

Table 5 Consumption structure of ethylene (1990)

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Ethylene	100	38.5	36.8	0.6	3.6	16.0	3.7	0.7
LDPE/LLDPE	34.1	36.3	30.6	52.9	45.7	29.8	50.2	40.5
HDPE	19.7	17.3	21.7	27.3	7.1	23.5	19.3	30.3
EDC	15.1	17.1	13.2	19.8	13.9	14.8	15.3	8.0
EO	12.4	10.7	14.8	-	18.8	11.2	6.5	7.5
ETHB	7.0	6.7	7.5	-	4.6	7.9	7.0	-
ETHANOL	2.1	3.6	0.9	-	9.9	-	.	-
ACETALD	1.9	2.6	1.5	-	-	2.6	-	2.7
VA	1.6	0.1	2.3	-	-	2.6	1.2	1.3
Other	6.1	5.6	7.5	-	-	7.6	0.5	0.7

Source: UN statistics and own calculations

Table 6 Consumption structure of propylene (1990)

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Propylene	100	40.7	35.0	0.15	0.15	20.4	2.9	0.7
PP	40.5	36.5	37.5	100	-	52.6	40.1	84.3
ACN	16.3	17.4	14.2	-	-	19.2	11.9	-
OXOALC	10.2	13.1	7.6	-	-	8.7	10.6	3.2
PO	8.8	8.8	10.8	-	-	4.7	13.8	-
CUMENE	8.4	10.2	8.5	-	-	5.2	7.0	5.9
ISPALC	4.9	5.3	5.9	-	-	2.4	5.5	-
C7"/C"11	4.0	2.1	7.7	-	-	-	-	-
ACRAC	1.5	0.7	3.6	-	-	-	-	-
Other	5.4	5.9	4.2	-	-	7.2	11.1	6.6

Source: UN statistics and own calculations

Table 7 Consumption structure of benzene

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Benzene	100	42.5	33.5	0.2	1.2	18.8	3.3	0.5
ETHB	48.3	41.7	55.5	-	-	47.2	50.4	76.2
CUMENE	19.3	21.9	21.2	-	-	12.9	13.1	16.8
CYKLOHEKX	14.7	14.6	12.7	-	93.6	19.4	16.6	-
ALKBEN	3.8	3.9	2.3	42.5	5.6	4.2	10.4	6.2
NITRB/ANIL	5.1	7.0	5.3	-	-	5.2	3.4	0.6
MALANH	1.6	2.5	0.2	-	-	0.1	-	-
CHLORBEN	1.7	2.5	1.7	-	-	0.1	-	-
Other	5.5	5.9	1.1	57.5	0.8	10.9	6.1	0.2

Source: UN statistics and own calculations

Table 8 Consumption structure of xylenes

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	%							
Xylenes	100	35.2	30.6	0.4	0.2	30.0	3.4	0.2
o-XYL	20.4	28.3	18.2	-	100	11.4	41.7	-
p-XYL	58.4	43.9	74.2	21.3	-	63.9	31.2	-
m-XYL	1.9	2.9	1.5	-	-	1.5	-	-
MIXED	19.3	24.9	6.1	78.7	-	23.2	27.5	100

Source: UN statistics and own calculations

Message given by the statistical figures is self-explanatory. Over 70% of block-building petrochemicals is produced and consumed in developed countries. The consumption structure overthere is diversified to serve other subsectors of industry. In developing countries concentration is observed on one or two products. Selection of these products depends on local strategies and perheaps on the avilability of the appriopriate technology. The consumption structure of petrochemicals is a clear reflection of GDP per capita in given country and consumption potential of existing industrial structure.

Over 2/3 of block-building petrochemicals are transformed into thermoplastics, synthetic fibres and synthetic rubbers.

Their consumption is directly related to the consumer market through the production of the automotive industry, packaging industry, furniture industry, textile industry etc. The regional split of production of thermoplastics is given in the following table.

Table 9 Production structure of downstream derivatives

Products	Regions							
	World	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	Million ton/year (1989)							
THPLSTC 1\	60.2	21.7	18.6	0.6	0.6	15.4	2.6	0.7
SYNFIBR 2\	12.5	3.2	3.4	0.15	0.1	5.1	0.5	0.05
SYNRUB	6.22	2.1	2.1	0.04	0.03	1.5	0.4	0.05

Source: UN statistics and own calculations
1/ Polyethylene, polypropylene, PVC, polystyrene
2/ Polyacrylonitryl, polyester, polyamide.

The pattern of production of downstream derivatives is similar to the block-building petrochemicals: 75 % of the production capacities is located in industrialized countries, where they found local/regional market.

However, the production data should be supplemented by the trade information. Obviously the substantial amount of petrochemical derivatives, downstream products is consumed in producer's country. However, about 1/4 of the production of plastics, rubbers and fiibers is traded among the producers/consumers. Having in mind very high volume of this trade it is important for any collection of data to analyse also these trade data.

The world trade of chemical products in the year 1990 was over 200 billion US $ (the value of exports and equivalent amount of imports). Trade statistics are dealing with the groups of products defined by SITC and extraction of volume/value of trade in petrochemicals requires large scale statistical effort. The available data in data banks can be purchased by individual contracts and very few data are published. Therefore any results of analytical approach should be taken as obviously approximate especially when dissusing regional trade.

In the following tables are given data collected by UNIDO for:
- block-building petrochemicals: ethylene, propylene benzene;
- downstream derivatives: thermoplastics and synthetic fibres. e.

