MIDDLE EAST PIPELINES AND THEIR ECONOMIC FUTURE

FAWAZ C. NAJIA

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F O R E W O R D

The idea of this thesis came to my mind late in 1960, when, on its tenth anniversary, and under the impact of increased competition from supertankers, the Trans-Arabian Pipe Line Company (Tapline) pumped from Qaisumah, Saudi Arabia, to Sidon Terminal, on the Mediterranean Sea, the lowest throughput in its history of operations. Tapline was also under pressure at the time to increase its transit payments to Jordan, Syria and Lebanon.

I was fascinated by the clash of views which manifested itself at the time. On the one side was the company stressing "the influence of economics on the selection of a means of crude oil transportation in the Middle East, when both a pipeline and tankers are available to provide this service,"[1] and thereby calling for a level of payments to the transit countries compatible with its own economic well-being. On the other, were the local governments and Arab oil officials, deeply convinced of the "immense" economic profitability of

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1. P. P. Nibley and D. W. Dreier, "Pipeline Economics and Technology in the Middle East," a paper submitted to the Second Arab Petroleum Congress in Beirut, (October, 1960), p. 2.

pipeline systems in the area and thus bargaining for a bigger slice of the Middle East pipeline transportation pie.

The substance of this thesis is derived from various sources -- books, company pamphlets, reports, interviews and petroleum press articles. The debt to these is great.

My thanks go to Professor Paul Klat, for his patience, guidance and critical remarks; to Donald W. Dreier, for his help and constructive suggestions; and to Mona Gedeon and Nazir Hanna, for their typing assistance.

Fawaz C. Najia

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A B S T R A C T

This thesis is the result of an effort to weld some of the research, observations, principles and controversies on the subject of Middle East pipelines and their economic future.

A number of factors, however, have worked together to make this task difficult — especially the scantiness of informational material on the subject, the reluctance of Middle East pipeline companies to publish or reveal operational cost data, and the high degree of inaccuracy and error involved in forecasting future Middle East pipeline operations under constantly changing conditions.

The first chapter of this thesis sums up briefly oil developments in the Middle East during the past decade, the transportation choices which avail themselves for moving crude from this area, and the factors which allowed the market for Middle East oil to be extended westward of Suez.

To preface the discussion of Middle East pipelines,

which is the title of the second chapter, I have pointed out to the planning and engineering studies as well as the methods involved in the construction of pipelines in general. Then I have described the pipeline networks of IPC and Tapline, their construction, throughputs and capacities ... But, what is the purpose of such exposé, if it were not to lead to a comparative study of the two pipeline systems? Thus the major part of the second chapter is devoted to compare IPC and Tapline throughputs over the past five years, to show their respective as well as combined shares in the transportation of Middle East oil, and to assert that while IPC pipelines and tankers complement each others, Tapline and tankships are in direct competition.

The third chapter - Future of Middle East Pipelines - is the main part of this thesis. It contains an effort to analyze the factors that HAVE influenced and WILL influence future Middle East pipeline operations -- namely, political stability in the area, the over-all world demand for Middle East crude, the efficiency of operations, the payments to the transit countries, and, in the case of Tapline, competition with super-tankers. I must concede that I have refrained in this chapter

as well as in the conclusion from making any carefully calculated forecasts regarding the future of IPC and Tapline. Instead, an attempt has been made to indicate general trends.

The fourth part comes nearest to being an appendix to treat the Arab pipeline or "Tariki" project, which has already been abandoned by its sponsors, mainly because of political differences and the possibilities of severe competition from tankers.

The fifth and last part is what it purports to be, a sketch of the findings contained in this thesis.

CHAPTER I

I N T R O D U C T I O N

For the economic health of a modern society, an efficient transportation system is indispensable. Transportation costs enter into the selling price of all agricultural and industrial products and may significantly affect the competitive position of a country's exports. Nowhere is this consideration more relevant than in the Middle East, which is so heavily dependent on its oil export business.

The transportation of Middle East oil from the prolific oil fields of countries bordering on the Arabian Gulf (Iran, Iraq, Saudi Arabia, Kuwait, the Neutral Zone, Bahrain and Qatar), referred to in this paper as the Middle East, to the highly industrialized consuming markets in Europe and elsewhere is the largest international movement of petroleum in the world today.

Before studying this movement, and mainly that part of it which is done by pipelines, let us first review briefly oil developments in the Middle East during the past decade or so.

A. Middle East Oil Developments

Twelve years ago, seven international oil companies

held more than 93 percent of Middle East oil reserves and produced nearly 95 percent of the Middle East oil. These seven companies -- Standard of New Jersey, Texaco, Standard of California, British Petroleum, Gulf, Royal Dutch Shell and Socony Mobil -- were the early settlers who pioneered in Middle East oil development. World prices of crude oil then were generally stable.

Today, the picture is noticeably different. Instead of just seven international oil companies in the Middle East, there are twenty-six oil companies operating in the area under concession agreements.[1] New discoveries in other areas, mainly in Libya and the French Sahara, are affecting, and will affect more in the near future, the markets for Middle East oil. Despite recent cuts in Middle East posted prices,[2] the oil revenues of the half-dozen producing countries in the Middle East reached in 1960 the record level of one and a third billion dollars.[3] The reason is simply that production is still increasing at a steady rate.

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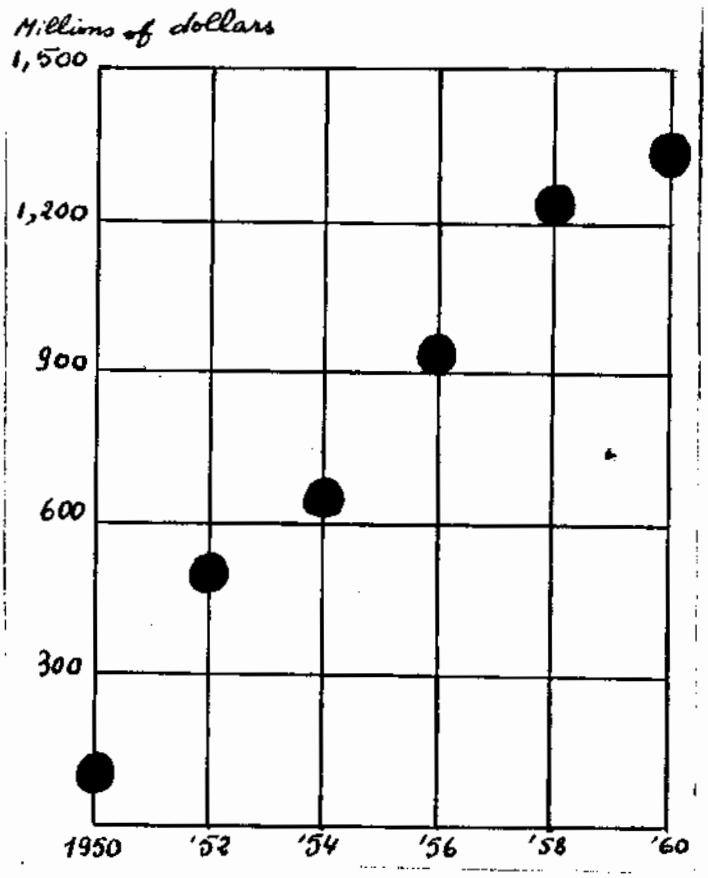
1. Roy Lebkicher, George Rentz and Max Steineke, "Aramco Handbook, (Arabian American Oil Company, 1960), p. 114.

2. Posted prices are the prices at which buyers are willing to purchase oil from a specified field.

3. Estimate given by W. E. Lindenmuth, Regional Vice President, Middle East Mobil International Oil Company, before the 1960 Annual Convention of the Quartermaster Association in Washington, D.C.

Figure 1

ESTIMATED REVENUES TO MIDDLE EAST
GOVERNMENTS FROM OIL OPERATIONS



Source: "Aramco Handbook," Op. Cit., p. 122.

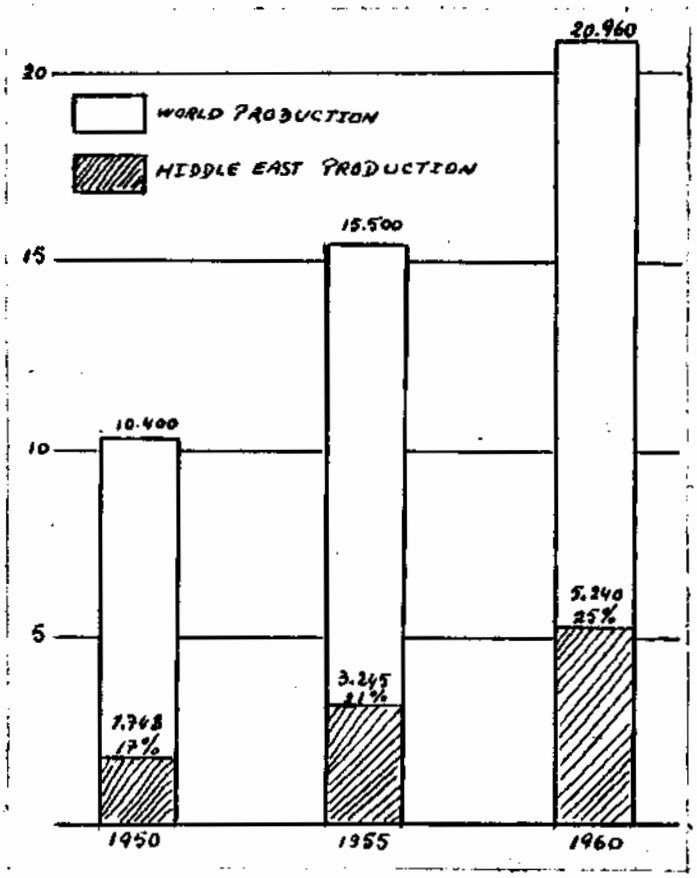
Barely exceeding 60 million tons in 1915, the world's crude oil production reached a record of 1,119 million tons in 1961. During this same period, crude oil production in the Middle East increased from half a million ton to over 282 million tons -- a quarter of all the oil produced

throughout the world last year, including the Soviet bloc.

The following figure shows the massive increases in Middle East oil production in comparison to the world's:

Figure 2

MIDDLE EAST AND WORLD CRUDE OIL PRODUCTION



Source: Tapline paper by P. P. Nibley and A. C. Nelson on "Economics of Oil Transportation from the Middle East to Western Europe," (September, 1961), p. 20.

This growth in production reflects a remarkable increase in Free World demand for crude oil. Demand in Europe, where two-thirds of Middle East oil goes, was up 17 percent in 1960 over 1959.[1] Demand in the Far East, which takes roughly one-fifth of Middle East oil, rose by about 20 percent.

Demand in the areas supplied by the Middle East is expected to go on increasing at a considerable rate throughout the next ten or fifteen years. Much more will be said about this in the third chapter.

Of the oil produced in the Middle East, more than one-fifth is refined in the area before being exported. Major refineries are at Ras Tanura, in Saudi Arabia; at Abadan, in Iran; at Homs, in Syria; at Tripoli and Sidon, in Lebanon; on the island of Bahrain; in Aden and in Kuwait. Crude oil refining in the region in 1961 averaged some 1,450,000 barrels a day,[3] nearly 6½ percent of the Free World's total (23,501,000 barrels per day).

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1. "1960 Statistical Review of the World Oil Industry," The British Petroleum Company Limited, (Britannic House, Finsbury Circus, London, E.C.2), p. 9. The annual average increase in Western European demand for oil during the years 1955-1960 is estimated at 12 percent.

2. Ibid., p. 9.

3. Oil and Gas International, February, 1962, p. 30.

The most impressive single fact about Middle East oil, however, is the amount of it still in the ground. In 1961, the crude oil reserves in the region were calculated at about 188.2 billion barrels, or more than 60 percent of the world's known oil (310 billion barrels). Kuwait alone has 62 billion barrels, the highest of any country in the world. The second highest proved reserves, 52 billion barrels, are in Saudi Arabia. The U.S. and Iran are next with 35 billion barrels, followed by Iraq, with 26 billion barrels, and Venezuela, with 17.5 billion.

