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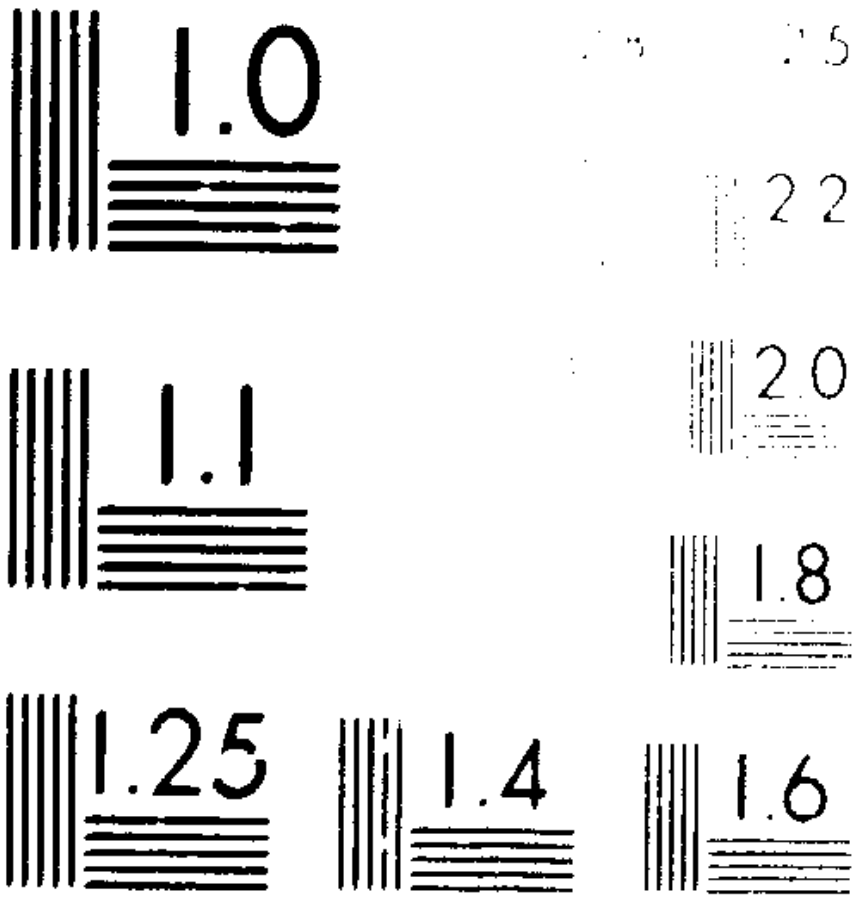
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org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INDUSTRIAL DEVELOPMENT & CONSULTING BUREAU

PHASE III KU/79/009

Oct, 1979 - June 30.1981

Extension July 1,1981 - June 30,1982.

KUWAIT .

TERMINAL REPORT

(Chemical and Petrochemical)

Prepared for the Government of Kuwait

by

Dr. Mohamed Ismail Abd Ellatif

Expert

United Nationa Industrial Development Organisation

acting as Exectuing Agency for

the United Nations Development Programme.

20 June,1982

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This report has not been cleardd with the United Nations Industrial Development Organisation which does not therefore necessarily share the views presented.

SUMMARY

Title:	Industrial Development and Consulting Bureau. Phase III.
Number:	KUW/79/009/A/01/37.
Duration:	Two year and 8.5 months.
Sector:	Industry.
Sub Sector:	Manufacturing Industry.
Government Implimenting Agency:	Ministry of Commerce and Industry.
Executing Agency:	United Nations Development Organization. (UNIDO)
Post:	Expert in Chmeical Petrochemical Industries.
Name:	Dr. Eng. Mohamed Ismail Abd Ellatif.
Start of Field Work:	21.10.1979.

ABBREVIATIONS

AIDO	Arab Industrial Development Organisation.
BTX	Benzene-Toluene - Xylene.
GFR	Glass Fiber Reinforced.
GOIC	Gulf Organisation for Industrial Consulting.
HDPE	High density Polyethylene.
IDC	Industrial Development Committee.
IDCB	Industrial Development & Consulting Bureau.
KCC	Kuwait Cement Company.
KNPC	Kuwait National Petroleum Company.
KISR	Kuwait Institute for scientif Research.
KNPC	Kuwait National Petroleum Company.
LDPE	Law density Polyethylene.
KPC	Kuwait Petroleum Corporation.
LNG	Iiquified natural gas.
LPG	Liquified Petroleum Gas ($C_3 + C_4$)
MCI	Ministry of Commerce & Industry.
MWE	Ministry of Water and Electricity.
MO	Ministry of Oil.
MC	Moulding Compounds.
MKD	Million Kuwaiti Dinars.
MPH	Ministry of Public Health.
MTBE	Methterbutyl Ether.
PE	Polyethylene.
NIC	National Industries Company.
PS	Polystyrene.
PIC	Petrochemical Industries Company.
PP	Polypropylene.
PVC	Polyvinylchloride.
PU	Polyurethane.
SAA	Shuaiba Area Authority.
VCM	Vinyl Chloride Monomer.
Ton.	Metric Ton.

CONTENT

1. INTRODUCTION

The Industrial Development and Consulting Bureau (IDCB) was an UNDP- project executed through three phases starting from 11 August 1973. Phase III of the project was originaaly for 22 month as of 1.9.1979 ending on 30.6.1981. Another period of one year (1.7.1981 - 30.6.1982) was annexed to phase III.

The main purpose of the project was to assist the Government of Kuwait in promoting industrialisation with a view to diversify the national economy. This went simultaneously in three main technical fields. The present report describes the activities which have been done during the phase span in the field of PetroChemical and Chemical industries. This terminal report is based on the progress reports which had been previously prepared and submitted to both UNIDO and MCI.