Table 10 Trade structure of the block-building petrochemicals

Products	Regions						
	Europe	NA	Africa	Middle East	Asia	S&CA	OC
	Kt/year (1989)						
Benzene							
- export	1623	230	48	40	285	105	-
- import	723	260	-	-	170	12	50
Ethylene							
- export	1723	90	250	180	160	10	-
- import	1913	100	35	25	460	50	-
Propylene							
- export	1220	250	125	250	195	40	-
- import	1834	220	5	220	440	-	-

Source: SRI reports and own calculations

Traded amounts of block-building petrochemicals are small in comparison with their production. Production of benzene in Europe amounts over 10 million tons, therefore exports and imports are respectively 16% and 7% of the production. Even smaller trade ratio is observed in ethylene; Europe exports 8% of the production and imports 9.5% of yearly production. Transportation difficulties of the liquid etylene are rather limiting trade to products transported by pipe line system.

Small amounts are sold in liquid form either to make balance of derivatives production or in case of usage in fine chemicals industry. Trade in other regions is insignificant in comparison with Europe.

Opposite is observed in downstream derivatives.

Table 11 World wide trade in thermoplastics (1989)

Product	Value in US $ million	Ratio export/production %
LDPE/LLDPE	4,800	28
HDPE	2,600	26
PP	2,840	27
PVC	3,050	18
PS	1,800	22

Source: UN satistics and own calculations

Value of trade in thermoplastics equals about 7.5 % of the overall trade in chemicals and this is a highest ratio for one commodity group.

The trade in synthetic fibres is smaller, however overall ratio of the export to the production is over 20%. The particular fibres data are given in the following table.

Table 12 World wide trade in synthetic fibres (1989)

Product	Value US $ million	Ratio export/production %
PAN	900	28
Nylon	550	15
Polyester fibres	1,350	18

Economies of developed countries denoted recession which started late 1990 and which in specific areas still continues. In 1989 process of reconversion of centrally planned economies to the market system has started and in the following years these countries denoted large scale decrease of local production and overall consumption. Also reliable production statistics from developing countries are delivered with two-three years delay. Therefore, for structural analysis it seems that years 1988-1989 may be representative. For other purposes like estimate of trends and projections the data from 1988 should be reviewed and analytical review of situation is requried.

This will be presented in last chapter of this paper. Therefore, selected data for years 1984, 1988 as well as the projection for the forthcoming year 1993 will be presented.

Also in early eighties the petrochemical industry of developed countries has been restructurized. The reasons for restructuring were as follows:

- mutiple installations constructed in sixites have shown lack of competitiviness on international market;
- dispersion of processes among multiple producers was an obstacle for further technology development;
- lower than expected demand, originated overcapacity in certain products;
- loss of markets in Latin America and Asia due to the development of national petrochemical industries and entrance on the international market producers from Middle East countries.

At the first step closures of selected capacities have been negotiated. It is estimated that in period between 1981 and 1984 production capacity of thermoplasics in Western Europe has been reduced by about 2 million tons followed by reduction of number of producers.

Table 12 Reduction of number of commodity plastics producers (1980-1984) in Western Europe

Product	Number of producers 1980	1984
HDPE	20	15
LDPE	25	19
PVC	28	18
PS/EPS	19	17
PP	18	16

Source: Chemical News, 1988

Development of production of petrochemicals depends on the following factors:

1) macroeconomic:
   - GDP growth;
   - new applications of downstream derivatives;
   - general availability of capital;
   - general trade and tarrifs world situation.

2) microeconomic:
   - industrial restructuring in developed countries;
   - programmes supported by local Governments of developing countries by capital participation;
   - possibility of the development of certain packages of industrial policies by investing countries;
   - advantegous microeconomic conditions for foreign investors (tax holidays, profit repatriation conditions, credit subsidies for infrastructural and environment protection elements of the petrochemical complex, import tarrifs, etc.)

The elasticity growth coefficient for downstream derivatives production denotes historically value over 1 and in many cases is 10 % - 20% higher than rate of growth of GDP.

However, it should be mentioned that this macroeconomic relations can be used for testing of the results of more detailed demand assessment, which stability depends on the local industrial structure. Quick growth of local demand of down-stream derivatives will be always observed when local e.g. housing construction, automotive and packaging industries will be developed. Then, previously limited by import barrier amount of used materials grows quickly, not only substituting imports but also covering demand in multiple new applications.

Also technological break-throughs in new application may change overall cosnumption pattern of plastics, fibres and rubbers. This was observed when automotive industry drastically increased application of plastics and when preservation and packaging of food substituted paper and glass by plastics.

The expected consumption growth of petrochemicals' downstream derivatives, following the correlation between the GDP and downstream derivatives consumption pattern is given in the following table.

Table 13 Projection of the world production of petrochemicals (optimistic scenario)

Product	Year 1995	2000	2010
	million ton		
Plastics	75.9	92.3	136.6
Fibres	14.9	17.3	23.2
Synthetic rubbers	7.0	7.7	9.4
Ethylene	72.5	85.7	100.0

Source: Own assessment

The regional distribution of added capacities is expected to be divided as follows:

Table 14 Regional ratios of the new capacities in petrochemicals (Year 2000)

Products	Regions Europe	Africa and ME	NA	Asia	S&C America	Oceania
	% of added capacities					
Plastics	20	10	20	25	20	5
Fibres	5	15	10	40	25	5
Rubbers	20	35	15	5	15	10
Ethylene	20	12	18	35	10	5

Source: Own assessment

Projected increase of capacities will require large amount of capital investments. Assessment of financial resources required is very difficult. The reasons of diffficulties are obvious

The future monetary situation is impossible to forecast, rate of exchange are not stable and rate of interest are inpredictable. However, taking into acount optimistic scenario of the world development the required financial resources to support world wide petrochemical industry development is given in the following table.

