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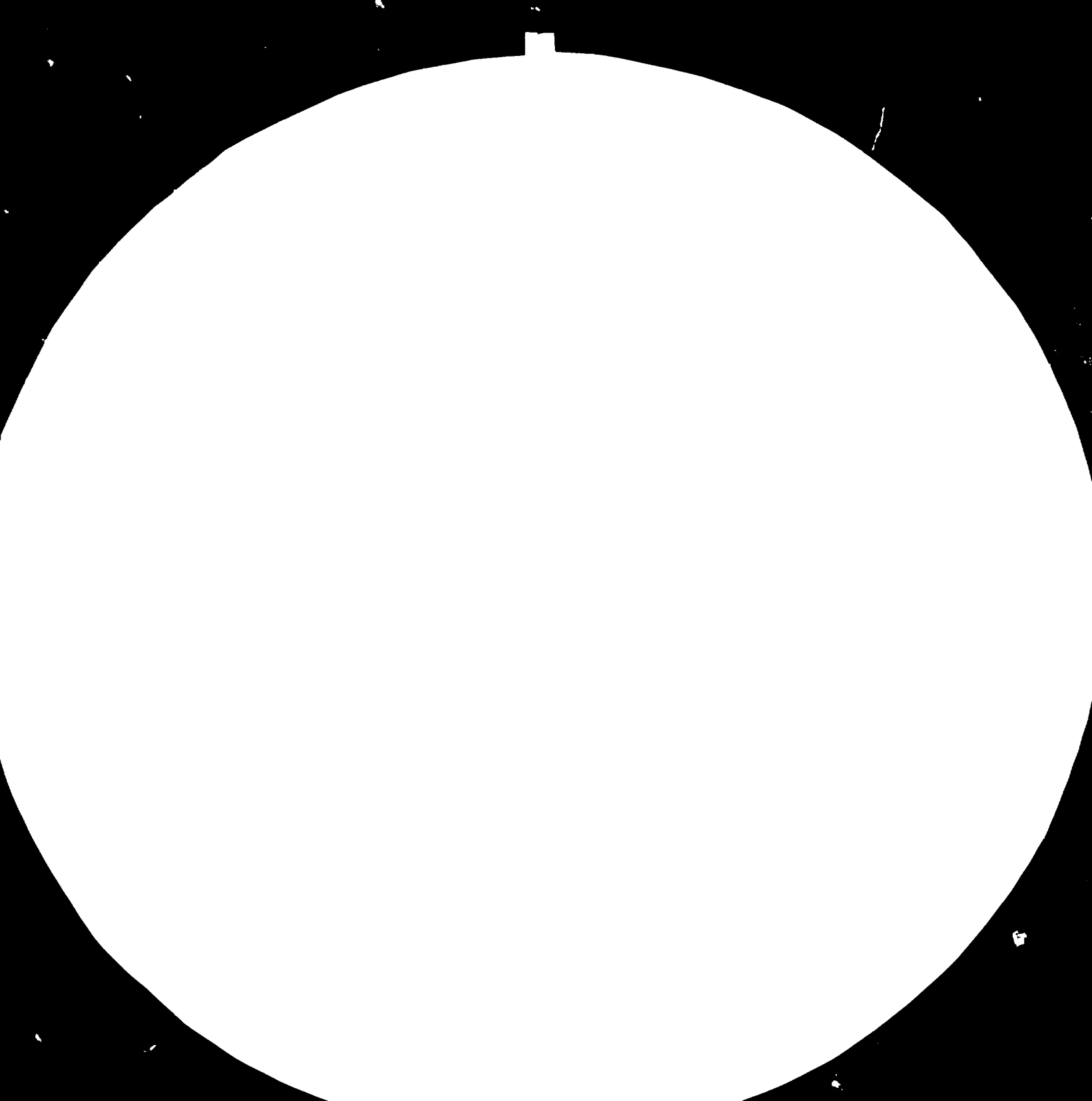