The report summarizes the activities implemented and analyse its achievements in relation to the objectives outlined in the project document. It does not include the routine and day-to-day activities which had no serious impacts on the final targets of the project. The overall conclusions end recommendations reached. during Phase III ofthis project are represented in this final report.

II. OBJECTIVES

The immediate objectives of the project were outlined as as follows:

a) To advise and assist the authorities withrespect to industrial strategies, plans and programmes.

b) To identify industrial investmentopportunities and prepare prefeasibility studies.

c) To assist in evaluating feasiblity studies and licesse application for industrial project.

d) To assist the enterpreneurs in preparing license agreements, selecting technologies and programme of implementation.

e) To train local counterparts and candidates from other developing countries.

As mentioned in the preliminary report (Dec. 1979) the following activities were defined and scheduled according to priorities to fulfil the objectives of the project:

1) Prepare and train counterpart personnel.

2) Advise and assist in preparing industrial development strategies and plans.

3) Assist and carry out industrial surveys.

4) Identify new investment opportunities.

5) Assist and prepare prefeasibility and feasibility studies in cooperation with short term consultants.

6) Evaluate studies and license applications.

7) Advice during project implementation.

8) Assist in adapting and creating local technologies.

9) Participate in Institution buildingactivities.

The main achievement reached by the execution of these activities are represented in the followingsection of the report.

III. FINDINGS

INDUSTRIAL DEVELOPMENT STRATEGIES AND PLANS

The starting activity, which was executed during a limited period, was the reviewing of the available studies reports, decrees and the five year plan (1976-1981). This was followed by a survey on the present trends and obstacles facing the industrial development. The proceeding activities aimed to help in adopting new measures during the formulation of the new strategies.

- The study on "The Future prospects of Petrochemical Industries development dealt with the reserves of raw material and the impacts of the factors like:natural resources, domestic and regional markets, labour, utilities and industrial areas which limit its progress.
- Another study on "Oil refinery and Petrochemical Industries development in Gulf Area: Why- How-and when"laid down some basis which could be beneficial for any foreseen planning. A partial survey was done the available raw, intermediate and waste materials for chemical and non-petroleum industries, aimed to predict the structure of development of the after-oil period. and search for ways to diversify the natural income.
- The "study and comments on the Industrial Law No. 6" recommended the review of the law to include the aspects reflecting the actual situation of the industry and to contain in particular.
  - definite measures for defining the type, size, periority of industrial establishment.
  - Additional incentives and coatume protection.
  - Special promotion procedure for export-oreinted industries.

- Participation in the study on "The rule of manufacturing industries in buildingup the production base in OAPEC by reviewing and answering the detailed questionnaire submitted for this purpose.

- A similar particpation was given to the study on the ways of technology transfer in Kuwait & Gulf Area"

- Classifications and size-measures of the industrial establishment in Kuwait a detailed background paper prepared for IDC.

- During the fomulation of its future plan, SAA was assisted in estabolishing priorities for industries to be located in SIA and MAJA.

- " Associated Gas and Intermediate petrochemicals" a study aimed to emphasize the importence of filling the gap. between refinery and downstream industry by production of selected products like, BTX,E,EG &Styrene, .

- " Rubber and Plastics Industries Develpment in Kuwait" A sectoral study indicated the present situation, obstacles facing its developmentin comparison to the international trends and ways to enlarge its share in thenational income. The study reached the conclusion of creating a regional centre for it progress. It includes also the technical and financial requirements of the proposed centre.

- Two other studies on "technology transfer" and "Master plan for petrochemical industries" were proposed during the tripartite meeting held in Kuwait on march 1981 but were not executed due to the overload.

B. Industrial Survey and Identification of new Investment Opportunities.

The studies carried out during Phase III on chemical/ petrochemical sectorare summarised in annex No. 1. These studies included:

- Local Supply/demand balance, present and prospects.
- Regional and international surplus/deficit.
- Production technologies and licensors.
- Raw material availability.
- Preliminary economic study and investment possiblity.

These studies necessitate the forehand updating of the port-folio of the existing industries.

Based on surveys executed by regional/international organizations, other new investment opportunities were identified and suggested to be implemented as joint venture projects. Such cooperation with reighbouring countries is highly appreciated to secure resources and labor force as well as substantial market.

The following list shows the new investment opportunities identified and their state of realisation. More than twenty of these opportunities were found feasible and project for manufacturing the products suggested are either in the stage of preparingfeasibilitystudies or under implementation.

Most of these projects required advanced technologies and assistance in marketing and/or in operation management.

Table 1

New Investment Opportunities identifed and its stages of realisation

Class	Product	Capacity	Stage of realisation
Refinery and basic Petrochemicals	Lube oil base	-	Project under study
	BTX	integ. ted complex.	Project approved- feasibility study stage
	Butadiene	-	no action.
	propylene		Local/regional project under study.
	Petroleum Solvents Solvents	30 000 t/y	Two projects under implementation.
Intermediate Petrochemicals	Ethylene	Integrated	Project approved, feasi-
	Ethylene Glycol	complex	bility study stage.
	Formaldihyde +	20000 t/y	project approved,
	moulding compounds.	30000 t/y	implementation stage.
Finel Petro chemicals and downstream.	Polyethylene	Integrated	Project approved,
	polystyrene	40000 t/y	feasibility study under study.
	Polypropylene		Local/regional product under study
	PVC		no action
	PVC- pipes		Project under implementation
	plastic sheets	1200 t/y	three projects under execution.
	foamed plasties	-	Two projects under execution.
Chemical products	Caustic soda		one projects under execution.
	Soda Ash	32000 t/y	local/regional project
		300000 t/y	under study (accepted)
	Chemicals from brine.	-	no action

Class	Product	Capacity	Stage of realisation
	Complex fertilizer ammonium nitrate	Pilot plant/ 300 000 t/y	local/regional project under study. No action.
	Fruit juice	8000 t/y	project accepted.
	rubber articles	-	no action
	recycling of mubber tyres	7000 t/y	project require incentives.
	recycling of wood waste-	-	no action.
	laboratory chemicals.	-	no action.