Table 15 Capital investment cost of the petrochemical industry developemnt by the year 2000

Product	Region					
	Europe	Africa and ME	NA	Asia	S&C America	Oceania
	US $ million (1990 prices)					
Plastics	7800	1955	7800	14600	15600	1950
Fibres	1080	4880	2170	13100	10800	1100
Rubbers	1700	4540	1300	650	1950	430
Surfactants	1140	2560	1140	6850	4560	570
Organics	12000	3000	12000	8000	8000	2000
Total	23720	16935	24410	43200	40910	6050

Source: Own calculations

Amount of capital is obviously large. For cumulative investment during next decade above US $ 150 billion has to be spend only for petrochemical industry. It is to large to be afforded only by private companies without support of international financial institutions and local Governments. To compare these figures with the private investment, respective data have been collected. Data are given in the following table.

Table 16 World wide private investment in chemical industry

Region	Years		
	1988	1989	1990
	Ecu billion		
Europe	16.8	19.5	20.5
USA	16.4	9.4	8.9
Japan	11.5	13.2	13.4
Total	44.7	42.1	42.8

Source:CEFIC report 1991

Therefore, whatever has been published promoting involvement of the private companies into the development of petrochemical industry remains rather wishfull thinking than reality.

Trade regulations will have important impact on the implementation of presented scenario.

Two conditions of GATT agreement are crucial for subsequent succesfull development of petrochemical industry:

- temporary policy measures defending local markets of developing countries should be allowed;
- markets of developed countries should remain open in terms of competitive price.

These conditions will largely improve the trade balance between the North and South, changing the financial flows from donations to the comparable value of trade balance.

The presented scenario of development is considering specific situation of the petrochemical industry in both developed and developing countries. To pursue the possible line of development one should consider two elements:

- the maturity of Europen petrochemical industry;
- programme of development of petrochemical industry in leading countries.

Obviously, the petrochemical industry in Europe and USA require restructuring. The process of restructuring, which started in early 80-ties is not yet completed. Actual maturity of selected Europen installations is given in the following table.

Table 17 Maturity of petrochemical industry in selected European countries

Regions	Cracker capacities in operation over 20 years	15 years	10 years	New
	thousands t/year			
Benelux	2500	525	-	1050
France	1350	1180	-	-
Germany	850	480	300	940
Italy	840	350	700	-
Nordic	600	400	-	-
Portugal	-	-	300	-
Spain	240	810	-	-
U.K.	385	1115	-	1000
Total	6765	4860	1300	2990
%	42.5	30.5	8.2	18.8

Source: Chemical Week International March, 1990

The sample of the capacities is small (12%) however it is possible to judge over the maturity of the world petrochemical industry. It seems that in developed countries (Europe, USA, Japan) maturity of petrochemical industry by the year 2000 will reach the critical value of 20 years of operation. Therefore, restructuring will be necessary and actually programme of rehabilitation and extension of capacity over 1350 thousand tons of ethylene, only in Europe, is under execution.

Considering this situation, the net value of capacities to be revamped or closed by the year 2000 in Europe may reach value of 10 millions tons of ethylene per year.

The world wide figure will be easily 20 million tons per year. It seems that at least 50% of investors would consider foreign investment at the condition of availability of ethylene in the European/USA pipe line system. This is a good chance for North African countries.

Similar conditions are in USA, creating oportunity for Mexican and Canadian petrochemical industries. Japaneese industry is figthing the battle between the sustainable projects proposals and MITI regulations. Already prepared and under prelimianry steps of implementation are projects of 3.0 million tons of ethylene new capacities (about 9% of new capacities). However, the conservative policy of MITI will allo·· perheaps additions less than 1 million t/year with the emphasis of the ethylene export (Showa Denko project).

The situation in developing countries is different. Only few enetred, or are under the way to enter, the club of petrochemicals producers. The pattern of reasons which caused establishment of the petrochemical industry are diversified, however, basic impact is due to the national industrial policies and not "the free-market invisible hand".

The historical data on production and production and projections for selected developing countries are given in the following table.

Table 18 Trend of ethylene production in developing countries

Countries	Year		
	1985	1990	2000*/
	Kt/year		
AFRICA			
Algeria	100	120	120
Libya	330	330	600
Nigeria	-	-	300
South Africa	220	330	450
MIDDLE EAST			
Kuwait	-	-	750
Quatar	280	280	280
Saudi Arabia	1600	2200	3200
ASIA			
China	960	2170	4200
India	250	550	1700
Indonesia	-	-	500
Korea Republic	500	1150	3300
Malesia	-	-	350
Singapore	300	430	800
Taiwan Province	900	950	1200
Thailand	-	-	400
S&C AMERICA			
Argentina	230	300	700
Brazil	1430	1540	2500
Colombia	115	150	450
Ecuador	-	-	300
Venezuela	150	180	600

Table 18 Trend of ethylene production in developing countries (continued)

Countries	Year 1985	1990	2000*/
	Kt/year		
NORTH AMERICA			
Mexico	950	1400	1800
Total	8315	12080	24000
Total world	55600	65100	85700
% of world capacities	14.9	18.5	28.0

*/ including projects under planning and negotiation stage
Source: UNIDO statistics and own calculations

In Africa only advanced project is in Nigeria at Port Harcourt were capacity of ethylene cracker, based on LPG, will be added to existing aromatics production. Expansion of SASOL planned in South Africa may be revised, after embargo on hydrocarbons will be raised.

In Middle East SABIC project in Saudi Arabi is fairly advanced, however decision to use naphta as raw material is questioned. The decision of that change in raw material source is based on intention to extend downstream derivatives profile to polypropylene and aromatics products.