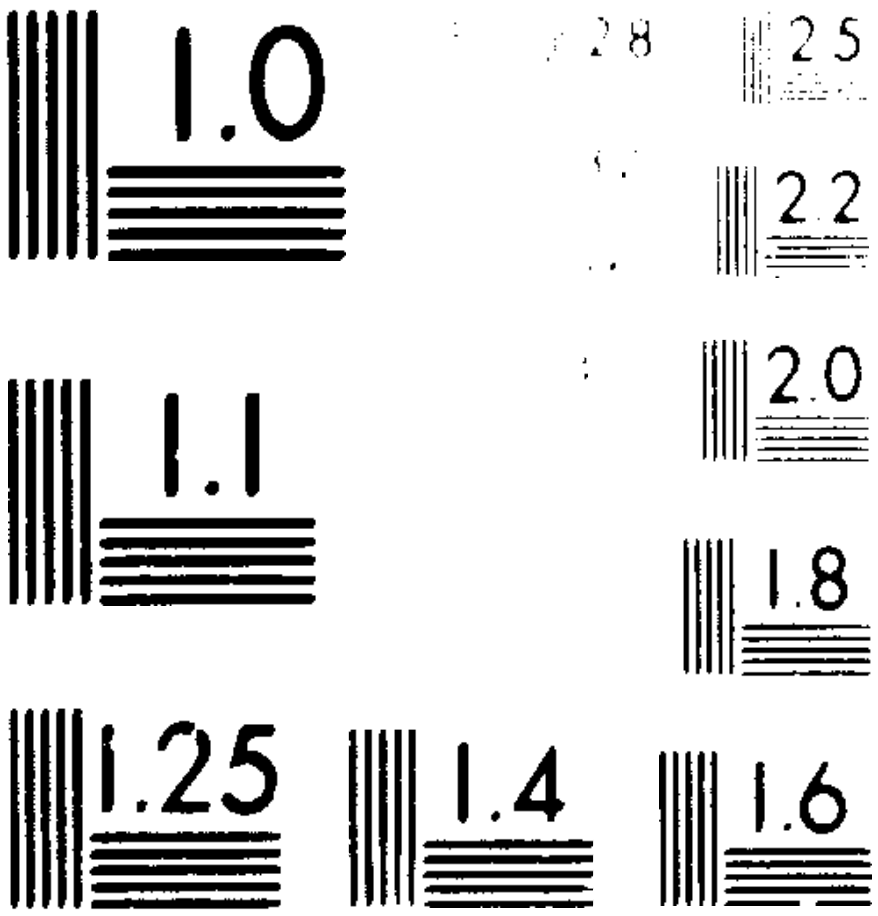
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Saudi Arabia.

STRATEGIC ASSESSMENT OF THE PETROCHEMICAL JOINT VENTURES UNDER IMPLEMENTATION BY SABIC AND TRANSNATIONAL CORPORATIONS.

J.M. WAKIM

13.

Options for Discussion in Connection with
The Document of the 5th Industrial Development
Conference for Arab States

UNIDO Contract No. CLT 83/1028
Allotment Account Code: UC/IDC/79/184/11-01-3

The assignment specified in UNIDO contract no. CLT 83/103 has been completed. The attached documents represent the agreed on report mentioned in the contract.

LIST OF ATTACHED DOCUMENTS

1. Saudi Arabia - The Joint Venture Companies
2. The Arabian Petrochemical Company
   - Petrokemya
   - Eastern Petrochemicals - SHARQ
3. The Methanol Joint Ventures in Saudi Arabia
   - The Saudi Methanol Company
   - The National Methanol Company
4. Saudi Arabian Supply Demand Balance of Major Petrochemicals
   - 1981 Demand for Specified Petrochemicals in the Arab Countries
5. An Analysis of the State of the Petrochemical Industry in the Arab World
   - Arab World Imports of Specified Petrochemicals From 1976-1981
   - Linkages Between Petrochemical Derivatives
6. Updating and Enriching Document of 5th Industrial Development Conference for Arab States.