It is clear from the table that great interest is given to chemical/Petrochemical industries indicated by allocating more imestments for its developmentwith faster rates than previously noticed. A close look at the potential markets for FA-derivatives indicates few feasible outlets in formulation, points and adhesives industries. Other outlets may exist but they are rather bound with conservative views on their feasibility at the present time.

With respect to rubber articles production, there are numerous possibilities for establishing production units in this field. The fechnology and access to know-how for these industries are fairly easy to obtain.

The justification of investing in the field of VCM/PVC and its formulated commodities is rather controlled by the local availability of chlorine at reasonable cost and enough domestic demand for film, sheets, pipes... etc.

The recent licensed extension of Caustic Soda-plant calls for a survey on the possible outlets for its associated products.

The establishment of E, EG, LLDPE industries will lead to new opportunities in its downstream industries.

Any assessment for investment in the field of propylene and PP industries was found to depend mainly on the availability of suitable feedstock after finalizing the modernization and extension of Mena Abdulla-refinery being carried presently.

Attendance of the confernce on "Sulphur and its uses in Arab countries Held in Kuwait in April 1982, lead to identification of new investments which require detailed studies to test its feasibility.

The target of the suggestion submitted during the meeting with UNDP/UNIDO mission in Kuwait on march 1981, to implement a study on the promotion of export oriented and auto centred chemical industries was to increase the area of investment in this field.

C- Appraisal and Evaluation of License Applications

The evaluation of license applications submitted to IDCB remained one of the major activities throughout the project Period slap. The procedure of evluation and the forms used in this procedure were modified according to the type and the size of the project. Thirty six applications (annex No 2) representing and approximate total investment value of million KD and round. workers were evaluated.

The following observations on some license applications were beyond the capability of the investors.

- Insufficeint market sutdies.
- Improper design capacities and consuguence production lines.
- Unsuitable process technology and product mix.
- Improper economics parameters estimates.

Others were directly related to their type of experience. This situation increased the responsiblities of IDCB. During the evaluation process many surveys on market, technology.. etc had to be made to minimise the effect of uncertainlty and to reach conclusion with maximum supporting evidences. For capital intensive projects: breakeven, and sensitivity analysis had to be conducted. These and other were in my opinion, necessary to support and protect the industrial development from incorrect diversification, and to achieve the expected goals and to minimize the risk. The higher cost estimates of equipment and Know-How generally observed in some cases were within the expected range for location factors.

In other cases they were somewhat exaggerated.

As can be seen from the distribution per type of license application evaluated, more interest was given to final petrochemicals and chemical products .

The evaluated License Application per type

Type of products	Quantity of applications
refinery basic products	10
intermediate petrochemicals	3
final Petrochemials downstream	11
Chemical and building material	12

The license applications for refinery and basic petrochemical products had to be referrec to the Ministry of Oi and KPC. The consuption per capita in all Gulf countries, cannot be considered as big enough for marketing the whole quantity of commodities produced.

Therefore, large consuming countries like syria, Egypt Sudan and some African and Asian Countries were considered as potential market.

As all Gulf countries have ambitious plans for petrochemical development, the determination of the real position of the submitted products to IDCB, within the plans of Gulf countries represented the essential part in the evaluation procedure.

D - Assistance in Preparing Pre-and Feasibility Studies

This represented another major activity which required more time and effort than was estimated in the work plan (Dec.1976). Assistance was always given to regional and international organisations during their preparation of feasibility studies which deal with:

Fertilizers - basic- intermediate - and final -
Petrochemical products
Pesticides - Soda Ash
Silicon products.

The studies were then submitted to IDCB for evaluation Annex No 3 summarise the studies and surveys reviewed and evaluated during the project period The followingtable represent the distributionof these studies by type

Table

Pre- and feasibility studies reviewed and evaluated

Quantity of Studies	Subject	Oranisation prepared the study.
4	Basic petrochemicals	UNIDO - GOIC
2	Intermediate petrochemical	GOIC
3	Final petrochemicals	GOIC
8	Chemicals and Fertilizers	UNIDO - GOIC - AFED
17	Total	

Most of the studies were prepared by international consulting firms on behalf of GOIC. It is obvious that sencere steps were taken towards the establishment of solid common regional strategies. The large number of regional studies handled not only by the a.m. organisation but also by bilateral committees (Kuwaiti, Saudi,

and others) support this conclusion. Some of these regional projects showed sound profitability and accordingly steps for their implementation have already been taken.

E. Adaptation and creation of local technologies

This was an additional activity to those scheduled in the project document of IDCB. The activity was suggested in my preliminary report and was appreciated by both authorities concerned. It was realised by two means indicated belows:

1. A proposal was submitted to the Manager of the Battery plant of NIC, to study the feasibility of increasing the capacity and performance by introduction of new technologies The proposal was accepted and various surveys and contacts with the foreign licensors and similar plants in the Gulf Area were carried out. The study was considered as an example of the real cooperation between MCI and the existing Industrial establishment towards the adaptation of foreign technologies.

2. The accumulated knowledge about the problems that face the plasties industries gathered from th[illegible]ous visits to the local factories, indicated the n[illegible]y to have a specialized R & D centre to tackle such problems.

A detailed study implemented on the obstacles facing the development of the sector and means of overcoming them was conducted. The technical and financial requirements of a proposed Rubber and Plastics Industries Development Centre were included in the study. The proposal was accepted by the authorities and will be transfered either to a regional or international organisation for further consideration.

F. Assistance in Project Implementation

Assistance has been given to about semi-governmental, and private companies during theimplementation of their projects. The following are examples ofthe types of industries that have recieved such assistance.