B. Transportation Choices

Although the great bulk of Middle East oil goes to Europe, none of the oil fields is within easy distance of the Mediterranean. For every barrel of oil produced for use west of Suez, there are presently three main transportation choices:

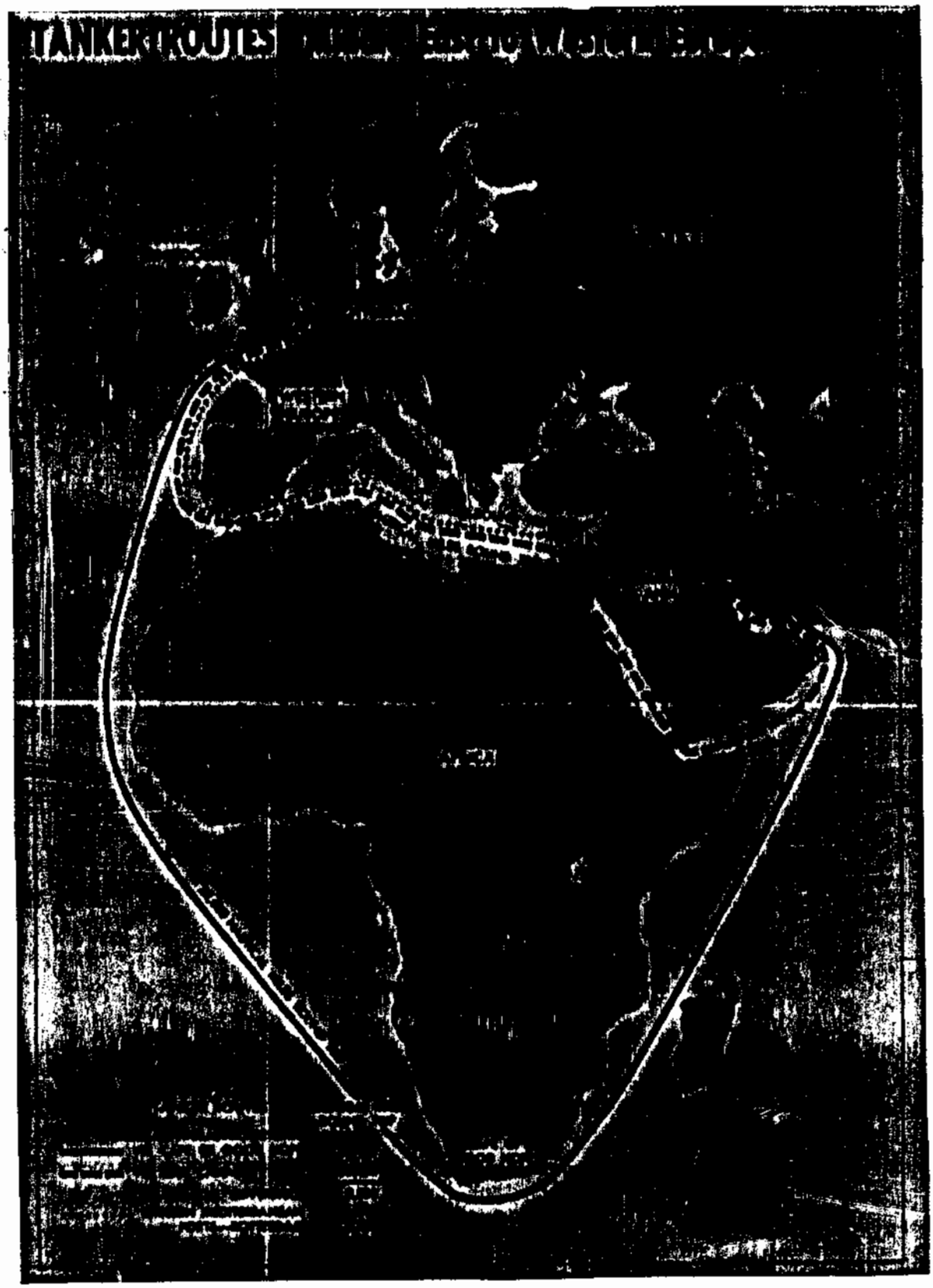
1. First, it can be loaded on a tanker and shipped through the Suez Canal. The oil shipped by this route amounts to about two-thirds of the total. A typical tanker round trip from Mina Al Ahmadi on the Arabian Gulf to, say, Rotterdam is about 13,100 nautical miles.

2. Second, it can be sent by pipeline to the Eastern

Mediterranean and there loaded on tankers. About one third of the oil for the West is shipped by thid method. There are two pipelines to the Mediterranean -- Tapline and the Iraq Petroleum Company network. In 1961, IPC's deliveries to tankers at the terminal ports of Banias and Tripoli amounted to 35,332,827 tons. During the same year, Tapline pumped from Saudi Arabia to Sidon some 15,071,200 tons of crude oil. Both pipelines thus transported about 18 percent of the oil produced in the Middle East. The round trip from the Eastern Mediterranean to Rotterdam is about 6,700 miles.

3. Third, Middle East crude oil can be shipped around the Cape of Good Hope, 22,500 nautical miles round-trip to Rotterdam. Naturally, this route is not frequently used.

Figure 3



Source: "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 24.

As a natural economic behaviour, the buyers of oil select the most economic means of transportation to move crude oil from a particular source to a specific market. "In selection of a particular source of crude oil supply to satisfy the demands of a marketing area, the delivered cost of the oil at the market is a prime consideration, and the costs of transportation are an important part of the delivered costs."[1] Thus, Middle East oil did not displace American and Venezuelan oil in Western Europe only because of its low cost of production. It gained hold of well over half the total Western European market also because economic means of transportation made its C.I.F. price in Europe equal or less than that of either American or Venezuelan oil.

Now whether an increasing proportion of Middle East oil will tend to move by pipelines or by tankships depends on which of the two means provides the lowest cost, as compared to the investment required and the cost of operation. This will be the subject of our study also in the third chapter.

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1. "Pipeline Economics and Technology in the Middle East," Op. Cit., p. 3.

C. Crude Oil Prices and Shifting Sources

As we pointed out above, circumstances of geography and transportation make for certain "natural" or "tributary" markets for oil from a particular source. Where these markets border upon one another, there are what are generally called "watersheds" -- points on one side of which it is cheaper for a buyer to get his oil from a source than from another. These "watersheds" shift in location, "depending upon relative quantities of exportable oil pressing for outlet from one source as compared with another, easy or tight availability of shipping with consequent effect upon freight rates, and other factors."[1]

At this point, it should be mentioned that sales of oil, whether crude or refined, are usually made at prices F.O.B. the ports of shipments, with the purchaser himself arranging and paying for transportation. This is one of the main reasons why freight rates are a significant component of the cost of oil in a market and why the "watersheds" shift with changes in freight rates.

Up to about 1932, the oil needs of Western Europe,

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1. From an undated IPC stenciled paper on "The Pricing of Crude Oil," p. 5.

the largest consumption area outside the United States, were met by exports from the United States, the only area at the time with a large surplus of oil for export, and the cheapest point from which Europe could obtain additional supplies. It followed logically that all of the crude oil traded internationally was sold at the same price, that of the U.S. Gulf, plus the freight and insurance charges from there to destination.

The dominating influence of the United States on the price of crude oil was lessened, when the growth of consumption and the rising costs of production in the U.S. turned that country from the world's major exporter into a substantial net importer of foreign oil.

Venezuela became then the chief source of European supply until about 1948. At that time, increasingly large reserves of oil were being developed in the Middle East and started seeking outlets. Middle East crude slowly began to displace Venezuelan oil and, today, most of Europe's oil comes from this part of the world.

At first, no prices were quoted in the Arabian Gulf, and Middle East crudes were sold on a delivered basis that

allowed them to compete with American and Venezuelan crudes. These sales were made mainly to destinations east of Suez or other nearby markets, where Middle East crude oil had a transport advantage over crudes from the Western Hemisphere. "But the main advantage of Middle East oil, the possibility of achieving the world's lowest production costs per barrel, could be achieved only if the very high cost of exploration and development in the area could be spread over a very high rate of output ..."[1] To absorb the increased output, an expanding market was needed. Yet, as Middle East crude widened its market area, its advantage over Venezuelan oil in transport costs shrunk. And as it penetrated westwards, it suffered an increasing disadvantage in transportation costs. This meant that the market for oil from the Middle East could be steadily pushed to the West only if the price realized on its sale was reduced correspondingly.

When F.O.B. prices were first posted in the Arabian Gulf, they were roughly equal to those in Venezuela, which meant that the market for Middle East oil could be extended

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1. The institute of Petroleum, "Competitive Aspects of Oil Operations," (The Southbourne Printing Company, Ltd., Bournemouth, England, 1958), p. 182.

to the point where freight charges from the Middle East and Venezuela were equal. The limit of the market for Middle East oil was then pushed out further by absorbing freight rates in the delivered price, which was reflected in a reduction in posted F.O.B. prices in the Arabian Gulf. Thus Middle East crude became steadily cheaper than Venezuelan oil and the watershed was extended gradually westwards until it reached the United States.[1]

Middle East oil will continue to be competitive then in Western Europe, currently its most important market, as long as it continues to be produced at a minimum cost and moved there with maximum economy.

The operating costs of the various possible means of transporting Middle East oil to Western Europe dictate that such transportation be accomplished, under normal conditions, by one of the three ways mentioned earlier -- by pipeline to the Eastern Mediterranean, by tanker through Suez or by tanker also through the Cape of Good Hope. Normally, "the tanker can move oil, on a ton-mile basis, at a cost lower than that of the large-diameter pipeline. However, this advantage can sometimes be offset, when pipelines and

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1. The implicit assumption has been made here that Middle East and Venezuelan crudes are homogeneous.

tankers are in direct competition, by the pipeline's ability to take the most direct route across land, while the tanker is restricted to a more lengthy sea route."[1] These circumstances apply to the pipeline operated by the Trans-Arabian Pipe Line Company "in its competition with tankers routed from the Arabian Gulf into the Eastern Mediterranean."[2] Tapline's system and the system of trunk lines operated by the Iraq Petroleum Company between the producing fields of the Kirkuk area and the Eastern Mediterranean are the two major crude trunk lines in the area, aside from crude gathering lines and product lines, which have been built with the specific purpose of facilitating and minimizing the cost of moving part of the Middle East oil to markets of the Western World.

Other pipeline systems in Bahrain, Qatar, Kuwait, the Neutral Zone, Saudi Arabia and Iran provide the sole outlets from producing fields to refineries or nearby tanker loading terminals. "The only major pipeline in the Middle East which does not fall into this exclusive outlet category is Tapline.

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1. "Pipeline Economics and Technology in the Middle East," Op. Cit., p. 3.

2. Ibid., p. 3.

This is because oil from Saudi Arabian producing fields can move westward by either of two routes. Unlike IPC, Tapline competes with tankers in the movement of crude oil from the Arabian Gulf to the Eastern Mediterranean. It is capable of competing only because its route is an almost straight line from the producing areas of Saudi Arabia to the Mediterranean terminal at Sidon, whereas tankers must take the longer route around the Arabian peninsula and then pass through the Suez Canal."[1]

Before studying the economic future of the two aforementioned major pipelines, and especially Tapline since its exceptional feature of competing directly with tankers raises more problems to its future as an economic means of transportation, let us first study at length what these pipelines are, by whom they are owned, when they were built and at what cost, what countries they cross, how long they are and what capacities they have.

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1. "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 9.

CHAPTER II

MIDDLE EAST PIPELINES

A. Pipelines - General

Frequently referred to as one of the newer modes of transportation, the modern high-pressure pipeline is an adaptation of nature's own method of moving liquids and is the lineal descendent of one of the oldest forms of transportation.

Until the discovery of oil and its commercial value in 1859 no other liquid other than water had been required in as large quantities as to call man's ingenuity into play in its transportation. Within six years after the discovery of the Drake well in Pennsylvania, however, an adventurous American, named Van Sickle, built "the first successful pipeline in the world from a producing field at Pithole City to the railroad at Miller Farm in the Oil Creek Area. It was approximately 32,000 feet in length, was made of 2-inch cast iron screw pipe, had three steam driven pumps spaced at intervals along the line and achieved a throughput of 80 barrels per hour."[1]

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1. P. J. Graber, "Common Carrier Pipe Line Operations and Accounting," (University of Tulsa, Oklahoma, 1951), p. 2.

The emergence of the Middle East as the world's primary source of oil has also necessitated the construction of pipelines, much more developed and efficient of course than the Van Sickle pipeline, to move Middle East oil to local refineries as well as to deepwater terminals, where it is picked up by tankers and shipped to consuming markets all over the world.

The Middle East pipeline network is an extremely important system and it has been most valuable in meeting increased world demand for oil. As Table 1 indicates, in fact, the areas of heaviest demand for Middle East crude are far removed from the location of crude supply.

Table 1

DESTINATION OF MIDDLE EAST OIL EXPORTS
(Thousands of Barrels per day)

To:	1946	1950	1955	1960
North America	8	166	299	484
South America	8	39	70	68
Asia and Australia	311	284	500	1,189
Africa	52	138	175	225
Western Europe	128	895	1,880	2,724
Total	507	1,522	2,924	4,690

Source: "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 2.

