

Petroleum Industry Stages

1- Research & Exploration

Include various studies, research and business technical and economic knowledge. This aims to identify the presence of the oil wealth in terms of quantity, quality and degree economically exploited.

2- Extraction stage

This stage includes a set of economic events and technical work on the creation of crude oil for the purposes of extraction and becomes ready to be transferred to centers and export demand, and this stage also includes preparation oil-producing wells and set up the equipment and facilities necessary for the pipeline and extraction operations.

3- Transportation

Which include the establishment, formation and provide specialized transportation to transport crude oil from production centers to centers and export demand, as well as the creation of tankers, container and in order to complete the transfer of the oil internally and externally.

4- Refining

The process of converting crude oil into petroleum products and the few products for use in its final form or centrist such as petrochemical and other industries.

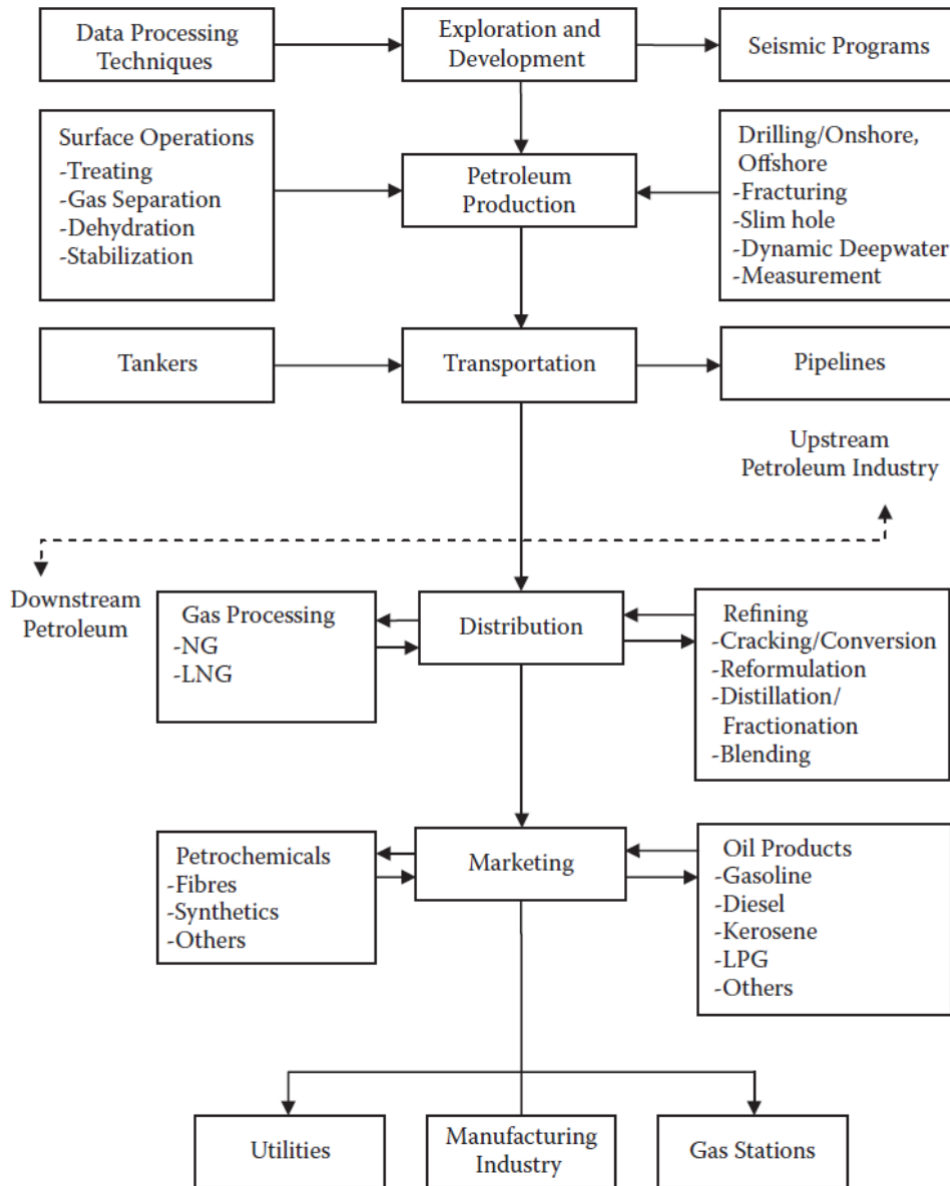


Fig.3 Petroleum industry stages from exploration to marketing

World Oil Supply

Crude oil production

Since the 1850s, oil has been produced in different parts of the world. The United States was the major producer; it produced over 90 percent of world production until 1875. Over the years and with the increasing importance of oil, new regions have emerged as key oil producers. The Middle East share of world's oil production has increased from 4.8 percent in 1940 to more than 25 percent in 2000, while the United States share reduced to around 10 percent in 2000 from 62 percent in 1940. Table 1 shows the share of crude oil production by region.

Table 1 Share of World Crude Oil Production (mbd) by Region from 1960 to 2010

Share of World Crude Oil Production by Region from (mbd) 1960 to 2010

Region	Year						2010 Share of Total
	1960	1970	1980	1990	2000	2010	
North America	9.20	13.26	14.10	13.85	13.90	13.88	16.6%
Latin America	2.90	4.83	3.75	4.51	6.81	6.91	8.9%
Western Europe	0.30	0.46	2.6	3.70	4.10	4.2	21.8%
Eastern Europe	3.20	7.60	12.31	12.4	10.5	13.81	21.8%
Middle East	5.30	13.90	22.02	17.54	23.55	25.18	30.2%
Africa	0.28	6.11	6.79	6.72	7.80	10.10	12.2%
Asia and Pacific	0.60	1.99	5.11	6.73	7.87	8.35	10.2%
Total	21.78	48.09	66.05	65.46	74.89	82.10	

Source: BP Statistical Review of World Energy, London, 2011. With permission.