- Insulating sheets from expandable polystyrene.
- PVC-pipes and fitting.
- Alkyd, and PVA resins and adhesives.
- Fruit juices and soft drinks.
- Cleaning chemicals.
- Petroleum solvents and greases.
- Separation of paraffins and alkylation of benzene.
- Aerosols and liquid detergents.
- GF reinforeed plastic reserviors.
- Polystyrene/PE disposable cups.

The discussion with the representatives of the companies were directed towards the identification of gaps in the applied technologies, research for more appropriate processes and optimum layout. Other discussions were carried out covering the possible ways of maximising labour inputs consistent with maintenance and improvementof production levels.

G. Applications for increasing SIte area

The site area is usually estimated during the evaluation of the project. The procedure followed took into consideration the parameters that effect the area such as process type, size, safety and environment protection measures. Other applications have been submitted for either revising the estimated area or expand it due to different reasons. The following are examples of these application.

- PIC asked for additional area to establish a central store (accepted)
- KNPC required an area to accommodate a new lube oil unit (given)
- Kuwait Chemical Manufacturing Co. applied for revising the project.area due to safety reasons, the site area was increased.
- Kuwait Melamine Company requested additional area due to modifications in technology and to accommodate a moulding shop for the formaldehyde mc project.

H. Training and Assistance to Counterpart

The following were the counterpart staff member during my assignment.

a) Eng. A. El Anzi " Chemical Engineer"
He was appointed as deputy director ofIDCB.

b) Eng. F. Al Assousi " Chemical Engineer"
He is now the manager of project dept. in Gulf Financial Centre.

c) Eng. A. El Ghanem " Industrial Engineer".
He left the bureau after a short time.

d) Eng. A. EL Marzouk " Industrial Engineer" Partial Assistance

e) Eng. May Ismail "Industrial Engineer"

f) Eng. A. El Diwasisan " Industrial Engineer "

The newly recruited counterpart have been briefed about the activities of the bureau and the procedure of carrying out studies and evaluation of license applications. The following activitess were executed by the counterpart under my guidance:

- evaluation of license applications on:
  - toilet soap.
  - solvent blending
  - Agriculture sulphur.
  - insulating sheets.
  - phthalic anhydride.
  - Polystyrene.
- Application for increasing site area in SIA.
- Study on the effect of utilities price variation on the feasibility of project.
- Study on the suitability of locally available raw material for cement Industry.

IDCB could achieve some success in attracting young engineers graduated from foreign universities. Some counterpart staff members were sent for short visits to regional organisation to get acquanted with their activities. It has been experienced that better achievement could be obtained through joint studies with the counterpart staff.

1. INSTITUTION BUILDING

- License application , review and evaluation
  - Toilet Soap of international trade mark.
  - insulating sheets of sandwish type using polyurethane material.
  - Print ink and related products.
  - Plastics bottles of different material.
  - GF reinforced plastics water tanks.
- Studies on Industrial incentives and customs protection for the following products:
  - Leas Acid Batteries.
  - Detergents.
  - PVC - pipes.
  - Paints.
  - Aerosols and cleasing chemicals.

Another contribution was in the field of material and product specifications which helped in avoiding the use of material not suitable for loal conditions.

Meetings were held with the

- Minister of Commerce & Industry.
- Undersecretary and assistnat Undersecretary of MCI.
- Heads of the Industrial Affairs.

aimed to follow up project grogress and the obstacles that might be facing its activities. The discussions covered also the procedure of evaluating license application, market studies, counter part training, optimum procedure for measuring the size of establishment .. etc.
effect of fuel and other utilities on the feasibility of project

J. Safety measures and Environment Protection

The evaluation of licene applications highlighted the importance of the safety measures and environment protection aspects. Meetings and discussions of the matter were held with authorities responsible for Environment protection, covering the following items:

- Messures taken to minimise Air-and Water pollution.
- Technologies available for treating industrial effluents, sludge, sewage.
- Analytical instrumentation.
- Investment required to reduce Sulphur and Nitrogen. emissions.
- Permissible emission-range of different pollutants.
- Distribution of industries, according to its environmental impact, within a industrial area.

It seems essentail to have definit item in the project concerning the method of environment protection.

- I attended the first Arab Gulf conference in Environment Protection, in Kuwait

K. Cooperation with Regional and International Organisations:

- The International Trade Centre UNCTAD/GATT, delegated and expert in carpets Mr. N. Hariharan, to investigate the markets for Persian carpets, hand knotted, woolen carpets and rugs. Assistance was given to the expert to enable him to determine the demand potential and the possibility of improving marketing.

- Two delegates from the Industrial Development Programme World Bank, already attached to the Ministry of Planning in Kuwait, visited the IDCB. They were investigating the present industrial development situation and future trends in Gulf States especially in the field of chemical and petrochemicals.
All authorized assistance was given to them.

- Assistance was provided to candidates from regional institution concerning the availability of chemical/ petrochemical raw material and intermediate products, their properties and specifications governing their suitability for processing and modes of transportation and storage.

- A joint mission from UNIDO and AIDO visited IDCB as a part of complete tour in the Gulf Area surveying the petrochemical and Plastics Industries in thr rigion. The survey aimed to realise the main target of a whole study which was the preparation of an integrated plan with proposals of some joint Arab projects in the field.

- Continuous assistance was provided to missions from GOIC visiting the country for industrial surveying. Participation took place also during the discussions and visits prepared for GOIC - Krebs mission for the Soda Ash project.

- A report on the availability and suitability of raw material for silicon production, was prepared as background paper during the meetings held with the representative of KFAS/AB.

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

- The studies conducted in the field of chemical/Petrochemicals covering the various aspects of its present status prospects have no doubt helped to clear up the scope of planning. It is now obvious that the governmenthas reached definite. strategy about the future role of this sector. The specialised organisation the semi-governmental company that were recently formu formulated to carry over the responsibility of developing the sector and the large scale petrochemical projects that were evaluated, and now under implementation. Support this conclusion.