However, this decision may put SABIC in cost disadvategous production cost position even if the price for LPG will be raised to 1 $ per mln Btu. Original project in Kuwait may be postponed due to the post-war rehabilitation programme of oil fields and refining capacities.

However, in this place long discussed petrochemical complex in Abu Dhabi may be realized. The Gulf Cooperation Council decided to establish trading company (marketing/shipping) to avoid unnecessary competition between member states but it seems that SABIC will have decisive position in all Middle East petrochemical trade.

In Asia, China is the dominating producer among developing countries. However, huge local market constrains the development of a large scale export oriented petrochemical industry. Possibility to achieve production of about 4 million tons per year of ethylene with further processing stages will depend on intiative and furter development of special economic zones where foreign capital may decide to participate in investment programme of downstream derivatives.

India is considered the petrochemical dwarf of the continent. Lack of the local refining capacities in naphta feedstock (used for other purposes) was always hampering development of petrochemical industry. Current study prepared for the Government shows the demand for ethylene and propylene (conservative projection) respectively above 2 million tons and 880 thousand tons. Some preparations to move ahead with petrochemicals have been observed in Madras refinery where private capital is expected to participate.

In Republic of Korea growing up deficit of ethylene and propylene has motivated Government to lower tariffs on the imported products from 10% to 2% as downstream derivatives production has accelerated. The growing deficit of ethylene and propylene will allow at the end of the century to revamp existing and establish new petrochemical capacities. Similar situation is observed in Taiwan Province which is a major importer of petrochemicals (over 30% of demand is covered by imports). Production capacities of downstream derivatives are constantly underused due to the lack of ethylene and sixth naphta cracker is urgently needed.

New producers will also emerge by the year 2000, namely Thailand, Malasia and Indonesia. In Thailand lenghty discussions about the needs of Eastern Sea Board petrochemical complex and its feasibility has terminated by creation of international financing consortium and preparatory works already started. Indonesia plans to start petrochemical industry have been postponed and lower then expected capacities will be established. The lack of Government financial resources was the original reason of this decision. However, it seems that by the year 2000 at least one large scale petrochemical complex will be establsihed.

In South and Central America establishment of new crackers is expected in several countries. In Argentina new petrochemical complex in Nequen state is supposed to be established, and not extension of already existing production facilities in Bahia Blanca.

Currently the feedstock prices established in Argentina are perheaps lowest in the world (30 cents per 1 million BTU). Still privatization of the Bahia Blanca cracker has been postponed due to the political reasons.

Brazil is one of the success stories in petrochemical industry. Development of three petrochemical complexes (COPENE, PETROBRAS and COPESUL) is under the way and COPENE which seems to be the largest petrochemical complex world wide, started further expansion form internal cash flow.

The fourth complex in Rio de Janeiro is under advanced stage of negotiations. This decision has been largely discussed and doubts expressed about need of establishment of the new petrochemical pole instead of expansion of existing ones.

However, as financing banks have been interested in conversion of country debt into equity of the new pole, it seems that fourth petrochemical pole in Brazil will be established and US $ 1.6 billion expeditures has been approved in the Government plan. It is to wait and see the implementation of the project.

In Venezuela small scale revamping of the El Tablazo cracker has been completed. The major expansion of this petrochemical complex to the capacity of 250,000 ton/year will be completed after new cracker (350,000 t/year) will come on-line. This capacity would not allow Venezuela to enter international market with downstream derivatives as practically all products will be consumed domestically.

Columbia and Ecuador are two potential newcomers in the petrochemical family of producers, however the production programmes are not yet approved and financing for the petrochemical projects is still sought.

In North America, Mexico practically completed the petrochemical expansion projects and production is expected to meet mainly domestic demand. It is expected that revamping and restructuring programme of United States petrochemical industry, which is expected during middle of 90-ties, after signature of the common market agreement, will attract American investors to Mexico.

2. Host country strategy

All Governments from the developing countries in their strategic isues concerning the industrialization process are considering development of the petrochemical industry. There are several conditions to implement the programme of the petrochemical industry development:

1) macroeconomic:
   - GDP growth;
   - new applications of downstream derivatives;
   - general availability of capital;
   - general trade and tarrifs world situation.

2) microeconomic:
   - industrial restructuring in developed countries;
   - programmes supported by local Governments of developing countries by capital participation;
   - possibility of the development of certain packages of industrial policies by investing countries;
   - advantegous microeconomic conditions for foreign investors (tax holidays, profit repatriation conditions, credit subsidies for infrastructural and environment protection elements of the petrochemical complex, import tarrifs, etc.)

3. Prior and on-going assistance

In period of 1976-1991 UNIDO has prepared number of studies related to the petrochemical industry development. Through the organization of Consultations on the Petrochemical industry (Mexico City 1979, Istanbul 1981, Vienna 1985, and Insbruck 1992) the consensus has been achieved to prepare a Directory of Technological Capabilities in Developing Countries related to the Petrochemical Industry. Also IDB decided to prepare piloting petrochemical data base for the Arab countries. A number of UNIDO projects has been aimed to assist selected developing countries to prepare programme of the petrochemical industry development (Algeria, Iran, Brazil and SADAC countries). The part of these projects' reports the statistical review of the petrochemical capacities have been given using different external sources of information, owing the fact that UNIDO had not relevant data base.

4. Institutional framework for the subsector

Parties involved in ensuring petrochemical industry development in the developing countries.