As far as oil production compared with production of other forms of energy is concerned, Table 2 shows that between 1960 and 2010 the pattern of primary energy production changed between different forms of energy. The share of oil in world energy production reached its maximum in 1970 with more than 60 percent. This was caused by the decrease in coal production in major parts of the world. In the 1990s, however, the share of oil production declined to less than 40 percent as a result of its replacement by other forms of energy such as coal.

Table 2 World Primary Energy Production in Percent Share (Energy Mix in Production), 1960–2010

World Primary Energy Production in Percent Share (Energy Mix in Production), 1960–2010

Energy Source	Year					
	1960	1970	1980	1990	2000	2010
Oil	54.53	60.19	46.45	39.40	39.00	38.50
Natural gas	22.28	25.62	18.41	20.51	21.50	21.70
Coal ^a	20.36	11.56	26.18	28.07	28.1	28.20
Hydroelectric power	02.82	02.46	06.35	06.58	06.00	06.50
Nuclear power	0.01	00.17	02.60	05.43	05.40	05.10
Total	100	100	100	100	100	100

Production of Refined Oil Products

Production of refined oil products is determined by several factors, mainly the supply of crude oil, refining capacity, oil prices, environmental regulations, and world economic growth. However, adequate supplies of oil products depend on the optimal allocation between types of crude oils and an increasing supply of natural gas, which affect the sources of refinery feedstock. The type of crude oil with respect to its density and sulfur contents determines refining yields and refining processes. For example, light crude with lesser density will yield a higher proportion of more valuable final oil products such as gasoline and will require a less complex refining process.

In 2010 world production of refined oil products was estimated to be around 82.3 mbd with an average annual increase of 6 percent from 1960 to 2010. Figure 4 presents world production of refined products by regions over the period 1960 to 2010 compared to OPEC's share. The United States and Western Europe produce almost half of the world total. On the other hand, Latin America, Eastern Europe, and mainly Russia produced around 10 percent each of world production in 2010 over the same period. The

Middle East, which is the largest producer of crude oil, however, produces almost 8 percent of world production of refined products. This indicates that refineries were located near the consuming areas rather than producing areas, except in the case of the United States and Europe which are both major producers and consumers. Refineries located near the markets are known as market refineries, in contrast to resource refineries which are located near producing oil fields. Refinery locations can be determined by certain factors including product types and transport costs as well as political considerations.