Pipelines were constructed in the Middle East therefore to transport oil from producing fields to refineries or terminals on the Arabian Gulf, where crude and finished products could be shipped to major importing countries. The IPC and Tapline systems, however, pump crude oil from producing fields in northern Iraq and Saudi Arabia, respectively, to terminals on the Eastern Mediterranean.

Before studying each of the two systems separately, let us first mention that, generally speaking, the methods employed in pipeline construction are similar the world over. Both the IPC and Tapline projects, of course, had their particular share of problems, the number of which were largely governed by the major factors of climate and terrain.

But as in the case of any large undertaking, adequate planning and engineering studies are essential for the construction of any pipeline. In the initial stages, a route is selected based on economic considerations. If the preliminary studies are sufficiently attractive to warrant further work, more detailed surveying by means of aerial photography and ground surveys is

done to ascertain the most economical and practical route which will satisfy the requirements of delivery points and topography ... while the route selection is in progress, detailed hydraulic studies are undertaken to determine the most economical size of pipe, type of pumping units, number of pump stations and their location.

Following the selection of the route and prior to construction, the acquisition of the right-of-way is undertaken. Then follows the stringing, ditching, welding, cleaning, coating, wrapping, lowering in, backfill and clean-up.

All these general economic and technological considerations were taken into account in the construction of IPC pipelines and Tapline.

B. IPC Export Pipelines

Key factor in Iraq has always been the export pipelines from the north to the Mediterranean seaboard. Today, "Iraq has the world's biggest crude-oil-export pipeline system. The importance of this system was emphasized in 1956-1957, when its sabotage in Syria temporarily reduced Iraq's production and exports to

a mere trickle."[1]

Furthermore, "the fabulous Kirkuk field, which holds most of the country's 26 billion barrels of recoverable crude reserves, is entirely landlocked. This makes it vitally dependent on the series of big-inch pipelines which link it with the terminals at Banias and Tripoli, more than 500 miles westwards in Syria and Lebanon."[2]

Iraqi oil from the giant Kirkuk field then is transported to the aforementioned terminals by export pipelines operated by the Iraq Petroleum Company, Ltd., which is owned by British Petroleum Co., Ltd. (23.75 percent), the Royal Dutch/Shell group (23.75 percent), the Compagnie Francaise des Petroles (23.75 percent), the Near East Development Corp. (23.75 percent) and the C. S. Gulbenkian Estate (5 percent).[3]

The IPC network of export pipelines to the Eastern Mediterranean comprises:

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1. F. G. Thackeray, "Here's What's at Stake in Iraq," in an article published in the Oil and Gas International, January 1962, p. 37.

2. Ibid., p. 37.

3. "Aramco Handbook," Op. Cit., p. 115.

1. A 12-inch in diameter pipeline leading to the Lebanese port of Tripoli. It is 532 miles long, has a capacity of 45,000 barrels per day and went on stream in May, 1934. It was built at the cost of $26 million.

2. A 16-inch in diameter pipeline also leading to Tripoli. The 16-inch line to Tripoli has a length of 620 miles and a capacity of 120,000 barrels per day. It was constructed at the estimated cost of $112 million, was placed in partial operation in July 1949 and in full operation two years later.

3. A 30-32 inch line terminates at the Syrian Mediterranean seaboard of Banias. Opened in April, 1952, it is 555 miles long, has a capacity of 300,000 BPD and was constructed at the estimated cost of $115 million.[1]

IPC's pipeline system has been repeatedly improved,

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1. During the British Mandate in Palestine, another 12-inch pipeline conveyed Iraqi oil to Haifa. But since the establishment of Israel, IPC has stopped the flow of oil through that line.

expanded and elaborated. Its over-all export capacity at the tail end of 1961 reached 48 million tons (the equivalent of 1,000,000 barrels per day), when the paralleling of the 555 mile 30-32 inch pipeline through its entire length and the ancillary works were completed. Work on this parallel loop from Kirkuk to Tripoli was begun in 1957 and was carried out stage by stage by the construction of loop lines between pumping stations. It has naturally entailed the installation of new pumping equipment such as remotely-controlled gas turbines.

During 1961, deliveries to tankers at Tripoli and Banias rose to an all-time record high of 35,332,827 tons of 724,323 barrels per day. This represents 72 percent of the total crude oil production of Iraq during the same year, which amounted to 49,021,842 tons.

From 1934 to 1961, the IPC export pipelines transported more than 304 million tons of crude oil to the Mediterranean. And during the past five years (from 1957 to 1961), IPC pipelines delivered to Tripoli and Banias a total of 126.5 million tons of oil -- 65 percent of the 192.5 million tons of crude produced in Iraq during the same

period.

The amount of crude oil transported by IPC from 1957 to 1961 represents about 11 percent of Middle East crude oil production during those five years, which amounted to 1,142 million tons.

C. Tapline

Also competing for a share of the Middle East oil transportation business is Tapline, which is owned by four major American companies in the following proportions: Standard Oil Company of California (30 percent), the Texas Company (30 percent), Standard Oil of New Jersey (30 percent) and Socony Mobil Oil Company (10 percent).

The sustained increase in world consumption of oil between 1945 and 1949 provided "a ready outlet for increasing quantities of Saudi Arabian oil as fast as it could be made available,"[1] by the drilling of new wells and the installation of new export facilities. In 1950, a great project for moving a large part of Saudi Arabian oil produced by the Arabian American Oil Company to the Mediterranean by pipeline was being brought

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1. "Aramco Handbook," Op. Cit., p. 149.

to completion. The inception of this pipeline system (part of it belonging to Aramco and part to Tapline, an affiliated company) involved the laying out of what was then the largest crude oil pipeline in the world over a distance of 1068 miles.

Aramco owns and operates the eastern portion of the 30-31 inch pipeline, which extends 314 miles up to Qaisumah. The portion owned and operated by Tapline extends for 754 miles from Qaisumah to a 4-berth tanker loading terminal in Zahrani, near Sidon, Lebanon.

Constructed at the total cost of $176 million, the Tapline section of the pipeline, as completed in December 1950, had four diesel-engine-driven pumping stations which provided an initial capacity of 320,000 barrels per day.

"The new outlet provided by Tapline, together with additional pipelines between Abqaiq and Ras Tanura, enabled Aramco to enjoy in 1951 the largest rise in production of any year in its history. The increase was about 215,000 barrels per calendar day, from an annual average of 546,703 barrels per day to 761,510 barrels

per day."[1]

Spaced along the pipeline today, at points about halfway between the main stations, are four gas turbine pumping units installed in 1957-1958 as part of a program to increase the pipeline's daily capacity by about 140,000 barrels. The average sustained daily capacity of the Tapline system today is 479,000 barrels. This amounts to a capacity of 23.4 million tons per year.

Since crude oil production in Saudi Arabia last year amounted to 68.023,180 tons, we can safely conclude that Tapline was equipped to transport one third of that oil. Actually, however, Tapline in 1961 pumped 15,071,200 tons (or 23 percent only) of the oil produced by Aramco in Saudi Arabia.

Since December 1950, when it started operations, to December 1961, Tapline pumped more than 171 million tons of crude oil. During the same years, crude oil production in Saudi Arabia amounted to nearly 539 million tons. Tapline then, in eleven years of operation, has moved 32 percent of the crude oil produced in Saudi Arabia during the same period.

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1. Ibid., p. 153.

D. The Two Systems

Talking of Tapline and IPC together, the two pipeline systems had a combined throughput during the past five years of about 205 million tons. (Table 2)

Table 2

T A P L I N E A N D I P C T H R O U G H P U T

(millions of tons)

	1957	1958	1959	1960	1961	1957-1961
pline throughput to Sidon	16.922	17.905	16.499	12.148	15.071	78.495
throughput to Banias and Tripoli..	10.302	21.993	26.802	32.025	35.333	126.455
tal deliveries	27.224	39.898	43.251	44.173	50.404	204.950

Knowing what Middle East crude oil production amounted to during the years 1957 through 1961, and having the quantities of oil moved by Tapline and IPC, we can build another table showing the percentage of Middle East crude transported by the two pipelines during each of the past five years. (Table 3).

Table 3

PERCENTAGE OF MIDDLE EAST CRUDE MOVED BY IPC AND TAPLINE (1957-1961)

Year	M. E. crude production (tons)	IPC-Tapline Throughput (tons)	Percentage of M.E. crude moved by Tapline and IPC
1957	173,000,000	27,224,000	15.8%
1958	208,000,000	39,898,000	19.1%
1959	223,000,000	43,251,000	19.5%
1960	256,000,000	44,173,000	17.4%
1961	282,000,000	50,404,000	17.9%
1957-61	1,142,000,000	204,950,000	17.94%

Over a five-year-span then (1957 through 1961), IPC and Tapline together transported slightly less than 18 percent of the crude oil produced in the Middle East during that same period.

Table 3 also indicates that Middle East pipelines are in no way keeping up with the increase of crude oil production in the area; whereas crude oil production has been constantly increasing in the Middle East, the percentage of it moved by the two pipelines has not. This is more true however of Tapline than IPC. In fact, whereas IPC deliveries at Banias and Tripoli are keeping up with the increase of crude production in Iraq, Tapline, because of competition from super-tankers, is not keeping up with the increase in Saudi Arabian crude oil production. (Tables 4 and 5).

Table 4

PERCENTAGE OF IRAQI CRUDE TRANSPORTED BY IPC TO MEDITERRANEAN

Year	Iraqi crude production (million tons)	IPC throughput (million tons)	Percentage of Iraqi crude exported by IPC pipelines
1957	22	10.302	45.6%
1958	35	21.993	62.6%
1959	41	26.802	65.5%
1960	47	32.025	68.5%
1961	49	35.333	72%

Table 5

PERCENTAGE OF SAUDI CRUDE MOVED

BY TAPLINE TO SIDON

Year	Saudi crude production (million tons)	Tapline throughput (million tons)	Percentage of Saudi crude exported by Tapline
1957	49	16.922	34.7%
1958	49	17.905	36.5%
1959	53	16.449	31%
1960	61	12.142	20%
1961	68	15.071	22.2%

We can note that whereas the percentage of crude oil exported by IPC pipelines (Table 4) has been increasing during the past five years, the percentage of Saudi Arabian oil transported by Tapline (Table 5) has diminished.

The Tapline system, fully used until 1957, has never been used to capacity since. Contrary to IPC, from 1957 onwards, Tapline has been used primarily to fill marginal requirements in the transportation of Middle East crude. In 1961, for instance, "Tapline operations were at capacity when petroleum demand was high (during cold weather periods in Europe) and well below capacity during the remainder of the year."[1]

As a matter of fact, "the 1961 pumping level of Tapline was exceeded during every year of operation except 1960, 1953 and 1951. During the latter two years, lower deliveries were more a reflection of lower capacity than lack of demand for crude oil at Sidon."[2] (Figure 4).

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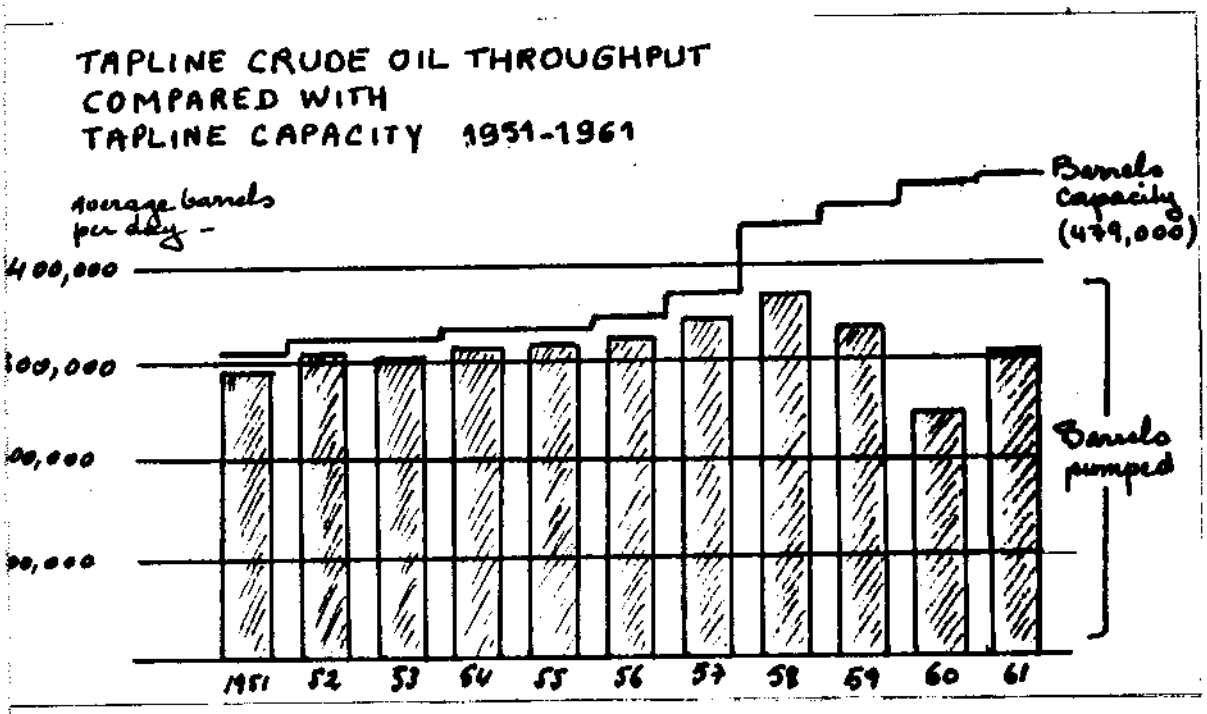
1. Pipeline Periscope, Beirut, Lebanon, Vol. 10, No. 1, February 1962, p. 2.