SAUDI ARABIA

Company/Ownership/Location	Product	Start-up	Capacity (kt/a)
Arabian Petrochemical Co. (PETROCHEMYA) 100% Saudi Basic Industries Corp. (SABIC) Al Jubail	Ethylene	1985 (Mid)	500
	HDPE	1985 (Mid)	70
	LLDPE	1985 (Mid)	80
Al-Jubail Petrochemical Co. (KEMYA) SABIC and Exxon Corp. Al Jubail	LLDPE	1985 (Late)	260
Eastern Petrochemicals Co. (SHARQ) 50% SABIC and 50% SPDC Ltd. Al Jubail	Ethylene Oxide	1985 (Mid)	225
	LLDPE	1985 (Mid)	130
Saudi Yanbu Petrochemicals Co.(YANPET) SABIC and Mobil Yanbu	Ethylene	1985 (Mid)	450
	Ethylene Oxide	1985 (Mid)	165
	HDPE	1985 (Mid)	90
	LLDPE	1985 (Mid)	200
	Ethylene Glycol	1985 (Mid)	220
Saudi Methanol Co. SABIC and Japanese consortium led by Mitsubishi Gas Chemical Al Jubail	Methanol	1983	600
Saudi Petrochemical Co. (SADAF) SABIC and Pecten Arabian Ltd. (Shell Oil) Al Jubail	Ethylene	1985 (Late)	650
	Ethyl Alcohol	1985 (Late)	281
	Ethylbenzene	1985 (Late)	327
	Ethylene Dichloride	1985 (Late)	456
	Styrene	1985 (Late)	295
	Caustic Soda	1985 (Late)	377
	Chlorine	1985 (Late)	

World Scale (kt/a)	Comment
550	- In December 1982, Dow withdrew from
100	this project and SABIC has made no
200	announcement of future plans
200	
200	- SPDC is a Japanese group headed by
200	Mitsubishi
550	
200	
100	
200	
220	
600	
550	
261	
330	
370	
300	

SAUDI ARABIA (Cont'd)

Company/Ownership/Location	Product	Start-up
The National Methanol Co. 50% SABIC, 25% Celanese Arabian Inc., and 25% Texas Eastern Arabian Ltd. Al Jubail	Methanol	1985
Taiwan Fertilizer SABIC and Taiwan Fertilizer Al Jubail	Urea Ammonia	1983 1983
SABIC Dammam	Ammonia Urea	On-stream On-stream
Ownership not announced Al Jubail	Polystyrene VCM PVC Butene-1	Being Discussed
SAFCO (Saudi Arabia Fertilizer) Dammam	Melamine Formaldhyde Resin	1985
Under consideration	Butadiene SBR Formaldehyde Acetic Acid Vinyl Acetate Polyvinyl Acetate	1988-90 1988-90 1988-90 1987 1987 1987

Capacity (kt/a)	World Scale (kt/a)	Comment
600	600	
500		
300	330	
198	330	
330		
95		
102	230	
100	225	
80		
20		
124		
80		
112		
60		

THE ARABIAN PETROCHEMICAL COMPANY - PETROKEMYA

Introduction

The project started as two seperate joint ventures: A SABIC-DOW cracker and derivatives complex and a SABIC-SPDC cracker and derivatives complex. SPDC (The Saudi Petrochemicals Development Corporation) is a Japanese consortium of 54 companies led by the Mitsubishi group. During the early planning stages, it became apparent to SABIC that it would be advantageous to merge the two projects. In December 1980, after intensive negotiations, SABIC arrived at a formula for coordinating the two projects. Petrokemya was established.

Petrokemya consisted of an ethane cracker capable of producing 500 kt/a of Ethylene. It also included low density and high density polyethylene plants with combined capacity of 150-180 kt/a. The company was a 50/50 joint venture between SABIC and DOW.

Petrokemya was also supposed to supply ethylene to another 50/50 joint venture between SABIC and SPDC. This joint venture is called SHARQ and was planning to build a 225 kt/a ethylene oxide/ glycol plant and a 130 kt/a low density polyethylene plant. At the same time SHARQ was supposed to supply Petrokemya with about 150 kt/a of ethylene glycol.

The financing of the two projects was also interconnected. Dow and SABIC owned the ethylene cracker. However, SABIC-SPDC will put up about half of the $2 billion capital in return for half the ethylene output of the cracker. A similar cross financing will entitle SABIC-DOW to half of the ethylene glycol output of the SHARQ plant.

Dow's Motives

It is presumed that Dow's interest in the project was based on the following strategic issues:

1. Increase capacity of ethylene and derivatives to keep their share in the growing global markets;
2. Locally use the cheap ethane ($0.50/M BTU) offered by Saudi Arabia to produce ethylene derivatives at world competitive prices;
3. Use the 100 k barrel/day Saudi entitlement crude to feed their chemical refinery in Louisiana.

4. Accomodate the Japanese in the Saudi joint venture to win their friendship. These friends, it was hoped, will help Dow meet its ambitious targets of exporting increased quantities of chlorine, caustic , and ethylene dichloride to the Japanese market.