- The previously established incentive measures have favoured the manufacturing of consumable articles. The new measures boost the promotion of the capital intensive projects. This present situation requires another policy for subsidization and incentives to be reflected in a new law replacing the law No 6.

- Marketing of refinery LPG and importing downstream products do not stimulate the local petrochemical industry thus leading to increase in the gaps between them. Products like refinery and fertilizers showed outstanding output growth rates than those of consumption. Lube oil, greases and solvents- consumption GR. were characterised by sudden increase during the last few years. Both growth Rates for paints were balanced by the link with construction development Plastics, rubber and paper products are of the fastest growing consumed commodities with limited production outputs. As outcomes of the studies carried out on these products new investment opportunities were identified which were readily utilised other opportunities are still available.

- The chemical petrochemical sector has very high share in the license application- evaluation acturty (36 license) applications)

The analysis of the licence applications submitted indicated the channelling of the new investment into more capital intensive having modern technologies. This may correct the results of the previous tendency towards commodity industry depending on the easily procurable raw material. The latter resulted in seven competition and accordingly to idle capacities giving out low cash flow and narrow profit margin.

- Out of nineteen regional studies submitted to IDCB seventeen were in the field of chemical/petrochemical sector. Reviewing and evaluating these studies represented a major proportion of the activities in the field. This reflected the new trend towards active cooperation within the Gulf countries.

- The results of the activity in the field of adapting and creating local technologies have revealed its importance in the course of the sector development.

- Plastics and Rubber industries require more active protection procedure to enable them to compete on local and regional levels. They have to shift from mere fomulation to actual manufacturing to fulfill the regional needs. This may requires also the recyling of wastes. For these reasons "the Plastics and Rubber Industries Develpment Centre" was proposed and appréciated by the authorities.

- Environment protection was found to be a vital factor during the evaluation oflicence applications.
  The most effective protection was found to be through the prevention of pollution from its source the procedure of which should be stated clearly in the projects.

- Resonable achievements were reached in training the counterparts and creating rational codre with high practical capablities in spite of the relative in stability of the trained staff.
  Other achievements were realised in thefield of institution building which required the allocation of more efforts than stated in the preliminary report.

In general, the implementation of the project activities in the chemical/petrochemical sector has managed to attract more interest in both local and regional level. The common obstacle that faced its performance, but with minor impact, came from the very broad generalisation of objectives incorporated in the project document. In spite, the project proved to be a solid support to both Industrial Affairs and MCI.

B - Recommendations

Based on the analysis of achievements and the conclusions reached, the following items are recommeded.

- Development of Chemical /Petrochemical Industries .
  - There is an Urgent need for a definit strategy governing the promotion of export oriented petrochemical Industries.(Intermediate and final) New incentive and protection policies should replace the existing ones accompanied by complete change of the Industrial Law No 6.
  - Additional Industrial surveys on the availability of raw material and waste products suitable for chemical/ petrochemical industries are required. The studies and surveys should lead to a programme of feasibility studies to be implemented in concordance with the Government Policies.
  - Detailed studies on the capacities of utilities, skilled labor and infrastructure required for the coming period have to start in due time.
  - Complete modificztion of the evaluation procedure is essentail. ist of periorities according to new measures should be available. Licences should only be permitted to non-pollutant industries or those who have waste treatment units, Dividing the market volume into small segments by permitting licences for the some products are very dangerous on the industrial development.

. Supporting the existing industries specially that of plastics by R & D Centres, like the propcsed RPIDC, is essential.

- Industrial Development and Consulting Bureau

The activities of IDCB have to be enlarged to enable it to play more active role in the strategies preparation. IDCB should be capable to render its services in the field of transfer and adaptation of technologies, selection of material and equipment and contracting according to terms suitable to national policies. Advisory services should be also possible through IDCB.

Freshly graduated counterpart should be trained in big companies before joining IDCB. Training courses and project evaluation and others subjects are of great value. Particpation in regional or international conferences boast the modern image and the scientific capabilities of counterpart staff.

- Future UNDP/UNIDO Assistance

Since intensive activities on the regional level in the field of chemical/petrochemical sector are expected during the proceding period, technical assistance of transitional nature is required to train the IDCB staff in specialized fields.
Advisers with clear and definit functions could be rendered available through UNIDO to do the job.

Annex No. 1

INDUSTRIAL SURVEYS AND STUDIES

1. "Foamed Plastics, itsmmarket and production in Kuwait"
The recent international trends in manufacturing of foamed plastics and their application have been studied. The possibility of producing and using such products in Kuwait. from the market, technical and economic point of views, were also covered by thestudy. Certain investment opportunities were identified.

2. "Polystyrene: Types, manufacturing and market"
A comprehensive study on the international supply/ demand balance by region, the production technologies and licenses, and marketing procedures has been conducted. Local as well as regional markets were also investigated aiming to forcast the future trends. The study included a pre-investment calculations for a production unit of moderate capacity .

3. "Soda Ash"

This opportunity study includes the internationa supply/ demand balance by region and review ofprocess technologies through synthesis and from natural resources. The feasibility of producing Soda Ash in Kuwait utilising the available raw material was envestigated. A projet of small capacity to satisfy the regional demand was proposed. The project is now under study with bigger capacity.

4. Caustic Soda and related Products from Brine"

A report was prepared on possibilities and the advantages of producing caustic soda and other channels from brine, the by-product of the existing desalination units. This could be considered as extension to the existing solt-electrolysis factory. A project of moderate capacity is now under implementation aiming to produce caustic soda, chlorine and other .

5. Printing Ink

A short study was carried out on the present and domestic market demand and its breakdown by type. It was recommended to install a plant to produce certain types, a project is now under execution.

6. Petroleum Solvents

The report on the subject that has been performed included the results of the survey and the opportunities for domestic production. The product mix should suit the different applications like points, cleaning ... etc.

7. Rubber and Plastic Industries in Kuwait

A detailed study on this sector was prepared aiming to highlight its situation and to identify the opportunities of investment in the field. It was suggested in the study to create a regional centre to carry over the responsiblity of the development of the sector. The technical and financial requirement of the center were indicated in the study.