Party	Function	Cooperating party	Relation
Government Agency responsible for development programmes	Preparation of respective proposals	Industrial Association UN system Agencies	Cooperation and conflict Cooperation
Industrial association	Representation and lobbying	Government Enterprises	Conflict Cooperation
Companies' managers	Analytical evaluation	Ind. Ass. R&D Institute	Cooperation Cooperation
Companies' Boards	Investment decisions	Governemnts Banks	Cooperation Cooperation
Licensors and suppliers of equipment	Offering of process and equipment	Petrochemical Companies	Cooperation Conflict
R&D Institute	Information Training Focal Point	Government Agency Enterprises	Cooperation Cooperation
UNIDO	Organization and supervision of network consuultations	Focal Point Government Other UN Agencies	Cooperation Cooperation Competition

PART B. Project justification

1. Problem to be addressed; the present situation

Problem to be addressed is an improvement of the system of the market and process information collection and dissemination in petrochemical industry in developing countries.

Traditionally advisory services in petrochemical subsector were organized by the UNIDO's System of Consultations and ad-hoc studies provided at request of Governments. However, Consultations are rare (five in fouteen years6) and funds from UNDP became difficult to tap owing the change of priorities and systems of technical assistance delivery. Therefore, the Governments as well as the petrochemical companies for purpose ot the collection of statistsical information have to organize own data banks or pay large charges for services of commercial counsulting companies. This is obviously not efficient way and many of companies have not access to actual data, what has negative impact on rational investment decisions and adequate market orientation.

2. Expected end of project situation

It has been decided by UNIDO Board to establish the petrochemical database and make it available to Arab countries.

The decision was not specicific on modalities of the data bank operation. Obviously once upon time preparation of the capacity/production data is not an organization of a database which requires permanent up-dating. Also communication media with Arab countries have not been explained (e.g. direct access by specified organizations to the database by electronic means).

It is also not clear why the database could not be available to other developing countries. Therefore, following the Board recommendations information has been collected and prepared to be disseminated however further modalities must be cleared up.

Considering large amount work already done and continuous efforts of groups of professionals in UNIDO to establish and operate fully-fledged petrochemical database the new concept of the establishment of the UNIDO Centre for Information Collection and Dissemination (Petrochemical Data Base) has been developed.
The Charter of the Center and all necessary accompanying documents have been prepared and are attached (Annex II).

The idea behind the organization of the Centre is based on the need to operate database as a data bank available to all enterprises of the developing countries as well as on the need to develop the UNIDO new role in direct co-operation with the industry.

The following elements should be considered when deciding on the proper solution:

- sources of information;
- competitive role of the database to the already existing commercial databases;
- organization of the Centre at UNIDO;
- modalities of financing of the Centre;
- efficiency of the Centre operation for its members.

Database must present an up-dated information on all elements of petrochemical industry operation world wide. To have valuable impact on the marketing, trade and investment all producing countries have to be considered as well as consuming countries (non-producers).

To collect, compile, process and disseminate the information Centre must have access to the sources of data. The necessary information would be supplied from developing countries by its members (petrochemical companies) directly or through network of correspondents (regional or national).

The developed countries are producing and publishing enough information that could be incorporated into the database, however if companies of industrialized countries would wish to participate in the Centre they are invited to do so on the common basis. Therefore, annual questionnaires would be prepared, disseminated, collected and introduced into database. Experience shows (e.g. that of ECE) that by June of the next after statistical year information can be available, which is much quicker that from any other source of information.

Database would be competitive to the existing commercial databases. Many commercial databases have not direct acces to the information from enteprises. In majority of the cases their source of informationa are either integrated statistical data form Governments or journals/newspapers reviews.

Therefore lot of internal assessment is made and rather trends then accurate data are provided.

On the other hand commercial databases ar providing very costly information (annual review of petrochemical data costs over US $ 30,000). The petrochemical companies from developing countries and especially small processors can not afford this cost.

UNIDO as a non profit organization, having ensured a modest membership fee from each industrial enterprise, could afford delivery of this information practically free of charge (against membership fee).

The Centre organized by UNIDO would operate very efficiently using already available resources and modest staffing of the Centre. It is foreseen that three staff members and one secretary could handle all operations including the transmission of information. The Centr operations would be incorporated as an Unit into existing INTIB structure. Also consulting services as well as fee for correspondents could be covered from the Centre budget. The transmision of the data through the electronic means (or by informatics' means -diskettes) would be cheap and quick.

Center would be financed from the membership fees and donations of countries supporting the project. The number of petrochemical companies world wide is large (above 4,000), therefore even modest membership fee (US $ 200 to US $ 500 depending on the size of the company) should be enough to support the Centre activities. Perheaps at the beginning of the Centre operation some support from UNIDO budget or donor country would be necessary.

UNIDO using its library and information from members would supply information in a most efficient way for the member enterprise. Each petrochemical enetrprise to collect necessary information must purchase at least 6-8 journals at the annual cost of US $ 600, employ 2-3 qualified staff to make abstracts from journals and operate own data bas system.

All this work would be made by the Centre and information would be supplied without any additional charge.

It looks like that establishment of the Center may economize petrochemical companies about US $ 40-50 million.

Whatever other solution would be choosen to satisfy needs for petrochemical data it must be considered that much higher costs are expected. The international cooperation in this field is the most effcient way to staisfy existing needs.

3. Target beneficiaries

The main task of the CENTRE-PETROCHEMICAL DATA BANK, i.e. acting as a clearing house for modern SYSTEM OF INFORMATION COLLECTION AND DISSEMINATION via programmed link between industrialized and developing countries is an efficient way for improvement of petrochemical industry development options selection.

The direct target beneficiaries of this programme will be the petrochemical companies aiming to trade their products and decide on future investment profile of their petrochemical complexes.