Effect of Changing Market Conditions on Dow's Plans

By mid 1982, the recession in the developed economies, reduced global demand for the petrochemicals which petrokemya was going to produce. The reduced demand was accompanied by structural changes in the market place. Industry realized that the forecasts of growth in demand made in the late 70's, were unattainable. Sufficient global capacity was available to meet demand until the late 80's. Therefore, prices are expected to remain depressed for longer than previously anticipated.

Dow's cash flow was lower than that envisaged in the most pessimistic scenarios developed by their strategic planners. The anticipated depressed petrochemical prices, are expected to reduce the availability of internally generated funds. In essence, Dow found themselves in a classical cash squeeze. They revaluated their financial commitments and decided to reduce capital expenditures and sell some of their operations.

They found that their chemical refinery in Louisiana was not as profitable as expected. Besides even it was, the entitlement crude offered by the Saudi's at the official price was not as attractive as it used to be in 1979. Spot crude prices are expected to remain below official prices for a while; so the crude entitlement commitment was transformed into a liability.

The importance of having Japanese friends did not carry enough weight. Dow had to struggle to maintain their share of the Japanese market. The Japanese companies tried very hard to keep Dow out of their market.

Because of all of these factors, Dow decided to withdraw from the SABIC-DOW joint venture Petrokemya.

SABIC's Options

The following is a listing of the options open to SABIC and our assessment of the ones they are most likely to choose:

1. Cancel Petrokemya - we do not feel that they will choose this option for the following reasons:
   (a) The industry will interpret this action as a Saudi withdrawal from their stated objective of becoming a major player in the global petrochemical game;
   (b) Abandoning Petrokemya also means the end of the SABIC-SPDC joint venture. The ethylene needed for the ethylene oxide/glycol and LLDPE plants of the SPDC joint venture is not available from any other source;
   (c) The Saudi's cannot afford such a set back at this time.
2. Locate an alternate partner for Petrokemya. The present state of the industry does not support major long term commitments. Therefore, it is unlikely that SABIC will find eager alternate partners without offering very attractive incentives. We do not feel that the Saudi's are willing to do that at this time. In fact, we do not feel that they need to.
3. Proceed with Petrokemya alone. The additional expenditure that the Saudi's will incur to cover Dow's portion of the capital, is relatively small. So, financially they will have no problem proceeding with the project. However, such a move is not in line with their stated objective of forming joint ventures with major petrochemical companies who can operate the plants and locate world markets for their products. Therefore,we feel that the Saudi's will not proceed with Petrokemya alone. (If they have to face such a problem in 4-5years, after the other plants are in operation, we feel that they will not hesitate to proceed on their own).
4. Restructure Petrokemya and Sharq. The merging of the two companies into a single operation is fairly easy. After all, the financial linkages and the material flow between the two companies make it essential to synchronize the activities of the two operations.

Therefore, we feel that the Saudi's will renegotiate the arrangements with SPDC. They will ask SPDC to build and operate the cracker. They will agree to build one world scale LLDPE plant (270-300 kt/a). And they will keep the HDPE plant.

The Japanese might not be eager to undertake the additional financial commitment. However, they do consider this venture as a national project. So, they will listen to SABIC, try to extract additional advantages, and finally reach an acceptable arrangement.

Conclusions

We feel that the restructuring of Petrokemya and SHARQ as explained in (4) above, is the most likely outcome of the Dow withdrawal. This will delay the starting of these plants by 1-3 years.

THE METHANOL JOINT VENTURES IN SAUDI ARABIA

Introduction

Several studies conducted on behalf of UNIDO and others, indicated that associated gas can be used as a basis for new industries in Saudi Arabia. The gas gathering system was started. The C_5^+, Butane, and propane were seperated. These fractions are liquids which can be shipped globaly and have specific markets. The methane and ethane which remain require major refrigeration, compression and handling efforts before they can be shipped. Therefore, it is advisable to use them locally whenever possible.

The ethane fraction can be used as a feedstock to petrochemical crackers producing ethylene. The Saudis are already in the process of building three crackers with a total capacity of 1.6 million tonnes per year.

The methane, aside from its use as fuel, can be used as a feedstock for methanol and ammonia. Both products are easier to handle than methane and are internationally traded commodities. This section will deal with the methanol joint ventures in Saudi Arabia.