2. Ibid., p. 2.

Figure 4



Source: "Kilometer 1213," a Tapline booklet (1960 edition), p. 2.

While Tapline's crude oil capacity in 1961 was 479,000 barrels per day (or about 23.4 million tons per year), only some 310,000 barrels per day (or about 15 million tons per year) were pumped through the system during the year. In other words, although last year Tapline improved its throughput in comparison to

1960, it operated at 65 percent of capacity only.

It was anticipated in 1950 that the opening of Tapline would reduce the demand for tanker tonnage considerably, particularly when the throughput was added to that flowing from the IPC fields at Kirkuk. This opinion was more or less universal throughout the industry at that time. Petroleum Press Service thus reported: "... There will be a great economy in the use of tankers from the elimination of the passage around the Arabian peninsula and through the Red Sea. Taking into account the return tanker trip, about 6,000 nautical miles will be avoided, which, it has been calculated, will eventually displace tanker tonnage equivalent to a 100 or so T-2 tankers. Coming at a moment when there is a great demand for tankers and freights are correspondingly high, this economy will be welcomed at the present time."[1]

The Oil and Gas Journal stated: "... Another bearish factor (in the tanker Market) is the opening of the Trans-Arabian pipeline in 3 or 4 months.

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1. Petroleum Press Service, November 1950, p. 310.

Depending on the rate at which it operates, this line will release up to 60 or more tankers."[1] Also, World Petroleum commented that "... Pipeline construction has a substantial influence on the world demand for tankers. When Trans-Arabian Pipe Line Company completed its 1,068-mile line across Arabia last December, the world supply of transport tonnage was in effect increased by 68-70 T-2 ships."[2]

Today however, as we have tried to show, all of these forecasts have proved to be in error. "During the construction of Tapline the Free World's demand for oil increased considerably, and the United States was unable to supply all that was demanded. Instead of Tapline being an expression of independent growth of oil demand, it was part of an integrated growth in which the need for tankers was increased. Tapline merely helped the oil industry to 'hold the line' -- without it the industry would have faced a serious transportation problem in the Middle East in spite

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1. The Oil and Gas Journal, October 1950, p. 129.
2. World Petroleum, May 1951, p. 61

of the volumes being moved through the existing lines in Iraq."[1]

Where competition reigns, efficiency, it is said, is always relative. However streamlined and perfect of its kind a device may be, something different may be able to perform the desired function even more advantageously. During the eleven years of its existence Tapline has pared the cost of transporting Saudi Arabian crude to the Mediterranean to a minimum -- only to find that tanker transport with which it competes has become cheaper still. In the case of I.P.C., however, the two principal methods of moving crude oil i.e. tankers and pipelines are complementary rather than in direct competition.

In their continuous pursuit of low costs, both I.P.C. and Tapline have pioneered and kept abreast of technological innovations and improvements. And in their sustained effort to facilitate the transportation of increasing quantities of Middle East crude

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1. R.S. Nielsen, "Oil Tanker Economics," (Bremen, 1959) p. 215.

oil to the markets of the Western world, both systems have more than trebled their combined capacities over the past eleven years. In fact, the capacities of both pipelines rose from 23 million tons in 1961 to about 71.5 million tons last year.[1]

Once laid, a pipeline is always a hostage to economic and political "fortunes." Much more than I.P.C., Tapline is hostage to both. The two systems are hostages to the political fortunes of the Middle East.

The economic fortunes to which I.P.C. is hostage can be traced down to three major factors:

1. The world demand for crude
2. Increased efficiency, and
3. The financial agreements with transit countries

A fourth economic factor to which only Tapline is hostage is its:

4. Competition with supertankers.

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1. From 1951 to 1961, the capacity of I.P.C. pipelines to the Eastern Mediterranean rose from 8 million tons to 48 million tons, and that of Tapline, from 15 to 23.4 million tons.

In a study of the economic future of Middle East pipelines i.e. IPC and Tapline, these factors have to be examined carefully. We propose to do that in the following chapter of this thesis.

CHAPTER III

FACTORS AFFECTING FUTURE OF MIDDLE EAST PIPELINES

A. Political Factors

The Suez Canal crisis of 1956 provides an excellent subject for a case study of the repercussions which a political event may have on the transportation of Middle East oil across pipelines or by tankers.

It was the Suez crisis in fact and the blocking up of the Canal on October 31, 1956, which gave rise to the enormous tanker building program which has had such big effects upon the level of tanker freights.

As a result of the Suez Canal closure, demand for tankers to haul Middle East crude around the Cape of Good Hope and from Tapline's Sidon Terminal soared, spot charter rates rose tremendously and hundreds of tankers were ordered and contracted. "As a result of this surge in orders, world shipyards, which had completed 3,600,000 deadweight tons in 1956, completed 5,300,000 deadweight tons in 1957, 6,900,000 deadweight

tons in 1958 and 7,500,000 deadweight tons in 1959."[1]

After the re-opening of the Canal, it became obvious that the supply of tankers already built or under construction exceeded the demand for them. This tanker surplus was further aggravated by the decrease in the rate of growth of world demand for oil. And, the depressed charter rates resulting from the surplus of tankers had a significant effect upon the competing means of oil transportation from the Middle East, namely Tapline.

Although Tapline experienced a period of full-capacity operations during the Canal shutdown, the surplus of tanker capacity from 1958 onwards depressed charter rates to such unprecedented levels that Tapline found itself unable to match this low-cost transportation and was forced to fill marginal transportation requirements during most of 1959, 1960 and 1961.

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1. "Pipeline Economics and Technology in the Middle East," Op. Cit., p. 7.

Another effect of the political Suez crisis on Middle East pipelines was the sabotage of the IPC pipelines in Syria on November 2, 1956. Three pumping stations of the IPC network in Syria i.e. T-2, T-3 and T-4 were blown-up, stopping the flow of oil from Kirkuk to Banias and Tripoli.

The economic repercussions of these political actions (the closure of Suez and the sabotage of the IPC pipelines) were "global and regional."[1] Aside from the enormous tanker building surge which ensued, the Suez crisis deprived Europe of "70 percent of its usual oil supplies."[2] It brought to a complete stop the IPC deliveries, amounting then to 25 million tons annually, as well as the Suez oil traffic, which represented more than 75 million tons a year at the time.

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1. George Lenczowski, "Oil and State in the Middle East," (Cornell University Press, Ithaca, New York, 1960), p. 326.

2. Ibid., p. 326.

The damaging economic effects of the Suez crisis on the European economy and the oil producing and transit countries in the Middle East can make the subject for a long study. Europe had to turn to new sources of supply at the expense of a drain on its hard currency reserves and had enormous difficulties in obtaining the needed oil supplies and adequate tanker space at short notice. Crude oil production in Iraq fell from 32,716,227 tons in 1955 to 30,606,282 tons in 1956 and to 21,361,979 tons in 1957. Syria and Lebanon also suffered reductions in income from transit fees paid by IPC for the passage of its pipelines across the two countries. "Syria's loss until the reactivation of the IPC pipeline was estimated at $50,000 a day, and Lebanon's, whose terminal at Tripoli was hauling 7 million tons a year, was $5,600 a day."[1]

In Saudi Arabia and in compliance to a Saudi government proclamation, Aramco stopped its deliveries to the Bahrain refinery, located in British-controlled

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1. Ibid., p. 328.

territory, as well as to British and French ships and markets. This meant a loss in revenue to both the Saudi Arab government as well as to Aramco owners.

A more recent political action which has had an effect on pipeline operations in the Middle East is the step taken during the first quarter of 1962 by Iraq against IPC. Iraq, in fact, expropriated last December 99.56 percent of IPC's concession acreage. In retaliation, IPC cancelled the second phase of its pipeline expansion to the Mediterranean. The first phase, which was completed at the end of 1961, boosted, as we have said earlier, the pipeline capacity from 38 million tons to 48 million tons per year. "Work on the $56-million second phase was to have started at the beginning of this year. It would have further boosted export capacity of the lines to the Mediterranean to 54 million tons annually, or 1,125,000 barrels daily. The IPC group, understandably, does not seem to think this is a good time to pour further investments

into Iraq ..."[1]

This decision will obviously slow IPC's exports to Europe through the Mediterranean pipelines. Even if extra demand for Iraqi crude materializes in the coming two or three years, the extra capacity that has now been cancelled won't be there because increased IPC pipeline capacity to the Mediterranean takes years to build.

As we have tried to show, the effect of political actions on the expansion of Middle East pipelines and their economic future is substantial. The economic future of Tapline and IPC is very much dependent on political stability. When this condition is not available, additional investments by IPC and Tapline owners in capacity-increase programs are withheld.

The chief disadvantage of the two systems, like all other pipelines of course, is that they are fixed facilities. It is crucial for the economic future

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1. Wanda Jablonski, "Iraq Facing Major Losses in Oil Growth," article published in Petroleum Intelligence Weekly, March 26, 1962, p. 5.

of both Tapline and IPC that supply areas (Iraq and Saudi Arabia) and transit countries (Lebanon, Syria and Jordan) be stable in terms of political environment. In considering the possibilities of expansion and the building of additional pumping facilities and new installations, Tapline and IPC long-range planners are forced to include a high risk cost because of the fact that their pipelines are fixed facilities and because of this element of political uncertainty.

If the Middle East political situation deteriorates (such as during the Suez Canal crisis), tanker owners have the opportunity to save their assets by withdrawing them from the danger area and rerouting them. Such an opportunity does not avail itself for investors in Middle East pipelines.

But more important still than this element of political uncertainty in the economic future of Tapline and IPC are the economic factors to which the two systems are hostage.

B. Demand For Middle East Crude

There is no doubt that the most important single factor affecting the future of IPC and Tapline is the outlook for world demand for the crude they transport. And the demand for Iraqi crude transported by IPC and for Saudi crude moved by Tapline is essentially part of the more general problem of energy demand.

A study made by the California Institute of Technology points out that:[1]

1. As time goes on, energy consumption per unit of industrial output must necessarily rise as the standard of living of the world rises.

2. And, as per capita consumption, population, and the extent of industrialized areas increase, total energy consumption will increase even more sharply.

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1. California Institute of Technology, "Resources of the World - A Speculative Projection," (California Institute of Technology publication, 1956), p. 18.

Development of the world economy, involving increased industrialization means a considerable rise in future energy requirements. And in considering how these requirements will be met, the importance of oil becomes apparent when we realize that Chase Manhattan Bank's new ten-year forecast on the oil industry expects petroleum hydrocarbons (oil and natural gas) to supply 73 percent of the free world's energy needs by 1970. "In the USA and Canada, oil and gas together now supply more than 70 percent of all the energy consumed; in Latin America, about 90 percent."[1]

In the United States, the large increase in crude oil demand has outpaced oil production by a wide margin. The United States in 1938, for instance, produced 162 million tons of crude, of which it exported 25 million. In 1960, the U.S. produced 342 million tons of crude and

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1. G. T. Ballou, "Current Challenges in the International Petroleum Industry," a paper presented at the Second Arab Petroleum Congress, Beirut, (October 1960), p. 2.

imported another 93 million tons.[1]

In Europe, the major market for oil pumped by IPC and Tapline, coal consumption continues its gradual decline and oil continues to take over much of the energy market. In 1938 coal provided about 90 percent of Western Europe's energy requirements. "Oil's share in the energy requirements of the European Community this year will be about one-third, with coal accounting for somewhat less than half, and hydro-electricity and lignite for most of the balance."[2]

The increase in world demand for oil (and by the same token for Middle East oil) is certain -- it is only the magnitude of this increase which may be modified in the years ahead.