3.1 **Centre's Services to Members**

The CENTRE will provide the following services to its members:

(i) free of charge:

- regular edition of information through electronic and classical means on:
  - -- addresses of petrochemical companies including downstream processors of backbone petrochemicals;
  - -- production profile of petrochemical companies;
  - -- capacities of the petrochemical production units;
  - -- sources of technology in petrochemical industry and in particular operational in developing countries;
  - -- annual production output;
  - -- technological profiles of petrochemical installations;
  - -- capacities and trends in capacity changes in industrialized countries.
- guidelines on preparation of a programming studies, sources and selection of the technologies and assisstance in preparation of feasibility studies in particular of revamping cases.
- facilitated access to the regular UNIDO publications related to the technology and its development;
- facilitated access to the services offered by UNIDO;
- direct communication between members.

This information would be available for every member of the Centre-Petrochemical Data Bank immediately after implementation of the scheme.

- information on markets/import/export/production and capacities worldwide of about 40 petrochemicals;
  This trade information organization depends on the implementation start-up of the scheme and operation of the network of national/regional coordinators. Therefore, this information would be available with the delay of about one year after Data Bank start-up.

(ii) services at discounted rates:
- training in proper use of data received for market analysis, marketing activites as well as investment opportunity evaluation (participation in the training workshops);
- experts identification services;
- preparation of the demonstration projects (technology audits), technology revamping projects etc.);
- co-operative projects among Center members (identified joint interest for similar technology revamping).

4. Project strategy and institutional arrangements

4.1 Modalities of communication between the data bank contributors and users.

4.1.1 Collection and update of information.

Once established structure of the data base requires filling up by the information collected. Collection and up-date of the information may be organized by the following procedures:

- use of accesible public sources of data and evaluation by experts lacking data. This basically is a methodology of the SRI, Economic Commision for Europe, etc.

- direct communication with data owner and reception of the information by private channels. The data owner may be Bureau of Statistics of a given Government or directly company involved. This is basically a procedure of EEC, UN system organizations, OECD etc.

Some informations are also collected informally by the intelligence methods.

The highest value for trade and investment decisions have current data and their comparison with time series or other relational variables. Therefore, direct communication is the utmost efficient method of the data collection. Having in mind frequence of information update the suppliers information communicate may be delivered at the special format and this by scanner transferred intc data base relevant location and format. By scanning also published information can be supplemented to the data base. However, owner of information must be motivated to supply the data precisly and periodically. The motivation can be established by regular price of data paid by the data bank, or method of trading the data collected by the data bank. In this case data supplier become also data user. The last method requires acceptance of all data suppliers. In this case the data bank organization must ensure for the data supplier/user the following conditions of the data bank operation:

- general interest in trade and investment by the user;
- professional, selective orientation of the data base content;
- direct access to the analytical and integrated information by user;
- economic efficiency of the relations between user and data bank.

Therefore, to establish the inflow of information and organize data base, the data bank owner must establish the principles and technical modalities of the information dissemination.

4.1.2 Dissemination modalities of the data to satisfy the supplier/user.

There are numerous methods of cooperation between data bank and information supplier/user. The following were selected for efficiency comparison:

- printed, periodical information dissemination. This method is based on the edition of the periodical NEWSLETTER with in principle agreed between suppliers/users information structure. However, the standard form of the information structure never would be adapted to all cases of data required for different purposes.

Therefore, printed information system must have also separate channel of urgent and non-standard information flow. The estimate of the running cost of this system is given in efficiency comparison chapter.

- direct communication with user by phone modem attched to the data base system. This requires preparation and dissemiantion of the guide manual as well as hardware adaptation of the UNIDO computer system to be accessible by phone line.

Also owing the long distance calls potential disturbances structure of the accessible files must be changed to hierarchical on line communication system providing at each order limited (one line) report with quick direct access to files. The cost for the user would be substantial as the phone connections are expensive and communication time is rather length.

The estimate of the investment by UNIDO and running costs of the system is given in efficiency comparison chapter.

- fax connection based on the telephone digit numbers. The data base information is divided into indexed groups. The index guide is distributed to all suppliers/users. The formalized data set (similar to the case of printed newsletter) is stored in ASCII file and at the communication translated into format of fax transmission. The deficiencies of the system are similar to the modem communication, however the communication distortions are less probable and communication time instead of minutes is limited to dozen of seconds. Organization of the system requires special processing software (e.g Telephone Response Technology Inc. INTELESYS), data base access, script system etc. as well as fax card, dialogue card, record adapter to be inserted into PC system. Number of access lines must be ensured (maximum 36 simultaneous lines per one PC). Obviously the structure of data bank on the output side must be adjusted to the communication technology selected. The estimate of the investment by UNIDO and running costs of the system is given in efficiency comparison chapter.

The grand total cost for the developing country company actively using the UNIDO Database woudl be annually:

Company costs*/:

Individual	Classical	UNIDO Data Bank Phone modem	Fax transmission
		Operation cost US $	
38,000	30,500	21,000	15,600

*/ membership fee US $500 considered

UNIDO costs:

Individual	UNIDO Data Bank Classical	Phone modem	Fax transmission
	Operation costs US $		
-	628,000	552,000	548,000

The efficiency of the classical method and fax transmission communication is nearly equal. Considering the elasticity of the operation and access to any combination of information the fax transmission menthod seems to be the most efficent and should be choosen for implementation. The savings of one company participating in the Data Bank are about US $ 23.000 annually and for all potential members from developing countries US $ 26-28 million.