8. Fruit Juice and drinks"

Market survey and analysis on Fruit Juice were performent aiming to detect the possibility of increasing the national production share. The study was combined with technoeconomic analysis of utilizing idle capacities in a dairy company The results were positive and the study was taken as excellent example in the field of better utilisation of existing capacities.

9. "Oil and Petrochemicals in Arab Countries, Presentation, Evaluation and Prospects"

A study indicated why Arabs should develop their petrochemical industries, in what field and the way of doing it.
The study is presented in the "Industrial Strategies in the Arab Countries Seminar organized by AFI - Kuwait and ADMCE - France on 4/12/1980.

Annex No. 2

LICENSE APPLICATIONS EVALUATED

A. Refinery and Basic Petrochemical Products

1. Petroleum Solvents

A project of0.4 mKD investment to produce 4000 t/y P. solvents using kerosine and naphtha was evaluated the products represented a wide range of solvents which are used mainly for the manufacturing paints, varnishes and others.

2. Petroleum Solvent

The feedstock for this project were naphtha , kerosine and gasoline locally produced. The product-specifications were that of Shell.
The results of market studies were used in determing the domestic and Gulf market share. Assesment of feedstock availability has been also made .only one project of larger capacity is under implementation.

3. Thinner blending

A project for thinner components blending for paint manufacturing of capacity 1000 t/y was evaluated.
A report was submitted to IDC with recommendation not to permit licence because of technical and economic reasons.
The Committee accepted the recommendation and the license was not given.

4. White Spirit" production

An established chemical company applied for having the permission to produce ' white spirit from locally available raw material. The request was studied from the technical and market point of view and a report was submitted to IDC

5) Lube oil from used Oils

Evaluation of a project to produce lubricating oils from used oils throught modern technology was carried out. The expected capacity was 15000 t/y using 2,5 million A.D. as total investment. The technology was appreciated. But the recommendation was not to permit the license IDC accepted the recommendations.

6. Lubricating greases

An application to obtain license to produce lubricating petroluem greases was evaluated. The project was of 2000 t/y capacity and 0.3 m.K.D. as investment. The analysis of the data collected showed that enough demand exists on year 1982 for multipurpose, litheum/soduim and some other greases.
The entrepreneur tried to adopt modern technology with reliable internationa' company but the capacity requisted was under estimated . IDC permited the licence with certain restrictions.

7. Separation of N-paraffins from Kerosine

An entrepreneur intending to produce LAB applied for licensing the production of N-paraffins from locally produced kerosine. Licenser is a world famous one who offered a well-advance technology IDC agreed to permit the enterpreneur to produce N-paraffins.

8. Aromatics and Olefins production

The project was studied as a part of petrochemical complex. The IDC permitted the licnese. Detailed feasibility study is under preparation.

B. Intermediate Products:

11. Linear Alkyl Benzene (LAB)

The production of LAB, the active material in detergents, was suggested by the a.. entrepreneure. The plant was of 10 000 t/y actual capacity and its investment reached 4 million K.D. The process offered was under european license and the raw material are mainly imported. The analysis showed the necessity for such production. There is another project under study by OAPEC for producing 40 000 t/y . It was recommended due to technical and economic reasons, to increase the capacity with parallel charge in technology to a accomodate a unit for N-paraffin separation. IDC accepted the recommendations and the project is under implementation.

12. Caprolactum

A project for producting caprolactum, of 50 000 t/y capacity investing 35 million K.D. was evaluated . The process suggested follows american technology and uses toluene as raw material. The study covered the world status for Nylon 6 the main consumer of caprolactum, The availability of toluene and marketing possibility in Gulf countries were investigated.

The recommendation accepted by IDC was not to permit the license.

C. Final Petrochemicals and downstream .

12. Polystyrene production

This project was for the production of 3 grades of (GPPS, IPS , EPS) following the bulk polyme. ration technology .

The total investment expected for the project was about 17 million K.D. The features of the project, as a capital intensive petrochemical one, necessitated certain measures for determining

its feasibility. The IDC accepted the recommendation not to permit the license. A semi-governmental company is studying now the realisation of such production.

12. Production of Polyslyrene.

Another project of smaller capacity was evaluated. The technology proposed was of the suspension type for the production of expandable polystyrene.

The report prepared on the two project included the main parmeters for evaluation, technically and economically, and the recommendation as well. The IDC accepted the recommendation not to permit the license. A semi-governmental company is studying now the possibility of such production.

13-14-15 Production of Acrylic Sheets

Three license applications were submitted for that type of production. The first one is of moderate capacity for the manufacturing of acrylic sheets of different colours through casting process.

The second licence application was for a project of smaller capacity for the same product manufactured through injection.

The third licence application was found technically and economically unfeasible as a resulf of its first evaluation. The private entrepreneur entered certain modifications in technology, types and capacties of the products.

The results of the evaluations of the three licence applications were reported to IDC which agreed to the recommendation and all the three project are under implementation.

15. Formaldehyde and Moulding Compounds

A Semi goverment Company applied for licensing the production of formaldehyde and melamine-/urea-formaldehyde The capacity was round 20 000 t/y formaldehyde and 10000 t/y MC. The expected investment of the whole complex was round 7 m K.D. The evaluation proved the feasibility of erecting such plant in Gulf area. Regional demand exist which expected to be increased specially in the field of electrical, house, dinnerwares and sanitary articles IBC permited the license and the project is under execution.

16. Tyre Reclaiming

A project was submitted to IDCB by a private entrepreneur for reclaiming about 3500 tons/year of whole types. to produce rubber crumbs (fine ground), slabbed sheets (mechanical grade) and laminated sheets (tyre grade). Its total investment was expected to reach 2 million KD. The evaluation of the market, technical and economic parameters showed the necessity of tight cooperation between this industry and other up-and down-streams. The assistance of the agencies responsible for enviroment protection and applied research needed. The recommended actions are under execution.