Table 3 gives the distribution of world refining capacity by regions for the period 1965 to 2010. Before 1965 the United States led the world in refining capacity with a share of 67 percent of total world refining capacity.

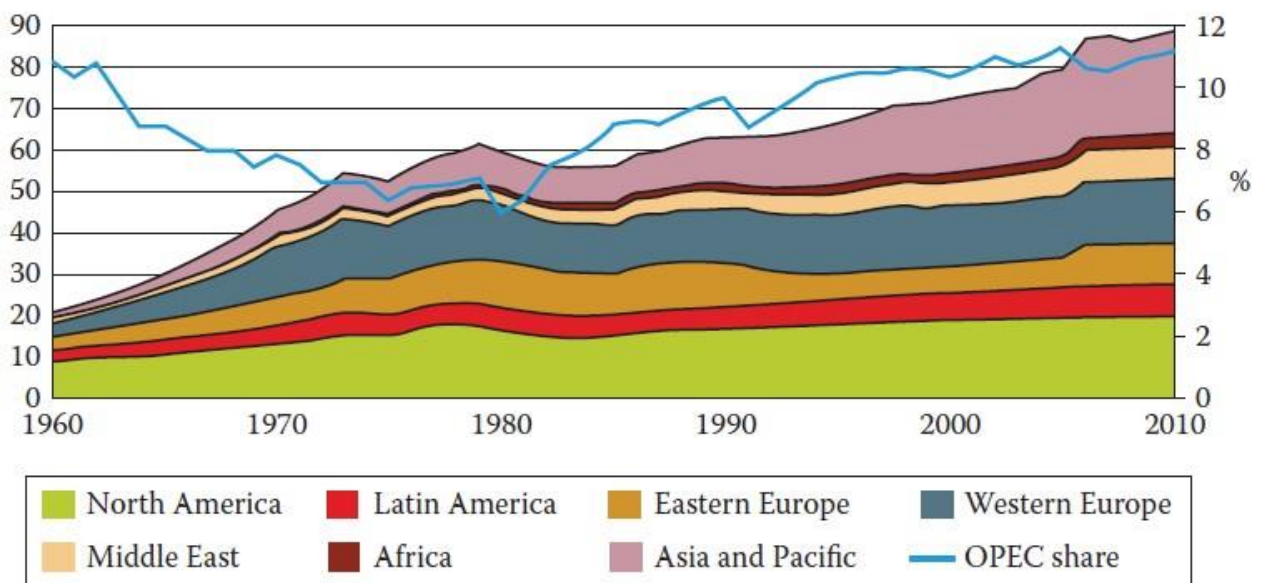


FIGURE 4 Production of refined products (mb/d), 1960–2010. (From *OPEC Annual Statistical Bulletin*, Vienna, 2010)

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Table 3 World refining capacity by regions for the period 1965 to 2010

World Oil Refinery Capacity by Region (1000 b/d)^a, 1965–2010

Regions	Year						Change 2010 over 2009	2010 Share of Total
	1965	1970	1980	1990	2000	2010		
North America	11,896	14,818	21,982	19,195	19,937	20,971	-0.7%	22.8%
South and Central America	3562	4808	7251	6009	6271	6707	0.3%	7.3%
Europe and Eurasia	13,194	21,968	32,136	27,909	25,399	24,516	-1.0%	26.7%
Middle East	1702	2466	3528	5260	6491	7911	1.2%	8.6%
Africa	560	697	2102	2804	2897	3292	8.9%	3.6%
Asia Pacific	3600	6588	12,364	13,470	21,478	28,394	2.7%	30.9%
World	34,514	51,344	79,363	74,647	82,473	91,791	0.8%	100.0%
Of which:								
OECD	22,852	34,591	49,833	40,542	44,761	45,124	-1.3%	49.2%
Non-OECD	11,662	16,754	29,530	34,105	37,712	46,667	3.0%	50.8%
European Union ^b	8413	15,119	20,669	15,239	15,456	15,240	-2.0%	16.6%
Former Soviet Union	4518	6105	10,190	11,217	8574	8033	0.9%	8.8%

^a Atmospheric distillation capacity on a calendar-day basis.