THE SAUDI METHANOL COMPANY

Participants and Location

This is a 50/50 joint venture between SABIC and a Japanese consortium lead by Mitsubishi Gas Chemical. It also includes Mitsui Gas Chemical, Sumitomo Chemical Industry, Mitsui Toatsu Chemicals, Kyowa Gas Chemical Industry, C. Itoh, Nippon Chemical Company, Toho Rika Company, and Nippon Steel Chemical Company. The companies cover most of the derivatives business in Japan.

The plant, with a capacity of 600 kt/a, came on stream early in 1983 with minimum startup problems. The capital cost is estimated at $300 million. It is located in Al Jubail and has direct access to ocean transport.

The Japanese Consortium Interests

The Japanese have been major producers and consumers of methanol. They dominated the methanol markets in South East Asia because of low freight rates and their ability to use spare plant capacity.

All of their plants used crude oil derived feedstock to produce methanol. With the increasing price of crude they became uncompetitive in export markets. Actually methanol produced from cheap natural gas abroad was shipped to Japan and sold for less than the Japanese could produce it. So they started closing some of their older plants.

MITI entered the picture when the seriousness of the dilema became apparent. For national security reasons they decided to maintain the newer plants. They also decided to exercise some degree of control on the sources of supply. For this purpose they identified the Saudi Methanol project as a strategic Japanese national project and participated by holding 50% equity.

As a result of this arrangement, they can satisfy the Japanese supply deficiency and probably recover some market share in South East Asia.

The Saudi Interests

The driving force behind the project was finding an alternate use for natural gas which was previously flared. This was accomplished. The Japanese companies were well qualified to build and operate methanol plants. Actually, they can also handle further up-grading of methanol to second and third generation derivatives if the Saudis decide to proceed downstream and increase the value added in the country.

A prerequisite for producing methanol is that markets exist for its use. A major market is Japan. The equity participation of the Japanese companies guarantees access to the Japanese markets.

Conclusions

The joint venture brought the Saudis and the Japanese together and satisfied the complimentary needs of both parties.

Should the Saudis decide to upgrade methanol, the Japanese will be able to participate. Both parties will derive additional benefits. We feel that it is important for the Saudis to start investigating these possibilities.

THE NATIONAL METHANOL COMPANY

Participants and Location

This is a joint venture with the following equity holdings: SABIC 50%, CELANESE 25%, and TEXAS EASTERN 25%. Celanese is one of the largest producers and consumers of methanol in the world. They have the technology to produce most of the important methanol derivatives.

The plant, with a capacity of 600 kt/a, is expected to come on stream in mid 1985. The capital cost is estimated at $400 million. It is located in Al Jubail and has direct access to ocean transport.

The Interests of Celanese and Texas Eastern

Celanese are among the worlds largest producers and consumers of methanol. They intend to keep such a high profile and protect their market share. They realize that major capacity additions will take place in resource rich areas offering hydrocarbon feedstocks at competitive prices. So the joint venture in Saudi Arabia will satisfy their strategic needs.

In addition a methanol production facility in Saudi Arabia gives Celanese logistical advantages. It brings them closer to markets which would have been difficult to service from the U.S.

The Saudi Interests

The Saudi interests in methanol were outlined in the Saudi Methanol Company section.

An examination of the interests of Celanese and the Saudis shows that the two interests are complimentary. Celanese brings into the joint venture an outstanding proven knowledge of the technology of methanol and its derivatives. They also bring a strong presence in the market place and an appreciation of market forces. They can open new markets for the joint venture product(s) which would have been difficult for the Saudis to enter on their own.

The Saudis brought to the joint venture, a cheap feedstock and needed capital. The entitlement crude was of value to Celanese and Texas Eastern in 1979. Under 1982-1986 most North American companies consider the entitlement commitment as a liability.

Conclusions

The Saudi/Celanese/Texas Eastern methanol joint venture represents a natural association of parties with complimentary interests. All parties benefit from the resources of the others.

The upgrading of methanol in Saudi Arabia to increase value added is as relevant in this joint venture as it was for the Saudi Methanol Company. We feel that the Saudis need to investigate the possibilities.