17. GF reinforced plastic Water Tanks & Boats

An application for licensing the production of water tanks and boats of different sizes made of glass fibre reinforced polyester was submitted. The investment needed is 0.3 million K.D.

The evaluation revealed the unfeasibility of the project, and the committee accepted the recommendation not permit the license.

19. Plastic Bottles

The production of Plastic Dropper Bottles physiologically harmless and inert to medicines is asked for by a private investor. The production capacity fixed in the licence appliation was round 14 million Bottles/year. The investment needed was 650,000 KD The injection molding machines follow modern technology in this field. The comparative analysis with the locally existing plants. showed the unfeasibility at present time for such an industry. IDC refused the project.

20. PVC Compounding

The dry blending of Polyvinyl chloride with other ingredients and additives was the scope of a private project of 0.5 million K.D. The products are expected to be used further for manufacturing finished articles like cable, sheets, Pipe etc. Both rigid and flexible flexible compoundscan be formulated in the production unit.

D. Chemical and other products

21. Silicon products manufacturing

The target of manufacturing special silicon products used in petrolium refineries, electrical transformers, lubrication... etc is covered by a licence application for a relatively moderate capital project. The product mix includes the main types only aiming to simplify the process and to reduce the capital needed. The project is of turn-key type offered jointly by two foreign companies . The evaluation proved The feasibility of the project with limited uncertainity in marketing of some products. The project was accepted and it is now under execution.

22. Caustic Soda, Chlorine and associated Products:

The governmental project aimed to satisfy the local demand expected in the near future. The complex includes units for the production of salt, chlorine, caustic soda, and other associated

product. The investment required is round 19 M. K.D. Each unit in the complex has its own technology characteristics. Improved technologies can now be followed in salt evaporation, electrodialysis, salt electrolysis using different typesof membrane and cell design. The evaluation procedure covered the market situation, technology availability and suitability, and comparative economic analysis of all parameter including DCFRR and sensitivity. IDC accepted the outcomes of the project evaluation and it is now under implementation.

23-24 Medical Reagents

Two licence application were submitted to IDCB for evaluation. The first project was supposed to produce 50,000 litres of medical reagents used for blood and urine analysis in automatic clemical chemistry analysers. The total investment reached 0.3 Million KD. The second projec is of a wider range of chinical reagents used in more than one type of automatic clinical analyzers, its total investment is round 0.3 Million KD. Evaluation of the two licence applications were carried out in cooperation with the Ministry of Public Health's representatives Both applications were refused.

25. Treated Chemicals

A private investor applied for obtaining industrial licence to produce some treated chemicals used in plastic industry. The production suggested was 10,000 t/y and the expected investment was round 300,000 KD. The products have certain physical properties suitable for the request of plastics, fiberglass and paint industries. The application is further evaluated by a newly assigned IDCB-staff and IDC permitted the license.

25. Fruit Juice /drink production

A well established dairy company asked for licensing frutit juice production within its battery limit. The market study indicated a deficit in satisfying the domestic demand. The juice production withing the boundry of a diary factory was found from the technical paint of view an excellent example of better utilisation of existing capacities the recommended actions were accepted by IDC the project is under implementation.

27-28 Disposable Syringes

Two licences applications were submitted to IDCB for evaluation. The first project was supposed tol produce 50 million disposable Syringes together with their accessories. Its total investmenttwas expected to be about 1 million K.D. The second project had double the capacity with additional production of plastics bags for medical solutions. The total investment required was estimated to be 3 m. K.D. IDC did not permit the license.

29. Polyvinyl Chloride Windows

A license application for erecting a plant to manufacture PVC plastics windows was submitted for evaluation. The project was of 0.5 m. K.D. investment for a capacity 15000 pieces per year various contacts with the main importers, consumers and research institutes have revealed the unsuitability of introducing the new product in the local market in the timebeing .

30. Styropare

A private enterpreneur applied for the license for erecting a plant po produce foamed polystyrene (styropore) The capacity suggested was about 20000 m^3/y.

: Ball point pens manufacturing

This production was covered by a license application for a project of small size hearing a capacity of 10 million pieces per year. The required investment was over half a million K.D. The types were public and one through therefore of high consumption rate sample-market analysis was followed for evaluating such an application.

. Diammonium Phosphate production

A governmental company applied for the license to produce D'P from imported phosphoric acid. The big project will get used of the locally produced raw material and the existing infra structure. A review of the Gulf, Arab and international potential was carried out. The fluctuation in price of both raw material and product and its impact on the feasibility of the project were checked.

Annex No 3

EXAMPLES OF REGIONAL STUDIES APPRAISED AND EVALUATED

I. Refinery and basic Petrochemicals:

The industrial Uses of associated gas

The joint study carried out by UNIDO and GOIC (April 1981) covered the major industries that can be established in the region using the associated gas. This field
The investment required and the production costs for each were estimated in four locations: Arabian Gulf, Mexico, US Gulf Coast, and German Federal Republic. The result of review and comments were sent to MI.

2. Production of Polymer grade Propylene

The study covered the sources of propylene presently available in Gulf Area, the applicability of international technologies to the regional circumstances and its comperative economic features. The decisive factors in this respect are the production technology of feedstock, its capacity and its price relative to energy.

The feasibility of manufacturing MTBE from isobutylene, coproduct in propylene industry, is questionable, The report written in arabic, sum up the results of the study-appraisal and is used as a background material for any further investigation on the matter.

3. Aromatics Production (BTX)

A study covered the Aromatics market, feedstock availability and suitability, production technology and economy, was implemented by GOIC. The project proposed in the study was compared with the Kuwaiti project which was evaluated and accepted by IDC and will probably be implemented. The review of the recent innovations

in the production technologies and the world market forecast were of great benefit for the correct evaluation. The economics of production including the location factors and real values of feedstocks are also of great importance.