^b Excludes Lithuania prior to 1985 and Slovenia prior to 1991.

Note: Annual changes and shares of total are calculated using thousand barrels daily figures.

Source: BP Statistical Review of World Energy, London, 2011. With permission.

- Asia pacific= China, Japan, South Korea, Australia, India, Singapore, Taiwan, New Zealand

This trend has continued with a decreasing rate as the refining industry has been directed toward markets of refined oil products. Supporting this argument, refining capacity in Western Europe and Asia has increased substantially, and their shares in world refining capacity have increased to 27 percent and 30 percent in 2010, respectively. Over the last four decades the world refining capacity rose to reach more than 91 mbd in 2010 from 51 mb/d in 1970. The major contributors to this rise were Europe and the Far East. The Middle East as a major crude oil producer has increased its refining capacity from 1.7 mbd in 1965 to 7.9 mbd in 2010. However, against expectations, its share in world refining capacity has not increased substantially. As a matter of fact, it did not exceed 8.6 percent in 2010.

In forecasting refined oil products supply, it is assumed that world economic growth rates would be 2 percent per year from 2010 to 2015 and 3 percent from 2015 to 2020. Oil prices, however, would be around \$180 over the period 2010 to 2015 and would be in the range of \$100 to \$110 during the years 2015 to 2020. Figure 5 shows the future projections of world oil refining capacity for the years 2000 through 2020.

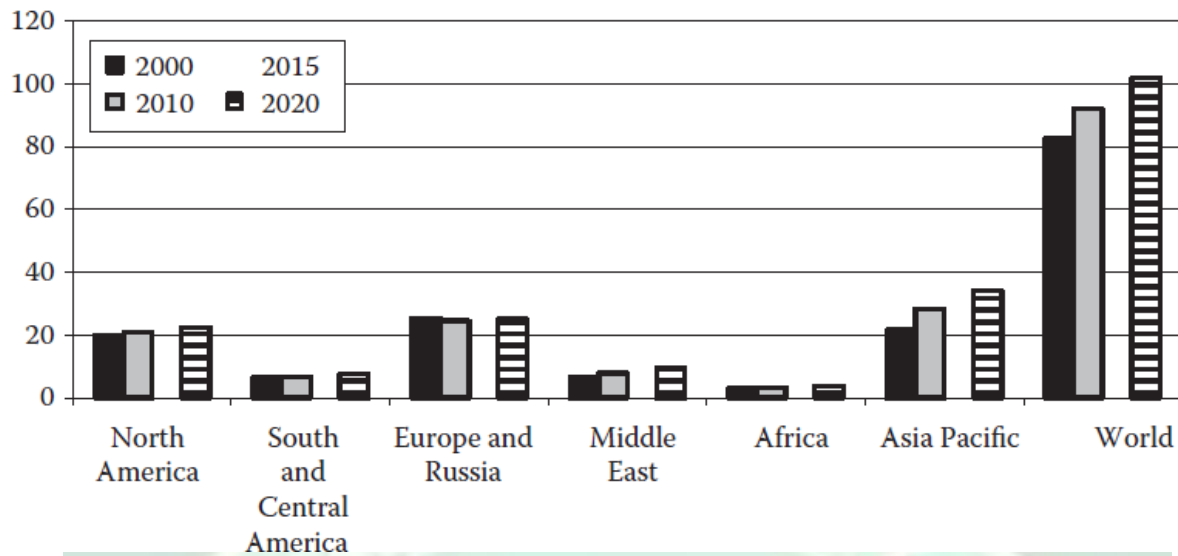


Fig 5: Forecasted World oil refining capacity (mbd), 2000–2020. From Alsahlawi M., Global Refining Industry Outlook, 2nd Annual Global Refining Technology Forum, 19 March 2012, Doha, Qatar

Surplus and deficit in the global oil supply

The different stage of the oil industry characterized maybe by norm or the shortage of crude oil production, where each stage suffer certain times of shortage or excessive production capacity.