SAUDI ARABIAN SUPPLY DEMAND BALANCE OF MAJOR PETROCHEMICALS

Product	Capacity by 1990 kt/a	Saudi Arabian Demand 1981	Saudi Arabian Demand 1990	1981 Demand in Arab Countries kt/a
Ethylene	1600	-	1570	
Low Density Polyethylene (LLDPE + LDPE)	670	23.21		242.87
High Density Polyethylene	160			
Ethylene Oxide	390	-	156	
Ethylene Glycol	220	0.48		6.65
Ethyl Alcohol	281	-		n/a
Ethyl Benzene	327	-		-
Styrene	295	2.23		2.84
Polystyrene	95	11.79		70.03
Ethylene Dichloride	456	-	159	-
Vinyl Chloride Monomer	102	-	106	-
Polyvinyl Cloride	100	75.35		291.45
Butene - 1	80	-	80	
Benzene	200	-	200	
Butadiene	124	-		11.35
Styrene-Butadiene-Rubber		1.01		33.49
Methanol	1200	2.63		6.96
Formaldehyde		-		n/a
Melamine		n/a		n/a
Acetic Acid	80	n/a		n/a
Vinyl Acetate	112	n/a		n/a
Polyvinyl Acetate	60	n/a		n/a

(contd....)

Product	Capacity by 1990 kt/a	Saudi Arabian Demand 1981	Saudi Arabian Demand 1990	1981 Demand in Arab Countries kt/a
Chlorine	370	11.25	328	24.29
Caustic Soda	377	6.39		79.21
Ammonia	498	2.50+	473	48.20
Urea	830	0.15+		92.21

+ Covers production less exports. The figures are not available at this time.

AN ANALYSIS OF THE STATE OF THE PETROCHEMICAL INDUSTRY IN THE ARAB WORLD

Introduction

Very few chemical products are presently produced in the Arab Countries. The flury of recent activity and the availability of cheap hydrocarbons in the area will change the historic pattern. The recently formed joint ventures will produce a large number of new products from world scale plants. Todate no attempt, that we are aware of, has been made to quantify the demand for these products in the Arab world. The purpose of this study is to gather historic import statistics and determine if they indicate systematic pattern. Because of the lack of production or production statistics, we will, in most cases, equate imports to consumption.

The import statistics were gathered for the years 1976 to 1981. They are based on data published by the exporting countries for products destined to the Arab world. The details are listed in the attached table 1. An analysis of the significance of the data will be performed in the following paragraphs.

Petrochemical Building Blocks

Building blocks are defined as products which enter into chemical reactions to produce higher value added products. They include ethylene, propylene, butadiene, butylene, and benzene. (Table 2). The statistics indicate that very little, if any, of these products was imported. The reason is that no derivatives made from these building blocks are produced in the Arab countries.

Intermediates

Intermediates are defined as products which have received some upgrading but they need further processing before they become commodities. (Table 2). They include ethylene dichloride, vinyl chloride monomer, ethyl benzene, styrene and ethylene oxide.

The statistics show that very little of these products was imported into the Arab countries.

Finished Products

Thermoplastics. These are products which require minimum processing to be transformed into consumer goods. They include high and low density polyethylene, polystyrene, polyvinyl chloride and styrene-butadiene-rubber. The statistics indicate that these products were imported in significant and increasing quantities from 1976 to 1981.

Polyethylene. In 1976, the Arab Countries imported 53 kt of low and high density polyethylene. The volumes increased to 387 kt in 1980 and dropped back to 243 kt in 1981. These numbers indicate average annual rates of growth of35.6% per year from 1976 to 1981. They also indicate that the Arab countries consumed the output of two world scale plants in 1980. If we assume that the growth drops to 10% per year, demand will reach 573 kt in 1990. All the output from the Saudi projects will be dedicated to the markets of the Arab world.

Polystyrene. The imports of polystyrene by the Arab countries increased from 5 kt in 1976 to 70 kt in 1981. This is equivalent to an average growth of 70.4% per year. Only one polystyrene project with a capacity of 95 kt is being considered in Saudi Arabia. Startup date has not been set but is expected to be in the late 80's. The Arab countries consumed in 1981 what that plant can produce in 1990. If we assume that polystyrene growth drops to 10% per year, demand wi[illegible]h 165 kt in 1990. This is equivalent to the output of two world plants.

Polyvinyl Chloride. The Arab countries imported 52 kt of PVC in 1976. The imports increased to 291 kt in 1981. This is equivalent to an average growth of 40.9% per year.