It is a fact that European countries with large

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1. Figures from "1960 Statistical Review of the World Oil Industry," Op. Cit., p. 20

2. Petroleum Press Service, April, 1962, p. 146.

populations and high demand for petroleum are deficient of crude oil resources, whereas countries of the Middle East have the greatest oil reserves and consume an insignificant fraction of their product.

In Table 1, showing the destination of Middle East oil exports, we have seen that Western Europe is the biggest market for Middle East oil, part of which is moved by Tapline and IPC. In 1946, as the aforementioned table showed, 25.2 percent of Middle East oil exports went to western Europe; in 1950, 58.8 percent; in 1955, 64.2 percent; and in 1960, 58.1 percent.

Turning to the future, a brief survey of the oil industry literature reveals that numerous supply and demand forecasts for oil are made each year.

However, the consensus of forecasts by various U.S. and international oil companies expects total Free World demand, including the United States, to grow at an average rate of 5.25 percent per year during the decade through 1970, compared to a growth of 6.75

percent in the past ten years.[1] The Chase Manhattan Bank estimates Free World petroleum consumption in 1970 to be 42,800,000 BPD, against 25,800,000 BPD in 1960 -- a growth rate of 5.2 percent per year.[2]

As regards Western Europe's future oil requirements, a detailed report on the subject was released in 1960 by the Energy Advisory Commission for the Organization for European Economic Cooperation.[3] The report reveals that the average annual increase in Western Europe's oil imports for the period 1960-1975 will be between 200,000 and 220,000 barrels per day.

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1. Petroleum Intelligence Weekly, January 8, 1962, p. 3.

2. The Chase Manhattan Bank, "Future Growth of the World Petroleum Industry," (New York, September 1961), p. 22.

3. "Towards a New Energy Pattern in Europe," a report by Austin Robinson and published by O.E.E.C. (January, 1960).

Another study by P. H. Frankel and W. L. Newton[1] expects the annual European growth of net imports to average about 7 percent for the period 1960-1965 and 5 to 6 percent for the period 1960-1975.

A comparison of the two forecasts has been made by P. P. Nibley and A. C. Nelson, of Tapline:

Table 6

	Net Oil Imports to Western Europe (Thousands of barrels per day)		
	1960	1965	1970
O.E.E.C. Commision (maximum forecast)	3,200	4,340	5,600
Frankel and Newton	3,400	4,740	6,320
Actual reported	3,700	-	-

Source: "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 11.

1. P.H. Frankel and W. L. Newton, "The State of the Oil Industry," an article published in National Institute Economic Review (September, 1960).

Since three-fourths of Western Europe's net imports normally come from the Middle East, it would appear in looking ahead through 1970 that the Middle East, because of its fantastic reserves and low unit production costs, will continue to be the main source of oil for Western Europe. Assuming all other economic and political factors constant, oil transported by IPC and Tapline will, in all probability, continue to be demanded in Europe and elsewhere.

If we anticipate that the future demand for Middle East oil will continue to grow, we can safely expect the future demand for oil transported by Middle East pipelines to increase as well.

Developments in the last few years, however, indicate that the USSR and North Africa will supply increasingly larger percentages of Western Europe's imports. In Mr. Emile Bustani's view,[1] the Soviets are "formulating a large-scale and prolonged onslaught

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1. Mr. Bustani is a member of the Lebanese Parliament.

on the European oil market,"[1] with price cuts as their key weapon. In 1960, the Soviet bloc exported 445,000 barrels per day of crude oil and petroleum products to the Free World. This represented an increase of 32 percent over Soviet exports for 1959. "Provisional estimates for 1961 indicate an increase of some 30 percent over the total achieved in 1960, and suggest that Soviet bloc oil exports amounted to an annual rate of approximately 30 million by the end of the year (615,000 barrels per day)."[2]

Russia is obviously determined to increase her exports and capture a substantial share of oil markets in Western Europe and elsewhere.

North Africa, meaning Algeria and Libya mainly, also shows promise of becoming a major oil-exporting area. Relatively close to the important markets of Western Europe, North African crude seems likely to

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1. From text of Emile Bustani's "Open Letter" on Soviet oil, dated March 20, 1962, to the Members of the League of Arab States and Iran.

2. Ibid.

offer some serious competition to the Middle East and reduce the future rate of growth for supply from there -- both by tankers and pipelines.

Referring always to Western Europe, which as we said gets about 75 percent of its net oil imports from the Middle East and is the focal point of the Soviet and North African oil offensive, we know that gross crude oil imports by Western Europe in 1960 reached 163 million tons -- some 128 million tons coming from the Middle East, 13 million tons from Venezuela, 11 million tons from the Sahara and other African territories, and over 7 million tons from the USSR.[1] In 1961, Western Europe crude imports went up by 26 million tons, and "the main change in the pattern of supply was a larger share of North African and Russian deliveries."[2]

Sufficient information has allowed P. P. Nibley and A. C. Nelson to assemble a forecast range of net

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1. Petroleum Press Service, April 1962, p. 128.
2. Ibid.

imports and sources of oil for Western Europe in 1965, as compared with 1960:

Table 7

NET IMPORTS AND SOURCES OF OIL FOR WESTERN EUROPE

(Thousand barrels per day)

	1960¢	1965	
Western Europe Net Oil Imports	3,700	4,700¢¢	5,400¢¢¢
Source of Oil:			
North Africa	200	800	800
U.S.S.R. (Assume roughly 10 to 14% of Western Europe's net imports for 1965)	300	500	700
Other	500	500	500
Sub-Total	1,000	1,800	2,000
Balance from Middle East	2,700	2,900	3,400
Increase from Middle East over 1960		200	700

¢ Latest estimates.
¢¢ Forecast by Frankel and Newton.
¢¢¢ Forecast representing an 8% per year increase over 1960.

Source: "Economics of Oil Transportation From the Middle East to Western Europe," Op. Cit., p. 14.

The conclusion from this forecast is that in 1965, the Middle East will supply more oil to Western Europe, but that there will be a reduction in the rate of increase of movement of oil from the Middle East to Western Europe, from 73 percent in 1960 to 62 percent in 1965.

Thus the entry of Russia and North Africa into the scene, however, seems unlikely to affect noticeably the future demand for oil moved by Middle East pipelines. In fact, in the future, the increase in Soviet and North African crudes will probably be absorbed by the expected increase in demand for oil in Europe. This will tend to keep the Middle East as Western Europe's primary source of oil and Middle East oil pumped by IPC and Tapline at a high level for at least the five or ten years to come.

We should concede therefore that the economic future of Middle East pipelines, looked at from the angle of the anticipated expansion in demand only is rather optimistic. If IPC and Tapline are to confront problems in the future, they are more related to cost factors than to factors of demand.

C. Increased Efficiency

To continue getting their share of the Middle East oil transportation business, IPC and, especially, Tapline (which is in direct competition with tankers) must be capable of moving a given quantity of oil from Iraq and Saudi Arabia to the Mediterranean, respectively, at costs competitive with other transportation charges.[1] They can accomplish this by keeping costs down through maximum efficiency of operation, improved techniques and the use of the finest skills and equipment.

IPC and Tapline transportation costs, like all other transportation costs, are difficult to calculate for they depend upon many variables, including: the percentage time usage of the pipeline per annum, the variation in throughput from month to month, the period taken for amortisation, depreciation, maintenance, management, operating expenses (such as power costs),

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1. Except for tankers, pipelines usually provide the lowest cost means of transporting crude oil. IPC pipelines provide the sole outlet for oil from Kirkuk. Pressure on IPC then to reduce its costs in order to be competitive with other transportation charges is not very high. Tapline, on the other hand, must meet an increasingly keen competition from tankers.

overheads and the amounts paid in taxes and local rates (such as transit and terminal loading fees). Because of the importance and magnitude of the transit and terminal loading fees paid by IPC and Tapline to the Middle East transit countries, they will be treated apart in the forthcoming division of this chapter.

As to the other operating costs, fixed and variable, we can say that both IPC and Tapline have pioneered or kept abreast of technological innovations and improvements in order to keep these costs down.

Many concepts of design and policies governing oil operations have been employed by Tapline and IPC to provide a low-cost transportation service.

Aside from its capacity increase program which was completed last year and which has already been reviewed, IPC's present pipelining effort involves the change over of the "second construction" 16-inch line to Tripoli from oil to gas service, to provide fuel for new pumping stations.

Provision for extension of the existing pumping equipment at K_1 pump station, should this become necessary, is being engineered. IPC has undertaken and is still undertaking considerable work at T-2, T-3 and T-4 and at Mile 494 to increase efficiency. T-2 and T-4 are to be instrumented in the very near future to allow for remote control of operations from a master control room at T-3, and gas turbines at the stations will operate on natural gas from Kirkuk field. "The operation of the whole system will be such that changes of line pressure at any station will cause automatic adjustment to the turbine speeds, so as to maintain the standard suction and discharge pressures within remotely controlled site point limits. T-2 and T-4 will be fully supervised and controlled from T-3, with full supervision of these and other location conditions, to Tripoli and T-3. Automatic logging of the remote station hydraulic and electrical conditions is to be effected at T-3 via telemetering circuits, and interface detection is provided to signal to T-3 the arrival of the batches of differing specific gravity at the locations."[1]

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1. J. W. Atkins, "Major Construction Projects," article published in The Crescent, March 1962, p. 27.

Work is also nearing completion on the installation at T-2 and T-4 of five Westinghouse gas turbines -- two sets will operate on each of the 30-32 inch systems, and the fifth set will be a stand-by to either.

Recent developments at Tripoli terminal include the extension of berths Nos. 1, 2 and 3 into deep water, the replacement of the main sealines with larger diameter pipe and the erection of eight large storage tanks to replace smaller ones.

Competition has also stimulated Tapline to use the latest methods and equipment. It now applies to its operations the pipe stress theory which increased its capacity by about 55,000 barrels per day, with no increase in investment or new facilities.[1] Competition also prompted Tapline to install its remotely-controlled, portable, auxiliary gas-turbine pumping units, which raised the capacity of the system by 40 percent with an additional investment equal to 11 percent of the original investment in the pipeline. Competition, finally, led Tapline to

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1. "Pipeline Economics and Technology in the Middle East," Op. Cit., p. 12.

become the first private enterprise to design and use an ultra-modern, "over-the-horizon" Very High Frequency system of communications, which allowed it to realize substantial savings over the cost of alternative systems of communications.

Tapline, in other words, is far more efficient operationally today than when it loaded its first tanker, 11½ years ago. During this period, in fact, the pipeline's capacity, taking into account increases in allowable pressures, the installation of remotely-controlled auxiliary pumping units and other improvements has been "increased by almost 60 percent since 1951 with an additional investment of only 12 percent of the original investment."[1] In its struggle to reduce costs in order to remain competitive with ever-larger and lower-cost tankers, Tapline estimates that it can transport a barrel of oil and load it aboard a tanker at Sidon for 24 percent less than it could 11½ years ago if its line were operating

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1. Ibid., p. 15.

at the present average sustained daily capacity of 479,000 barrels.

After this brief review of a few of the measures taken by IPC and Tapline to increase their efficiency and reduce operating costs, the question which follows is: "How about the future?"

There is no doubt that the economies resulting from the technologies applied to date have reduced Tapline's and IPC's unit costs at capacity operation. The future is likely to afford further cost reduction opportunities. Pipeline technology is still in the midst of a revolution. All routine IPC and Tapline operations in the future may be controlled and performed automatically, and only economic justification is needed to apply already existing designs for controlling the two pipelines by computers. "Some of the probable advantages of computer control are:

1. Optimum efficiency in the application of power
2. Greater safety
3. Savings in fuel
4. Reduced maintenance costs
5. Savings in operating manpower, and

6. Reduction in the capital investment."[1]

Both Tapline and IPC, as we have tried to show have made marked and successful efforts in reducing the cost of transporting Middle East oil to terminals on the Mediterranean and have thus reduced the delivered cost of this oil at the markets of the world. The barrel costs at near capacity operations have decreased while their capacities have increased substantially for relatively small increases in investments.

There is every reason to believe that IPC and Tapline will sustain their efforts to lower their operating costs even more in the future. These efforts, however, will very much depend on the level of payments that the two companies will have to make to the countries transited by the two pipelines.

D. Payments to Transit Countries

The level of royalty payments by IPC and Tapline to

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1. Ibid., p. 15.

the transit countries (Iraq, Saudi Arabia, Syria, Jordan and Lebanon) is the problem-child of future Middle East pipeline operations. Royalty payments in fact are a major component of Tapline and IPC operating costs.