5. Reasons for assistance from UNDP/UNIDO

UNIDO in a number of technical assistance projects the petrochemical industry has shown the utility and usefulness of the networking system and establishment of the centres to carry out basic work on the matters of interest of network members.

All consultations carried out by UNIDO on the petrochemical industry development produced library of advisory documents and reviewed the production/market situation. Therefore, UNIDO has all necessary information related to the future Center members (companies) as well as to the content of the required information to be disseminated.

Local Government institutes and organizations due to the lack of co-ordination, financial resources and dispersion of responsibilities are not able to carry out the work on establishment and operation of the petrochemical Data Bank.

6. Special considerations

The collected experience in the Centre establishment and operation will be used when other regional centres establishment would be decided.

7. Co-ordination arrangements

The Petrochemical Data Bank will establish global co-ordination centre in UNIDO HQ Vienna. The Task Force group in UNIDO HQ will be composed from Backstopping Officer (Programme Manager), Chief Technical Advisor (internationally selected co-ordinator), data bank operator, abstractor (scanning modality of abstracting), trainer (manuals, guidelines, methodological instructions), secretary. TF will use UNIDO infrastructural services to organize establishment of necessary data base (INTIB), and issue newsletters (Editorial Control and Publication Services), organize workshops/training courses (Industrial Human Resources Development Branch), recruit speakers and e: rts (Project Personnel Recruitment Branch).

8. Counterpart support capacity

The counterpart organizations (petrochemical companies) have planning and accounting departments from where UNIDO can get necessary information.

Selection of regional/national co-ordinators would be decided upon reception of the first round of questionaires and assessment of their quality.

PART C. Development objective

The CENTRE objectives are to promote and motivate collection and dissemination from petrochemical companies world wide to improve marketing and investemtn decisions.

PART D. Immediate objectives, outputs and activities.

1. **Immediate Objective 1**

To establish a network of cooperating enterprises in the field of collection and dissemination of petrochemical industry data.

1.1 Output 1

Roster of cooperating enterprises/companies

Activities	To be completed by	Responsible party
Activities for output 1		
1.1 Preparation of the memebrship questionnaire	1	UNIDO
1.2 Distribution of the mebership questionnaire	2	UNIDO
1.3 Nomination of the national regional coordinators	3	Governments
1.4 Nomination of the Board of Trustees	4	UNIDO
1.5 Programming meetings of the Board of Trustees	6/12/18/24/30	UNIDO
1.6 Confirmation of membership and distribution of particpant's manual	6	UNIDO
1.7 Preparation of the report on the Centre operations inception	8	UNIDO
1.8 Coordinators meetengs	6/18/24/36	UNIDO

Immediate Objective 2
Establishment of the Data Bank
Output 1. Collected and computerised results of the first round questionnaire distribution

Activities	To be completed by	Responsible party
Activities for output 1		
1.1 Preparation of the final questionnaire format	1	UNIDO/Center
1.2 Distribution of the final questionnaire format	3	UNIDO/Center
1.3 Collection of the responses	3	UNIDO/Coordinators
1.4 Computerisation of the data	10	UNIDO/Center
1.5 Preparation of the final manual and coded guidelines	12	UNIDO/Center
1.6 Start up of pilot dissemination of data	14	UNIDO/Center
1.7 Preparation of the report on Data Bank operation	15	UNIDO/Center

2.2 Output 2
Established network of communication with members of Data Bank

Activities	To be completed by	Responsible party
Activities for output 1		
2.1 Establishment of the principles and modalities of communication	5	UNIDO/Center
2.2 Preparation and dissemiantion of manuals and guidelines of data bank operation to members	9	UNIDO/Center

2.3 Technical adaptation of computers at UNIDO	7	UNIDO/Center
2.4 Testing of the system	9	UNIDO/Center
2.5 Dissemination of information to members	10	UNIDO/Center
2.6 Preparation of the report	12	UNIDO/Center

3.Immediate objective 3
To provide advisory services in the preparation of demonstration projects

3.1 Output 1
Advisory reports on demonstration projects

Activities	To be completed by	Responsible party
Activities for output 1		
1.1 Preparation of the Terms of Reference related to the member's request	as requested	UNIDO/Centert
1.2 Selection of the subcontractor	+2	UNIDO
1.3 Preparation of the advisory report	+5	UNIDO/Center
1.4 Distribution of the advisory report to interested members	+7	UNIDO/Center
1.5 Collection of comments and requests	+9	UNIDO/Center
1.6 Preparation of the final project report	36	UNIDO/Center

The number of advisory projects will depend on the requests of members of CENTER.

In above table expected timing is given of services execution in months after request have been received. In principle advisory services will be financed by interested enterprises, however center will sibsidize part of the operation for purpose of having rights to disseminate the results of advisory services to other members of CENTER.

PART E. Inputs

In this project document we assume that in the initial period (3 years) the budget of the Centre will be covered mainly by the combined sources of financing, probably from the UNDP Regional Programmes, or other donor source. The members of the CENTER will pay modest membership fees and will receive, free of charge or at discounted price, resulting services.

UNIDO from regular budget would support necessary Centre staff.

All petrochemical enterprises worldwide are legible for services of the CENTER, however, they will cover full cost if not CENTER members, of the respective service. The membership fee will be established by the Board of Trustees.

It is assumed that financing of the Centre will be divided into two periods:

a) initial period supported by the external financing
b) self-financing period.