The oil projects in all stages often take a long period of time starting from the planning process and until the start of the first stage of the production process which is known as (the period of pregnancy) as meaning that when he turns the decision to invest into energy productivity actual perhaps the world and prices will be changed.

For example:

The period (1974-1975) there appeared an oil surplus as a result of oversupply and lack of demand and the time period (1975-1980) was characterized by a lack of supply and

increased demand, which led to higher spot price, compared with the official price. Where it was a public official price for the year 1980 is \$ 29 a barrel / day while the spot price of \$ 36 a barrel / day.

The time period (1982-1988) increased crude oil production and increase supply, bringing the spot price for the year 1986 was (13 \$) barrels / day, while the official price (25 \$) barrels / day, during the same year.

1998, there were overkill in the supply of oil and this led to a collapse in prices, reaching \$ 10 a barrel / day.

The table below shows the total world oil (supply and demand) and the excess oil as well as the ratio of the Organization of Petroleum Exporting global supply.

Table 4 Total world oil supply and demand

Year	The total worlds crude oil		Oil Surplus	OPEC Supply	% OPEC from the world's supply
	Demand	Supply			
2001	76.6	84.6	8	30.5	36.1
2002	76.8	84.1	7.3	29.1	34.6
2003	79.3	79.7	0.4	28.3	35.5
2004	82.3	83.1	0.8	30.6	36.8
2005	83.7	84.2	0.5	31.6	37.4
2006	84.6	84.4	0.2	31.4	37.2
2007	85.8	84.8	1	31.0	36.5
2008	87	86.1	0.9	30.6	35.5

الترتيب العالمي	معدل النمو في الاستهلاك %		الاستهلاك المحلي لعام 2010	الدولة
	2010	2000		
1	1	2	19,15	الولايات المتحدة
2	3	10,4	9,06	الصين
3	2	1,5	4,45	اليابان
4	6	2,9	3,32	الهند
5	5	9,2	3,2	روسيا الاتحادية
6	14	7,1	2,81	السعودية
7	8	9,3	2,6	البرازيل
8	4	1,1	2,44	ألمانيا
9	7	2,5	2,38	كوريا الجنوبية
10	12	5,4	2,28	كندا

المصدر : BP Statistical Review of World Energy 2011

المصدر : BP Statistical Review of World 2011

معدلات الإنتاج والاستهلاك المحلي للنفط للعراق وبعض الدول العربية 2010-2009

نسبة 1:2	2010		نسبة 1:2	2009		الدولة
	الاستهلاك (2)	الإنتاج (1)		الاستهلاك (2)	الإنتاج (1)	
%	مليون برميل	مليون برميل	%	مليون برميل	مليون برميل	
42,9	1,8	4,2	33,3	1,3	3,9	العراق
16	0,4	2,5	9,1	0,2	2,2	البحرين
		0,9			1	الكويت
12,5	0,2	1,6	7,5	0,06	0,8	عمان
28	0,8	10	16,8	1,6	9,5	قطر
		0,4			0,6	السعودية
25	0,7	2,8	15,3	0,4	2,6	سوريا
		0,3			0,5	الإمارات
						اليمن

المصدر : BP Statistical Review OF World Energy 2011

Fig 6: The rate of production and supply in Iraq and some Arab countries

****The relationship between the three variables (the rate of explorer and production and reserves) with time:**

- 1- Changes in production volume / time. (dQ_P / dt)
- 2- Change in the rate of explorers / time. (dQ_D / dt)
- 3- The change in the reserve / time. (dQ_R / dt)

The possible relationship between the three variables above can be seen through the figure 7 below:

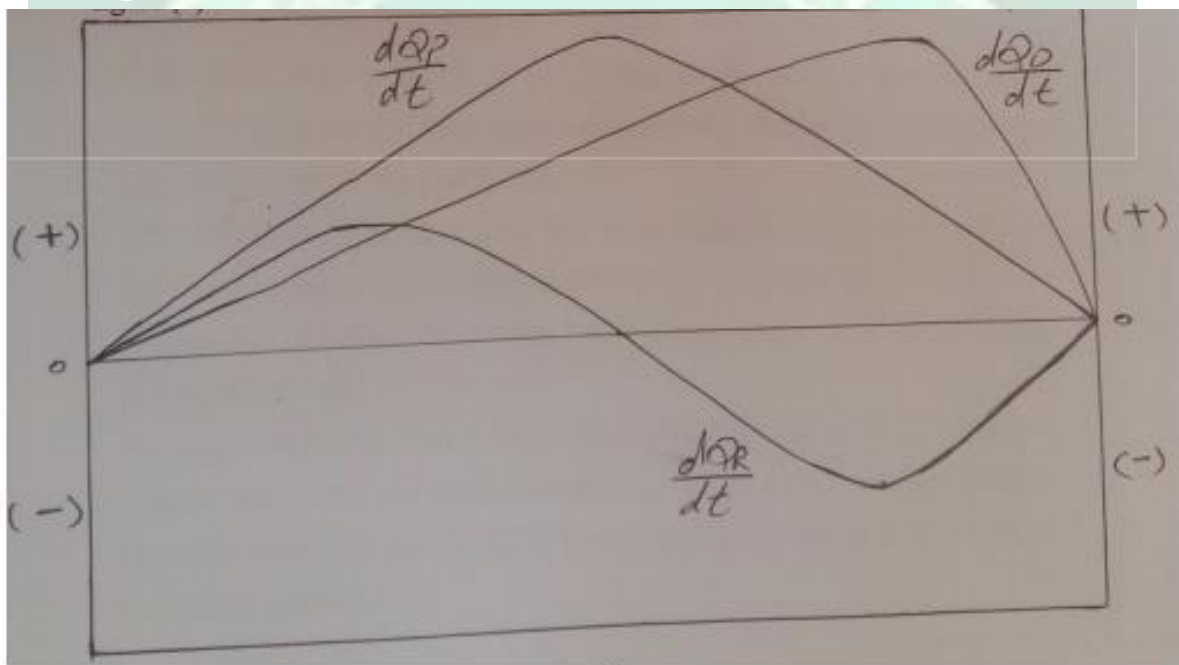


Fig 7: The rate of production, explorer and reserves with time

Conclusions from figure 1 as follows:

- 1- That the volume in the amounts of new oil discoveries (exploration) that add to the new reserve must be greater than the volume of oil production as a function of the time element. $(dQ_D / dt) > (dQ_P / dt)$.
 - 2- The new additions to the reserve for the original supplier base beginning countdown in the new stage. Where possible additions to be negative in some cases, because of:
 - A- The depleted cycle supplier has been ended (the oil well will be turned into a dry well).
 - B- The cost of extraction per barrel, of oil high compared with the global prices of oil.
 - 3- The relationships between the three variables shown in the above Figure 1 with time can be illustrate that the extent of the economic balances of oil, which, if made possible to elongation the cycle depleted supplier to the longest possible period.
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- 4- The process of oil production is greater than the size of the discoveries, which mean that the process of the original resource of oil is limited and the relationship is as follows: $(dQ_P / dt) \leq (dQ_R / dt)$.
 - 5- The relationship $(dQ_D / dt) = (dQ_P / dt)$, which indicates that the rate of additions and new discoveries are of course accelerate supplier depleted cycle.
 - 6- Relationship of $(dQ_P / dt) > (dQ_D / dt) > (dQ_R / dt)$ it produces fast drying process for oil wells.
 - 7- The relationship $(dQ_P / dt) < (dQ_D / dt) < (dQ_R / dt)$ which reflects the correct balance between the size of oil discoveries and additions size and the volume of production with time and this leads to prolong this relationship in the period of the resource depleted cycle.
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We note that Iraq has reserves that make it the owner of the longest lifespan of the oil reserves in the world where as much as 165 years, according to statistics for 2006 which is the longest lifespan in the world.