Only one PVC project with a capacity of 100 kt per year is under consideration for Saudi Arabia. Startup date has not been announced but is expected to be in the late 80's. If we assume that PVC growth drops to 10% per year, demand will reach 687 kt by 1990. This means that the markets of the Arab world will consume the output of seven world scale PVC plants.

Styrene-Butadiene-Rubber (SBR) The imports of SBR increased from 10 kt in 1976 to 33 kt in 1981. This is equivalent to an average growth of 26.4% per year.

An SBR plant is under consideration by Saudi Arabia. However, the capacity and startup date are not yet resolved.

Conclusions The announced thermoplastics capacities for Saudi Arabia will either barely meet the expected demand in the Arab countries or will not be sufficient. If the purpose of the joint ventures is to build export oriented petrochemical plants, the number and size of these plants need to be reassessed. Downstream integration to produce commodities requiring only simple processing for conversion to consumer goods is a reasonable strategy for developed as well as developing markets.

Aromatics The major use of aromatics is as octane boosters in the gasoline pool. For that purpose they are not isolated from conventional refinery streams. If additional octane barrels are required, reformers are added to the refinery. The reformer converts naphtha, parafinic or naphthenic, into aromatics.

Aromatics can also be obtained from pyrolysis gasoline produced from ethylene naphtha crackers. This stream contains a higher percentage of aramatics than the reformate. Therefore whenever possible, it is used by the petrochemical industry as a source of benzene, toluene and xylene

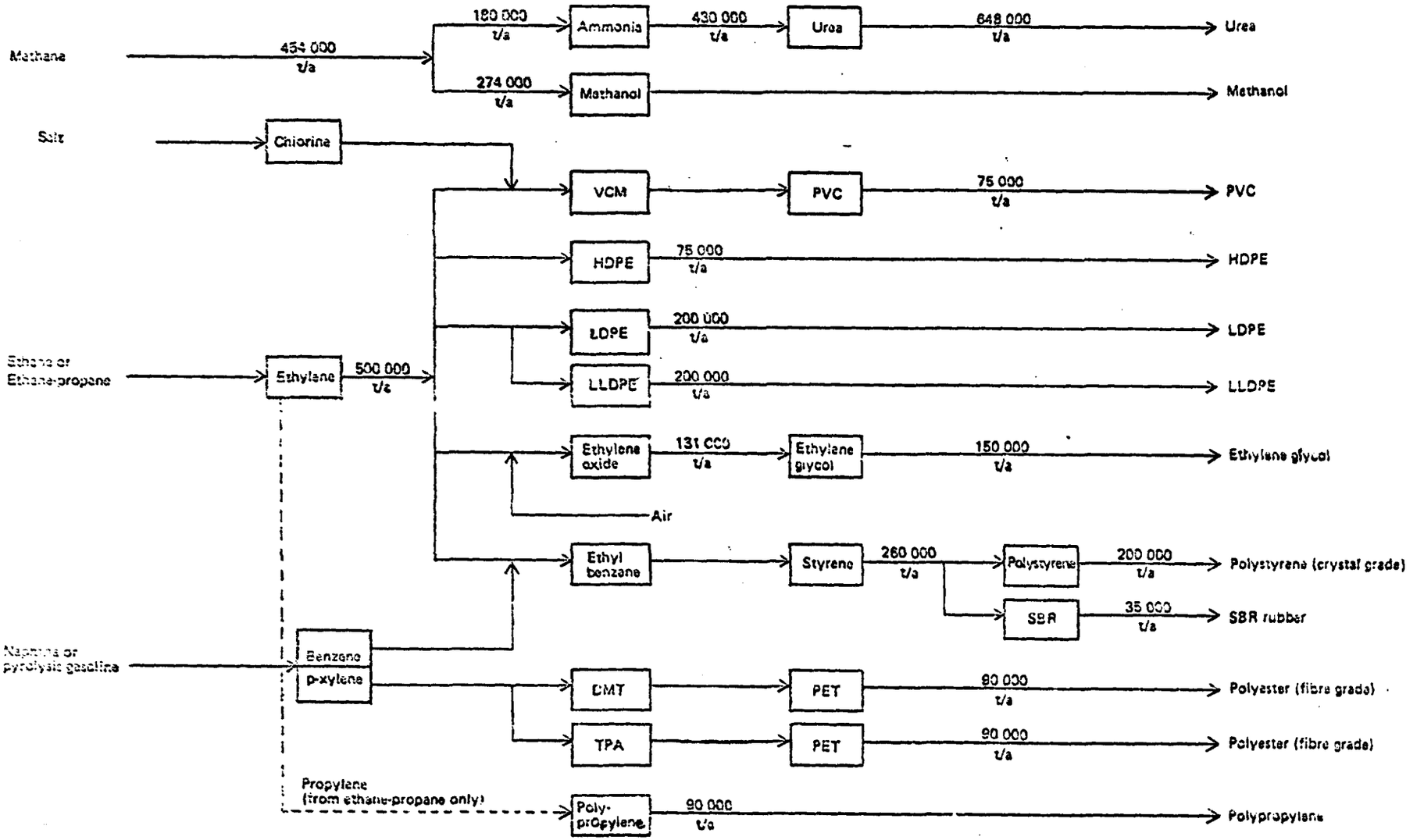
The aromatics used by the petrochemical industry constitute 10-15% of total aromatics produced in the developed countries. Toluene and xylene are used as solvents as well as petrochemical feedstocks. Benzene is used only as a petrochemical feedstock. The major uses of benzene are ethyl benzene/styrene, cumene/phenol and cyclohexane. Toluene is used to make benzene and benzoic acid/phenol. Virgin xylene is seperated into its ortho, para, and meta isomers. Ortho xylene is is used for making phthalic anhydride. Para xylene is used to produce terephthalic acid and dimethyl terephthalates and ultimately polyesters. The statistics show that toluene and xylene were imported into the Arab countries from 1976 to 1981. The volumes are small enough to indicate that they have been used as solvents. Solvent usage alone does not justify adding reformers to the refineries. However, building plants producing derivatives, will justify production of aromatics and will satisfy the derivatives markets in the Arab countries.