Our concern here is not to study in detail the several stages through which IPC and Tapline royalty payments to the transit countries have gone. We can mention that "when on March 25, 1931, IPC concluded its first transit conventions with Syria and Lebanon, it was expressly exempted from all transit fees, import duties, and taxation while gaining the right to construct, maintain, and operate the pipelines for seventy years, with the privilege of renewal."[1]

After World War II, Saudi Arabia's convention with Tapline, dated July 11, 1947, provided no transit fees to that country during the first fifteen years of Tapline operations. "The company undertook however to pay for all 'reasonable and necessary expenses' incurred by the government at ports and pumping stations for protection,

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1. "Oil and State in the Middle East," Op. Cit., p. 154.

administration, customs, health and municipal works, and tax and land-use formalities. After fifteen years the company was to pay the Saudi government a transit fee commensurate with the highest fees paid by Tapline or any other pipeline company in the Middle East, the length of the line, and the quantity of oil transported."[1]

Tapline's basic agreements with Jordan, Lebanon and Syria, signed between 1946 and 1947, contained many identical clauses. "Each convention was to be valid for 70 years, with the privilege of renewal, and each provided for a transit fee of £1.5 per 1,000 tons transported, with a minimum of £20,000 a year. The conventions stipulated, in addition, a security fee not less than £40,000 a year for Jordan and Syria and £25,000 for Lebanon. A subsequent 1950 agreement with Lebanon provided for a loading fee of 2.88 pence per ton."[2] Syria

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1. Ibid., p. 154.
2. Ibid., p. 154.

was to receive half the terminal fees under a separate agreement with Lebanon concluded on June 10, 1947. "The basic formula of all three conventions treated the pipeline as a transportation company. The company was expected to pay a transit fee without regard either to the value of the goods transported or to the profits realized by the operation."[1]

The conclusion and revision of Tapline's basic agreements with the transit countries affected IPC's agreements too. New IPC agreements were signed with Syria and Lebanon between 1947 and 1952 providing for payment by the company of a transit fee of £2.16 per 1,000 tons. Fees on government services, loading fees on exports and municipal fees were introduced or increased.

In December 1955, Syria again concluded a new agreement with IPC, which embodied three new principles:

"(a) - The equal sharing of profits between transit countries and the company

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1. Ibid., p. 155

"(b) - The nominal inclusion of the producing country among countries entitled to revenues on the transport of oil, and

"(c) - The distribution of revenues on a ton-mile basis (1s. 4d. per 100 ton-miles of crude transported)."[1]

Spurred by the advantageous terms of the Syrian agreement which raised Syria's revenue from pipeline operations four times what it had been the year before, Lebanon requested the revision of its own 1947 accord. This was done in June 1959, when Lebanon obtained a new agreement from IPC, which again brought about a substantial increase in the amount of payments to Lebanon and reduced IPC's net profits accordingly.

Tapline has also been under pressure to negotiate new agreements with Lebanon, Syria and Jordan. Such new supplemental accords were concluded between the company and the latter two countries between December 1961 and

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1. Zuhair Mikdashi, "Some Economic Aspects of Pipeline Transport in the Arab World," a paper submitted to the Third Arab Petroleum Congress in Alexandria, (October 1961), p. 7.

February 1962. They provide for a transit fee of 1.80 U.S. cents per 100 barrels per mile transiting each of the two countries. The company has also paid lump sums of $ 10 million to each of Syria and Jordan in lieu of retroactive increases for previous years. At present (April, 1962), a new agreement is about to be concluded between Tapline and Lebanon.

From the aforementioned, we can conclude that the payments made by Middle East pipelines to transit countries have been increasing over the years. The transit countries, in their own right, have continuously raised their revenues from IPC and Tapline.

In the case of Syria, for instance, payments by IPC before December 1955 amounted to £400,000 annually. The 1955 accord put up IPC payments to about £6½ million a year at the then throughput. In 1961, payments to Syria by IPC on account of oil transported through its territory amounted to £8.9 million.

On the basis of a 350,000 barrels per day Tapline

throughput, the revised Tapline agreement with Syria is estimated to bring her an annual revenue of $ 2.8 million, compared with a total of $ 1.1 million on the previous basis. A further rise in the total, to about $ 3.5 million, is expected when Tapline concludes her impending new agreement with Lebanon, since Syria shares with Lebanon the loading fees and transit and terminal dues for oil lifted from Sidon.

We said earlier that payments to the transit countries by the two pipeline companies constituted a major part of their operating costs. This is more true of Tapline than of IPC in the sense that an increase in payments to the governments is likely to affect Tapline more than it would affect IPC. Taking a purely theoretical example in fact, we will try to show that a doubling of payments to governments for instance by the two companies will affect Tapline costs and its competitive position much more than it would affect IPC.

We know that the posted price for a barrel of crude at the Mediterranean is $ 2.17. If we assume that IPC

payments to Syria and Lebanon are, respectively, 10 and 5 cents for each barrel of crude transiting the two countries and that other costs of transporting this barrel of crude tot up to 15 cents, we can conclude that the price of the barrel of oil at the well head (Kirkuk) is $ 1.87. If the production cost of the barrel in Kirkuk is assumed to be equal to 25 cents, IPC profits would then amount to $ 1.62 per barrel. Since IPC shares this profit with Iraq on a 50-50 basis, her profit would, under these assumptions, amount to 81 cents.

If IPC doubles her payments to the transit countries, the price of the barrel of oil at Kirkuk will become $ 1.72. IPC profits would then be equal to $\frac{1.72 - 0.25}{2} = 73\frac{1}{2}$ cents.

In other words, a doubling of IPC payments to Syria and Lebanon from 15 to 30 cents would reduce its profit from 81 to $73\frac{1}{2}$ cents only.

In the case of Tapline, however, savings on transport can be easily assessed since Saudi Arabian oil has market prices at both ends of the pipeline -- Ras Tanura and Sidon.

If the posted prices for a barrel of oil at Sidon and Ras Tanura are, respectively, $ 2.17 and $ 1.80, the price differential or Tapline savings would amount to 37 cents per barrel. If Tapline payments to the governments are 15 cents per barrel and other costs are 15 cents also, Tapline profit would be 7 cents per barrel. A doubling of government payments would put the total cost of transporting a barrel of crude by Tapline up at 40 cents -- which is higher than the price differential between Sidon and Ras Tanura.

In 1951, the difference between the posted price in the Arabian Gulf ($ 1.75 a barrel) and that at Sidon Terminal ($ 2.41 a barrel) allowed Tapline to effect savings of 66 cents per barrel, from which it could deduct costs and yet earn a profit. Today, the posted price in Ras Tanura is $ 1.80, and that at Sidon, $ 2.17. Thus Tapline has had to make increased payments to the transit countries while its savings have gone down from 66 cents to 37 cents, due to increased competition from tankships. Only during the Suez Canal closure did the

price differential between crude at Ras Tanura and Sidon exceed the 1951 level. In fact, it reached 72 cents a barrel.

All that has been said so far about IPC and Tapline payments to the governments leads us to one conclusion regarding Middle East pipeline economics -- that the imposition of increased financial payments on Tapline and IPC by the transit countries has undoubtedly raised their operating costs; most probably, these financial payments have not been outweighted by the increased efficiency of operation.

As we have tried to demonstrate, the possibility of increased financial payments by IPC to the transit countries in the future is likely to have little effect on IPC's exports from the Mediterranean because of the absence of tanker competition and because the IPC export pipelines represent the only outlet for Kirkuk oil (unless, of course, an alternate trunk line is built by IPC from Kirkuk to Iskendrun, the Mediterranean port in Turkey , or to Fao).

How much net savings Tapline will still be making

after the implementation of the new accords with Syria and Jordan and the signing up of the new agreement with Lebanon is difficult to determine. We should also bear in mind the fact that a transit agreement will also have to be negotiated in the near future by Tapline with Saudi Arabia, where 539 miles of its pipeline are located. The consequent uncertainty is a factor contributing to the low throughput of the Tapline system.

How much, in the future, the transit countries can explore the possibilities of increased revenues from IPC and Tapline cannot be determined now. But Tapline will certainly be more "sensitive" to this risk of increased transit payments in the future because it is in direct competition with tankers and its net profits fluctuate with tanker freight rates, or the alternative cost of moving crude oil by a tanker (including a return on its investment and Suez Canal fees) from Ras Tanura to the Eastern Mediterranean. The dwindling of the price differential between posted prices in Ras Tanura and Sidon during the past twelve years from 66 cents per barrel of crude transported from Ras Tanura into the Eastern Mediterranean to 37 cents has squeezed Tapline's net savings,

and therefore its "taxable profits" to a low level.

E. Competition with Tankers

While tankers and IPC export pipelines are complementary, tankers and Tapline are in direct competition because the buyers of Saudi Arab crude in markets west of Suez have the choice of picking it up at Ras Tanura or at Sidon. When such a choice exists, whichever is less costly will be used.

Oil moving by tankers from Saudi Arabia must move a distance of 3,500 kilometers, compared with 1,700 kilometers if Tapline is used. When Tapline started operations in December 1950, this difference materially helped its competitive position. At the time, in fact, the T-2 tanker of about 16,000 deadweight tons and a carrying capacity of 110,000 barrels was the most common in the world tanker fleet and it took about three such tankers to carry the equivalent of one day Tapline's capacity then.

In the twelve years since 1950, the picture has changed completely. The carrying capacity of the world's

tanker fleet rose from 27.6 million deadweight tons in 1950[1] to 67.1 million deadweight tons in December 1961.[2] In 1950, tankers averaged 13,000 deadweight tons and the largest tanker afloat was about 35,000 deadweight tons. Today the average tanker size exceeds 22,000 deadweight tons and the largest afloat, the Manhattan, is of 106,500 deadweight tons and can carry as much cargo as seven T-2 tankers or almost twice Tapline's daily capacity.

The reason for this trend is that supertankers can transport oil at lower cost than the T-2's. In fact, the Universe Apollo, which is practically the same size as the Manhattan, is estimated to transport the same quantity of oil as seven T-2 tankers "at about 40 percent of the cost."[3]

"Larger tankers can be operated by about the same number of men as the smaller ships, reducing the cost

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1. "1960 Statistical Review of the World Oil Industry," Op. Cit., p. 22.
2. Petroleum Press Service, March 1962, p. 97.
3. "Pipeline Economics and Technology in the Middle East," Op. Cit., p. 5.

of labor per barrel transported. For example, only 50 men are required to operate a 100,000 ton tanker, as compared to 41 men for a T-2 tanker. Fuel consumption per barrel moved decreases as the size of the tanker increases, even though the larger and newer tankers generally are faster than the smaller and older types. Also, the investment per deadweight ton for large tanker is much less than that for a smaller ship, since the shipbuilding costs and the steel requirements are relatively lower. The reduced investment per unit of carrying capacity results in lower depreciation interest and insurance charges per barrel of oil transported."[1]

The effect of increasing tanker size on unit

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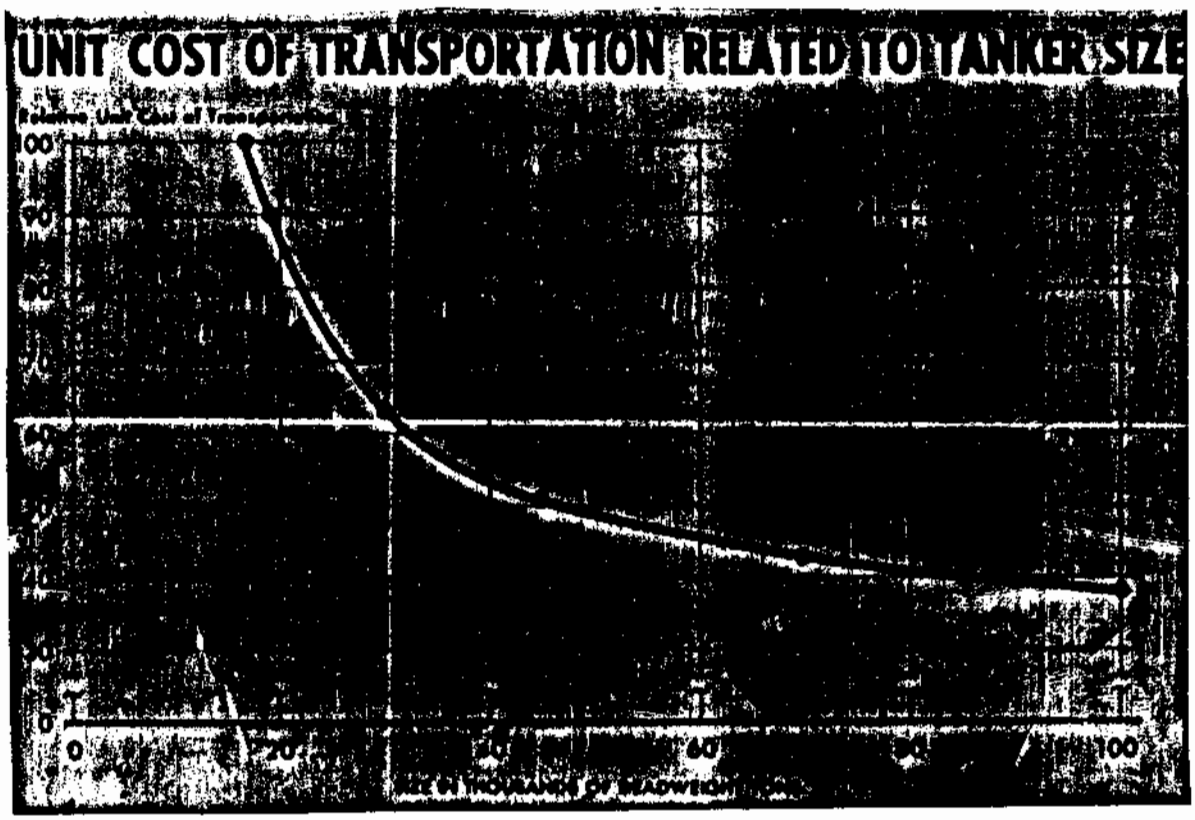
1. "Economics of Oil Transportation from the Middle East to Western Europe," Op. cit., p. 4.

transportation cost is shown in figure 5.