(a) Trust Fund Input (combined UNIDO and members' fees)

The budget of the Centre for the three years of operation, is as follows:

Budget element	Unit	Amount	Unit cost US $	Cost US $
International experts - consultants[1]	m/m	12	12,000	140,000
National Experts: [2] (coordinators)	m/m	45	3,000	135,000
Travel: [3]				
Project travel				35,000
Agency staff travel				35,000
Fellowships [4]	m/m	8		48,000
Technological advisory services: [5]				240,000
Non Expendable Equipment: [6]				9,000
Expendables: [7]				62,000
Miscellaneous: [8]				15,000
Total				719,000

Explanatory note:
1) International experts (i.a. CTA 3 m/m) to assist UNIDO HQ staff to organize operational computerized system and ensure access through the faxing system.
2) National experts
To ensure quality of the data received by the data bank the focal points of INTIB should be used and country coordinators on data collection should be establsihed. Accordingly to the Petrochemical Directory it is proposed to establish 15 regional and national coordinators. They would be employed by SSA annually for four weeks to assess, combine and expedite the companies data. Considering the salaries in the developing countries SSA cost would be US $ 3,000.
3) Travel cost to cover travel to countries with difficulties to establish national co-ordinators and cost of travel of Board of Trustees
4) Fellowships to train regional/national coordinators for 2 weeks in Vienna on the guidelines of Data Bank operation, to make them capable to transfer necessary methodology to petrochemical enterprises statistical staff.
5) Technological advisory service to establish a methodology of utilization of data bank in programming and marketing planning actions.
6) Non-expandables (software, manuals distribution of charters collection of enrollment forms, introduction of data from UNIDO sources to the Data Base).
7) Communication hardware
8) Miscelleaneous costs (reports, printing of forms etc.)

PART F. Risks

Description of risk	Estimated liklihood
1. Factors which can over time cause major delays or prevent achievement of the project's outputs and objectives	
1.1 Delay in the international consultants recruitment	Low (required quality consultants were recruited by similar UNIDO projects)
1.2 Delay in the participants nomination	Medium (involved organizations may have difficulties to eliberate high caliber managers for workshops

Description of risk	Estimated likelihood
2. Factors which may at the outset cause major delays or prevent achievement of the project's outputs and objectives	
2.1 Delay in the project staff nomination and selection of the necessary quality personnel	Medium (involved industrial organizations will be interested to train their best staff)

PART G. Project reviews, reporting and evaluation

(a) The project will be subject to review (joint review by representatives of the government, executing agency and Board of Trustees). Such meeting to be held after 12 month of the project operation. The UNIDO chief of unit shall prepare and submit to the all parties concerned a Project Performance Evaluation Report (PPER).

Annex IX

JOB DESCRIPTIONS

UNIDO STAFF

PETROCHEMICALS' DATA BANK

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title **Expert in Technical Information Systems**
Chief of the Petrochemical Data Bank Unit

Duration Three years

Date required Three months after project approval

Duty station Vienna UNIDO HQ

Purpose of project To establish and operate Petrochemical Data Bank by INTIB

Duties The UNIDO staff member will work in the information servces to organize, establish and operate PETROCHEMICAL DATA BANK.

He will specifically be expected to:

1. Identify UNIDO local information resources and establish abstracting system;
2. Identify local computer potential to be used in the data bank development and organize the necessary adaptation;
3. Organize fax connection system with customers;
4. Prepare final guidelines and code book for fax connection;
5. Supervise the data entering, confirmation and disseminantion;
6. Carry out the register of members;
7. Carry out budget control of membership fees and on this basis control access to the Data Bank;
8. Continuously improve the content and structure of questionnaire basing on the reactions of customers and regional/national coordinators;
9. Supervise the work of other Center staff members.
10. Prepare periodical reports on Data Bank operation, number of communications and overall DB efficiency.

Qualifications

Chemical engineer (or economist) with good theoretical and practical experience in information systems. The experience in the petrochemical industry market research and investment decision making would be advantage.

Language English

Background Information See Project Document

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title **Abstarctor of Technical Information**

Duration Three years

Date required Three months after project approval

Duty station Vienna UNIDO HQ

Purpose of project To establish and operate Petrochemical Data Bank by INTIB

Duties The UNIDO staff member will work in the information servces to organize, establish and operate PETROCHEMICAL DATA BANK.

He will specifically be expected to:

1. Establish system of abstracting petrochemical journals and other information sources;
2. Establish the scanning system of information transmission to the computer;
3. Prepare the modalities and requirements for coding and relational data storage;
4. Provide abstracting regular services;
5. Prepare regular UNIDO Petrochemical UNIDO review;
6. Prepare advisory notes for customers on the data bank utilization;
7. Expand Data Bank content by establishment of the new database files on market/trade;
8. Prepare forms and schedules for new database files;
9. Recommend subscription of new journals as well as other information resources;
10. Carry out the register of commercial petrochemical databases,their content and costs.

Qualifications

Chemical engineer with good theoretical and practical experience in information systems. The experience in the petrochemical industry market research and investment decision making is a condition for employment.

Language English

Background Information See Project Document

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title Database operator

Duration Three years

Date required Three months after project approval

Duty station Vienna UNIDO HQ

Purpose of project To establish and operate Petrochemical Data Bank by INTIB

Duties The UNIDO staff member will work in the information servces to organize, establish and operate PETROCHEMICAL DATA BANK.

He will specifically be expected to:

1. Finalize the programming of the database;
2. Adapt database to the system of operation through fax connextions and establish informatics' standards for this purpose;
3. Introduce data from abstracts and communications from companies/coordinators;
4. Ensure stable access to the database by customers;
5. Expand the database programme accordingly to the needs of customers by establishment of necessary files;

Qualifications

Informatics engineer with good theoretical and practical experience in information systems and practical capabilities in rpogramming of the databases in different systems. The experience in the petrochemical industry market research and investment decision making would be an advantage.

Language English

Background Information See Project Document