Ammonia and Urea Table 1 shows the imports of ammonia and urea into the Arab countries. Both products are essential nitrogen fertilizers. Several plants producing these products are already operational; additional plants are being built.

Table 1: ARAB WORLD IMPORTS OF SPECIFIED PETROCHEMICALS

	1976 kt	1977 kt	1978 kt	1979 kt	1980 kt	1981 kt
Polyethylene	53.04	92.05	221.14	302.40	386.67	242.87
Polystyrene	4.87	14.00	51.42	67.42	74.71	70.03
Poly vinyl chloride	52.45	94.74	164.71	236.11	299.29	291.45
Styrene-butadiene-rubber	10.37	16.43	20.83	26.41	42.44	33.49
Benzene	-	-	-	-	-	-
Toluene	4.94	8.63	11.22	13.12	16.68	10.64
Xylene	0.72	0.95	28.49	27.22	28.74	35.06
Methanol	1.10	0.95	11.08	12.32	12.81	6.96
Dimethyl Terephthalate	13.07	13.77	30.65	28.70	39.66	29.44
Styrene	0.43	0.66	0.67	0.71	2.42	2.84
Ethylene glycol	1.71	1.48	4.29	9.85	12.97	6.65
Ammonia	64.15	135.30	108.34	129.43	218.93	48.20
Urea	81.42	73.40	144.86	139.50	182.47	92.21
Chlorine	3.34	3.45	9.22	20.98	27.22	24.29
Caustic soda	38.35	44.59	80.44	143.21	154.17	79.21

Table 2: LINKAGES BETWEEN PETROCHEMICAL DERIVATIVES



UPDATING AND ENRICHING DOCUMENT OF 5th INDUSTRIAL DEVELOPMENT CONFERENCE FOR ARAB STATES

In addition to the attached documents, discussions were held with Mr. I. El-Zaim concerning the 5th Industrial Development Conference for Arab States. The discussions covered the following areas:

- Updates of statistical data;
- Analysis of the technical content of documents;
- Evaluation of the feasibility of petrochemical projects;
- Assessment of the technology used in the joint ventures;
- Comparison of cost of building plants in the Arab world and the U.S.;
- Exchange of ideas covering the joint venture agreements;
- Potential markets for petrochemicals produced in the Arab world;
- Means by which Arab producers can have access to world markets;
- Implications of shifting of global trade as a result of building petrochemical plants in developing countries;
- The role of transnational corporations:
  - Supply of technology
  - Supply of organizational and marketing skills.