Figure 5

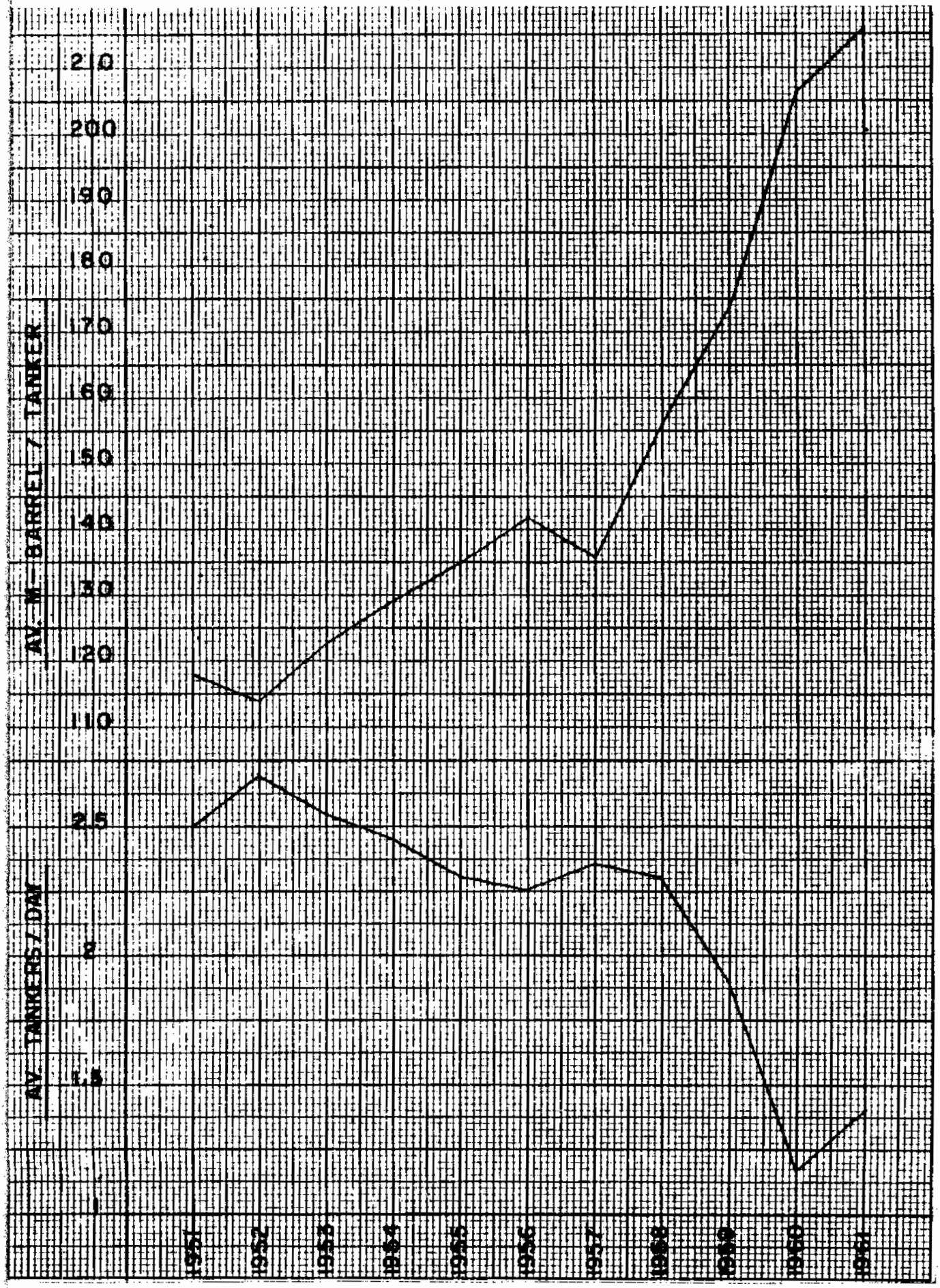


Source: "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 23.

The graph shows that a 46,000 deadweight tons tanker can transport crude for about 50 percent of the cost per barrel of oil for a T-2 tanker.

The effect of tanker size on unit transportation cost has been such that charter rates have gone down tremendously. The single voyage charter rate for moving a ton of crude oil from Sidon Terminal to New York in 1950, for instance, was $ 18.72. During the first quarter of 1962 the charter rate for the same trip had gone down to $ 3.12. And as we mentioned earlier too, the growth in the size of tankers has had such an effect in lowering the unit transportation cost by sea that the difference between the posted price in the Arabian Gulf and that at Sidon Terminal has fallen from 66 cents in 1951 to 37 cents in early 1962.

The average size of tankers calling at Tapline's Sidon Terminal has increased from 118,533 barrels in 1951 to 215,936 barrels per ship in 1961. Over the same years, the average number of ships loaded per day has decreased from 2.5 to 1.4 (See graph on next page).


AV. M—BARREL / TANKER
AV. TANKERS / DAY
220
200
190
180
170
160
150
140
130
120
110
2,5
2
1,5
1
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961

Other revealing Tapline statistics indicate that, during 1961, only 19.3 percent of tankers calling at Sidon were below 18,000 deadweight tons; 34.2 percent were of 20 to 30,000 deadweight tons; 28 percent were of 30 to 40,000 deadweight tons; 14.4 percent, of 40 to 50,000 deadweight tons; and 4.1 percent of more than 50,000 deadweight tons.[1]

As the average size of the world tanker fleet increased, the Suez Canal i.e. the gateway for tankers competing with Tapline in the transportation of Saudi Arab crude to oil-hungry Europe, was deepened so that tankers up to 46,000 deadweight tons can now pass fully loaded.

In looking into the future, there is every reason to believe that Tapline competition with tankers will be even keener. In fact, if the current trends toward larger tankers continue as it is expected, the Suez Canal Authority will very likely find it financially

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1. Figures and graph on previous page have been obtained through the courtesy of Mr. E. Y. Ayash, Tapline's Chief Oil Dispatcher in Beirut.

attractive to proceed with further deepening of the Canal and Tapline will then have to compete directly with tankers of more than 46,000 deadweight tons. Even at the present time, "The Suez Canal Authority has reported successful transit in ballast of tankers as large as 85,000 deadweight tons. Economic analyses indicate that the cost of moving oil to Western Europe by 85,000-ton tankers around the Cape and returning in ballast through the Canal is about the same as the cost of using 46,000-ton tankers through the Canal both ways."[1]

There are no indications at the present time that Tapline's cut-throat competition with tankers will end in the near future. In fact, in spite of the continuing surplus of laid-up vessels and the five-year post-Suez depression of charter rates, large orders for new tonnage are still being placed by tanker owners. J. J. O'Brien, Director of the Office of Oil and Gas,

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1. "Economics of Oil Transportation from the Middle East to Western Europe," Op. Cit., p. 6.

U.S. Interior Department, predicts that the current tanker surplus will not only continue but will even increase slightly by 1965.[1] He reports that the present excess capacity is equivalent to 315 T-2 tankers, or about 9 percent of the commercial tanker fleet. By 1965, the expected surplus capacity will reach the equivalent of about 450 T-2 tankers, or about 10 percent of a total 4,400 available. Other studies of the world wide tanker situation indicate that bigger tankers continue to dominate new building, since ships of 40,000 deadweight tons or more represent two-thirds of the vessels presently on order and that the outlook is for a 22.2 percent rise in the world total commercial fleet by the end of 1965.[2] The Jacobs & Co., Ltd., London, study of the 1961 tanker situation reveals that, among new tankers being built, those below 45,000 deadweight tons are the exception. The average is over 50,700 deadweight tons.[3]

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1. Petroleum Intelligence Weekly, March 19, 1962, p. 5.
2. Pipeline Periscope, December 1961, p. 5.
3. Oil and Gas Journal, March 12, 1962, p. 78

Moreover, the expansion of North African production in the future will mean a considerably lower demand for tankers to supply Western Europe than if the shipments were made from the Mediterranean or the Arabian Gulf. "It is reckoned that the 25 million tons of crude expected to be exported from North Africa this year will save the equivalent of 125 T-2's."[1]

"Tanker requirements will also be limited by growing exports from the Black Sea to Western Europe, insofar as these displace lower haul shipments from the Middle East; by continued restriction of imports into the USA, and by the moves towards oil self-sufficiency in Canada, Argentina and elsewhere."[2]

A corollary to the above is that there will be a reduction in the rate of increase of movement

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1. Petroleum Press Service, March 1962, p. 97.
2. Ibid., p. 97.

of oil from the Middle East to Western Europe and that there will be a reduction in the percentage of Middle East oil moved by Tapline.

While the capacity of IPC pipelines providing sole outlets for Kirkuk production will increase as necessary, the expansion of Tapline capacity will depend on the relative economic attractiveness of moving oil from Saudi Arabia by tanker or by pipeline. At present and for at least five years to come, it seems that in the light of the availability of long-term low-cost charters for efficient tankers, Tapline must seek and apply all possible means and equipment to achieve economy in its operation so as to assure itself a continued place in the business of Saudi Arab crude oil transportation and so as to avoid being used to fill marginal requirements only.

CHAPTER IV

THE ARAB PIPELINE PROJECT

Until few months ago, there appeared to be an element of paradox about the transportation of Middle East oil by pipelines. On the one hand, there was much talk of Tapline operating at lower than capacity levels due to its inability to meet competition from big tankships. On the other hand, Arab countries were busily engaged in the study of a proposal made by the one-time Saudi Arabian Director General of Petroleum and Mineral Affairs, Sheikh Abdallah Tariki, to build an Arab pipeline which would take oil from the producing areas of Qatar, Saudi Arabia, Kuwait and Southern Iraq and move it along a route parallel to Tapline to the Eastern shore of the Mediterranean. The system would also have feeder lines from the Kirkuk area and the newly-discovered Karatchuk field in Northern Syria.

Mr. Tariki's proposal of an all-Arab pipeline project to transport Arab oil from its sources to

Arab terminals was first presented in a memorandum to the Arab League Economic Council, during its fourth ordinary session in early 1957. The Economic Council referred the subject to the Arab Oil Experts Committee for further study.