4. Petroleum Coke

The prefeasibility study was conducted by a foreign consultant which included a comparative analysis of raw material available in the region and quality of the coke expected. The consultant recommended an earopean technology and made his economic analysis for a project following that particular technology. Detailed feasibility study was there after conducted taking into consideration the views of the Gulf States submitted as the result of the appraisal of the prefeasibility study . The availability of raw material with impurities the vital parameter in the realisation of this project. The results of evaluation were submitted to authorities.

5. Carbon Black

Prefeasibility study was prepared by the frensh Consultant SERETE through GOIC. The consultant analysed the supply-demand forecast in relation with tire manufacturing projection up to year 1990. He came to conclusion that the market of Gulf countries could be covered either through two units of 50 000 t/y of total capacity of one unit of the same capacity. The study was evaluated taking intoconsideration the Kuwaiti carbon black project. The report was prepared summing up the results of evaluation.

II Final Petrochemicals and other Chemical Products

6 Acetic Acid and its derivatives

A feasibility study prepared by GIOC for a product aiming to produce acetic anid, vinyl a cetate and polyvinyl a cetate. The study was reviewed and evaluated in the light of the domestic requirement of the Kuwaiti project for polyvinyl acetate production. The Kuwaiti investors expressed their readiness to particpate in the regional project capital.

C
7. Compound Fertilizers

The potential for manufacturing compound fertilizers in the Gulf States was covered by a study conducted by GOIC. Supply/demand forecast for simple and compound fertilizers in the Arab States and researdh for investment opportunities were reported together with recommendations for special procedure for producing compound fertilizers.

8. Pesticide Production /UNIDO

The feasibility study was carried out by "Chem System" through UNIDO. Although the study aimed to determine the possibility of producing some pesticides in Kuwait, but the least possible production capacity is expected to exceed the forecasted needs of any country in the region.

9. Pesticide Industry /AFFESD

Another techno economic study executed by a foreign consultant for AFFESD on the development of Arab Pesticide Industry.

10. Silicon and Ferrosilicon

An opportunity study dealt with the production of:

- Silicon metal (Si-metal)
- Ferrosilicon containing 75% silicon (Fe Si 75)

was reviewed. The market surveys for the Arabian Gulf and the Far East indicated, the possibility of erecting a manufacturing facility in the area. Analysis of the market types of alloys and production technologies, availability of suitable raw material and investment requirement were carried out. A report resuming the outcoming of the review and analysis was submitted to higher authorities.

11. Textile Fibre Glass

The reevaluation of the study of the am.m. product dealt with the main parameters like: manpower, raw material, utilities and ivestment. The technical and economic analysis of the project suggested confiremed its profitability, The production of fibre glass would substitute its importation hence leading to considerable saving in foreign-exchange and risk incorporated in importation. Such type of industry usually creates quite a number of investment and sonsequently job opportunities. It promotes other related industries like: FG reinforced plastics commodities (pipes, furnitures, tanks, boats ..etc)

12. Intermediate and final peto-chemicals: Market appraisal forfivteen intermediate and final products in the Gulf States was conducted by a foreign consultant on behalf of GOIC,

. Detailed Market appraisal for only four products was also conducted by the same consulta t. As a result of this appraisal and following certain cretaria some projects were selected to be investigated in a prefeasibility study.

1. Soda Ash

Prefeasibility prepared by British Sulphur for GOIC on a project aiming to produce 200,000 t/y Soda Ash. The study was reviewed and analysed in compamison with the possibility of erredcting the same projet in Kuwaitusing the raw material available locally.

ANNEX NO 4

VISITS AND MEETINGS

A. Visits

- Shuaiba Industrial Area and Mina Abdula Industrial Area:
  SAA - PIC - KNPC - NIC - KMIC
  lube oil plant.

- Sabhan Area
  - El Adasani Plastic Pipes.
  - ElESanea Chemical Product Factory.
  - Danish Kuwait Dairy Co.

- Other Industrial Areas
  - El Yousefi Reinforced Plastic products.
  - Kuwait Food Processing Co.
  - Five manor paint companies.
  - El Sharhan Factory for Aerosols.
  - NIC - battery plant.
  - NIC - Detergent plant.
  - NIC -

- Government, research and other Agencies
  - Ministries of planning, Water & Electricity, Public Health.
  - Kuwait Chamber of Commerce and Industry.
  - Kuwait University.
  - KISR,
  - Water Resources Development Centre.

B) Meeting

- The government officials from, MCI, MP, MWE, MO, SAA, MPH, Kuwait Chamber of Commerce & Industry.

- The representatives of Research Institutes: KISR, KU(Faculty of Science, College of Engineering and Petroleum)

- Missions from regional and international organisations

  UNIDO - AIDO - GOIC - OAPEC - UNDP - AFFESD - KFAS
  ECA - ADI
  Saudi Arabia - Kuwait joint committee.

- Foreign Companies and Societies

  - Chem System International LTD, England.
  - Sprea Co, Italy.
  - Buna Engineering LTD, Canada.
  - AB- Electro Invest, Sweden.
  - Synres International, Holland.
  - Uniroyal Chemicals LTD, England.
  - Alpkum Corporation , U.S.A.
  - CSL Silicones LTD, USA.
  - Krebs, France.
  - Union Carbide Corporation, U.S.A.
  - UOP Processes Internationa INC. , U.S.A.
  - EUTECO , S.R.L. , Italy.

- Local Companies and Societies

  - Chemical and Petrochemical Companies.
  - Central Bank of Kuwait.
  - Industrial Bank of Kuwait.

- Conferences and Seminares

  - Industrial Strategies and Policies" 24-26 March 1980, Kuwait.
  - "Sulphur and its usages in Arab countries 3-6 April 1982 Kuwait.
  - Industrial Strategies in the Arab Countries" 15-Nov. 1980, Kuwait