During its sixth session held in Baghdad in November, 1957, the Committee recommended "to the Arab Governments to work for the creation of an Arab pipeline company with the participation of the various Arab countries, particularly the oil-producing countries and the transit countries."[1]

The Committee made the recommendation after taking Tapline as an example to show the benefits to be realized by the Arab countries from the project. The Committee wrote: "According to statistical data, Tapline yields large profits to its owners. This can be verified from oil prices. The price for a barrel of crude is 210 cents at Ras Tanura and 259 cents at Sidon. The difference of 49 cents is the charge for

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1. Memorandum concerning "Petroleum Pipelines" submitted to the Arab League Economic Council during its fifth ordinary session by the Permanent Petroleum Office (April 1957), p. 4.

transportation per barrel through Tapline. Of this amount, actual transportation costs add up to 21 cents - including fees and dues paid to the various Arab governments - leaving a net profit of 28 cents received by the Company for the transportation of each barrel of Saudi oil. This means that the company is now realizing a daily profit of $ 112,000 from the transportation of 400,000 BPD. In other words, the net annual profit exceeds $ 40 million. With the construction of a pipeline having a capacity of 800,000 barrels per day, the profit to be derived by the Arab countries would be $ 80 million, in addition to the social and technical benefits."[1]

In February 1959, the Secretariat-General of the League of Arab States invited the Arab countries to send delegates to meetings of the Arab Oil Pipelines Company Project Committee. On the strength of another memorandum from Saudi Arabia stressing

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1. Ibid., p. 3.

the need for constructing an Arab pipeline "to absorb the expected increase in production in response to increasing world demand and to handle the tonnage that is expected to be shipped via the Cape of Good Hope in spite of the higher costs of such shipping unless new pipelines are constructed,"[1] the Committee instructed the United Arab Republic delegates to prepare a technical study of the project. Such a study was presented in a paper submitted to the First Arab Petroleum Congress by Dr. M. A. Sinbel and M. A. Korouch. The paper, which states that the project is economically profitable, contains all necessary details on the project, including the directions, diameters, lengths, capacities, pumping stations and construction and operating costs of the proposed pipelines.

There is no need for us here to go into the

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1. Report of the Arab Oil Pipe Lines Company Project Committee, session of 28 February - 8 March, 1959, p. 2.

full details of the project, its finance, economics, profitability, and the various estimates made to arrive at the additional amount of Middle East production which would be available for pipeline transport in the coming five or ten years. In fact, the Arab countries concerned seem to be, at present and for some years to come, far from willing to soft-pedal politics in favor of economics to realize this giant project -- even if, economically, the project were attractive. It is not our intention here to spell out the political differences and jealousies between the various Arab countries involved in the project, and mainly Kuwait and Iraq, but those should not be underemphasized.

Even on purely economic grounds, the project has however been lately rejected by its own sponsors. In fact, the Arab Oil Pipe Lines Company Project Committee recommended in November 1961 to postpone

indefinitely discussions to implement the project.[1] The Committee took this decision after studying the estimated crude oil exports to Western Europe from the Middle East through 1965 and the possibilities of competition with tankers. As regards competition with tankers, the Committee found out that:

1. Present conditions are such that long-term tanker charter rates are slightly lower today than the cost of transportation of crude by pipeline from the Arabian Gulf to the Mediterranean.

2. Recovery from the present level of depressed charter rates is not expected in the few years to come.

3. The Suez Canal Authority seems to have the

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1. Report of the Arab Oil Pipe Lines Company Project Committee, session of November 6-16, 1961, p. 3.

means to develop and deepen the Canal to meet any increase in traffic through 1965.

The Committee admitted that the expected exports to Western Europe and the Western Hemisphere in 1965 from sources other than the Middle East differ today from what they were when the proposal for the Arab pipeline project was made, mainly because of the emergence of Algeria and Libya as major producing countries and because of the depression of tanker freight rates. It concluded that:

1. It does not expect Middle East exports to markets west of Suez, by tankers and pipelines, to differ in 1965 from what they were in 1960.

2. The low charter rates will reduce the price differential between posted prices in the Arabian Gulf and ports on the Eastern

Mediterranean still further in the future, thus exposing the pipelines to increased competition from tankers.

3. The outlook for world petroleum production and trade in the near future might be affected by unexpected developments which might necessitate a revision of the project in due time.

The recent realization by the Arab countries of the implications of the present tanker markets as pointed out in the November 1961 report of the Arab Oil Pipe Lines Company Project Committee undoubtedly helped to account for their diminished interest in the long-mooted project. Enthusiastically advocated at the First Arab Petroleum Congress at Cairo in 1959, the project was scarcely touched upon at the Third Congress in Alexandria in the Fall of 1961. But a project to create an Arab tanker fleet was approved in principle at the Kuwait meeting of Arab oil experts and the Arab League Economic Council's

meeting in Cairo at the tail end of 1960. However, as one could deduce from the previous chapters and as we will try to spell out in our conclusion, the present moment and the near-by future certainly seem no more propitious for tankers than for the Arab pipeline project.

CHAPTER V

SUMMARY AND CONCLUSION

The transportation of Middle East crude oil to the highly industrialized consuming markets of Western Europe is the largest international movement of petroleum in the world today. Reflecting a remarkable expansion in Free World demand for crude oil, Middle East production and export of oil have risen spectacularly during the past fifteen years.

Efforts to move Middle East oil at the lowest possible cost have led to the development of an increasingly efficient transportation system. Middle East oil did not gain hold of well over half the total Western European market only because of its low cost of production, but also because economic means of transportation made its C. I. F. price in Europe equal or less than that of either American or Venezuelan oil.

Middle East pipelines, and namely IPC and Tapline,

constitute one of three possible economic means of transporting oil to Western Europe -- the other two alternatives being by tanker through the Suez Canal or by tanker around the Cape of Good Hope.

The IPC network provides the only outlet for Iraqi crude produced in the giant Kirkuk field. Comprising four operating trunk lines of different lengths, diameters and capacities, the network has an over-all capacity of 48 million tons. In 1961, IPC export pipelines moved 72 percent of the total crude oil production of Iraq.

Though equipped to move one third of Saudi Arabia's crude oil production during the same year, Tapline operated at 65 percent of capacity only and pumped to Sidon not more than 23 percent of the oil produced in the Desert Kingdom.

A comparative study of IPC and Tapline leads to the conclusion that, taken together, the two pipelines did not keep up during the past five years

with the increase in Middle East crude oil production. In fact, whereas crude oil production has been increasing regularly in the area, the percentage of it transported by the two pipelines has not. This applies more to Tapline, however, than to IPC. While the latter is keeping up with the rise in Iraqi crude production, the former, because of tanker competition, is not keeping up with the increase in Saudi crude production.

High on the list of conditions which must exist in the future for the successful operation and possible expansion of the IPC and Tapline systems, which are fixed facilities, is political stability. When this condition is withheld, as was the case for IPC during the Suez Canal crisis in 1956, an enormous investment is rendered useless.

It is extremely difficult to predict how significant political turbulence and uncertainty will be in the area in the years ahead. Nevertheless, the fact is that political instability is no more "chronic"

and "traditional" in the Middle East today than it was ten or fifteen years ago. There is every reason to believe that political factors in the few years to come will not jeopardize the possibilities of expansion and of building new pumping facilities and installations by the two companies. Work on the 30-32 inch pipeline loop from Kirkuk to Tripoli was started as soon as it was found to be economically attractive -- and that was less than a year after the sabotage of IPC pipelines in Syria. In other words, the "risk cost" which has to be taken into consideration by IPC and Tapline long-range planners because of the political element will not differ much in the coming five or ten years from what it is today.

In reviewing other factors affecting the future of Middle East pipelines, we have shown that the consensus of forecasts expects Western Europe's demand for Middle East oil to continue to grow. The emergence of Algeria, Libya and the USSR as potential large-scale suppliers of oil to Western Europe will probably hamper

this growth. But we can safely expect the future increases in Soviet and North African exports to Western Europe to be absorbed by the expected increase in demand for oil there. This will tend to keep Middle East oil pumped by IPC and Tapline at a high level through, at least, 1967.

The economic future of Middle East pipelines is thus a function of cost more than a function of demand. Both IPC and Tapline have kept, and will continue trying to keep, costs down through efficiency of operation, improved techniques and the use of the finest skills and latest equipment. The future is likely to afford the two pipelines further cost-reducing opportunities through improved technology.

A less rosy picture probably awaits IPC and Tapline when looking ahead to the level of payments which they will be making to the transit countries in the future. There are absolutely no chances for transit payments by the two companies to decrease and there is every chance for transit countries to ask

for higher payments. How much, in the coming decade, the transit countries will explore the possibilities of increased revenues from IPC and Tapline will depend on the bargaining power of the transit governments and the level of IPC and Tapline "taxable profits."

The possibility of increased financial payments by IPC to the transit countries is likely to have little effect on the future of IPC pipelines because of the absence of tanker competition or any other economic outlet for Kirkuk oil.

Tapline, on the other hand, will be more affected by this risk of increased transit payments in the years ahead because its competition with tankers makes its net profits fluctuate with tanker freight rates, or the alternative cost of transporting Saudi crude by tanker from Ras Tanura to the Eastern Mediterranean.

Whereas in 1951 the price differential between posted prices at Ras Tanura and Sidon was 66 cents per

barrel, and allowed Tapline to "save" more than 40 cents per barrel, today this price differential has gone down to 37 cents.

Said differently, the cost of moving oil from Ras Tanura to the Eastern Mediterranean eleven years ago in a T-2 tanker, including a return on its investment and Canal tolls, was 66 cents per barrel. A 46,000 deadweight ton tanker, which today is the most efficient means of transporting Arabian Gulf crude to Western Europe through Suez and which is thus Tapline's most serious competitor, can move oil from the Arabian Gulf to the Eastern Mediterranean and return a profit at a charter rate yielding 37 cents.

If it were operating at full capacity (479,000 barrels per day), Tapline today could transport a barrel of oil from Saudi Arabia and load it aboard a tanker at Sidon for 16 cents.[1] At a capacity of 350,000 barrels per day, the Tapline transportation cost per barrel has been estimated at 19 cents. At a capacity of 250,000 barrels per day, the transportation cost has been estimated at 28 cents per barrel. It is also estimated that the implementation

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1. This and the two other operating cost figures mentioned later include payments to the governments prior to the ratification of the new supplemental Tapline agreements with Syria and Jordan and the signing of a new accord with Lebanon. They have been obtained from an official but unpublished Tapline cost chart.

of the new Tapline agreements with Lebanon, Syria and Jordan will raise the transportation cost figures by 3 cents a barrel.

From the aforementioned facts and figures we can conclude that, assuming that tanker owners will not accept "distress" charter rates below 37 cents a barrel to avoid the alternative of laying-up the vessel, Tapline, even at the very low throughput level of 250,000 barrels per day can still make a "saving" of 6 cents per barrel. At a throughput level of 350,000 barrels per day, Tapline transportation savings would amount to 15 cents per barrel. At a full-capacity level, Tapline savings per barrel would equal 18 cents. This is far from the savings of 30 to 40 cents per barrel which Tapline used to make during the first six years of operations, but it is not at all alarming.

Tapline has been operating at below-capacity levels since 1958:

1. Because the surplus of the world tanker

fleet has been such that many tankers were operated at rates that barely covered out-of-pocket costs (which constitute only half the unit transportation cost per tanker, the other half accounting for depreciation charges, taxes and return on investment). In other words, conditions of over-supply in the tanker market have made owners of 46,000 dead-weight ton tankers accept distress charter rates of about 20 cents per barrel.

2. It is our own contention that the low level of Tapline throughput since 1959 is not only due to competition with tankers but also to the element of "uncertainty" regarding negotiations with transit countries and the levels of payments which would have to be made. This element of "uncertainty" regarding

> transit negotiations with Saudi Arabia, (which are due between 1962 and 1964) will tend to keep the level of Tapline throughput low until agreement is reached with that country.

Although the surplus in the tanker market is unlikely to abate within the coming few years, Tapline's future is not as gloomy as one tends to believe.

In fact, only when the price differential between Ras Tanura and Sidon (or the alternative cost of moving crude oil by a tanker, including a return on its investment and Suez Canal tolls) falls below Tapline's unit cost of transportation at capacity levels would Taplibe be in a critical position and truly used to fill nothing but marginal requirements.

Even if in the next few years 85,000 deadweight ton tankers could move fully loaded through the Canal from the Arabian Gulf, it is estimated now that they

could return a profit at a charter rate yielding not less than 30 cents a barrel. Assuming that distress rates are not accepted by tanker owners and assuming Tapline unit transportation costs to remain the same, it seems that Tapline is already equipped to stand this kind of competition at pumping rates of slightly more than 250,000 barrels per day (a rate at which the transportation cost is estimated at 31 cents per barrel).

Perhaps in the more distant future, after the current tanker surplus has abated, increased Tapline and IPC capacities or an additional pipeline from the Arabian Gulf to the Eastern Mediterranean would be economically attractive. But possibilities of this kind have to be closely examined in the light of the availability of alternative means of transportation.

Sponsors of the Arab pipeline project have recognized lately that, if constructed, this pipeline would have to be competitive with tankers and would

thus yield a low rate of return on investment.

We can say that any construction of a new pipeline in the Middle East or any expansion of existing pipeline facilities in the area, whether by the Arab countries or the oil companies, must make sound business sense for crude oil marketing is a tough competitive business and because oil may be produced by push-button but it can not be sold that way.

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