

OPEC: Its Role and Influence since 1960

Prof. Dr J. Clifford Jones



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Preface

My position in writing this book is that of an expert in matters relating to oil who is attempting to evaluate the role of OPEC over the 54 years of since it was set up at the first OPEC conference in Baghdad. There is a great deal of literature on OPEC, so an endeavour to describe its 'role and influence' in a book on the scale of this one might appear difficult to justify.

This book is a synthesis of carefully selected information on OPEC, a major essay in which the activity of OPEC since its beginning in 1960 is reviewed. Such matters as production quotas and the OPEC basket price loom large and I have tried to put the material together in a way which makes for continuity of theme. This, as already stated, has involved careful selection of documents and literature on OPEC. At least such information and documents are readily available in these days of the internet: the book would have taken much longer to write in the days of libraries stocked with hard copies. By the same token, the abundance of material now available electronically requires that an author drawing on electronic sources be discriminating.

The OPEC conferences feature throughout the book, and there is often more than one of these in a year. Information relating to such matters as production quotas, production levels and exports is often reported on a quarterly basis. Throughout the book I have tended (although there are some exceptions) to date events by the year only so as to avoid unnecessary detail.

More than once whilst obtaining information from the web in the writing of this book I have encountered a comment to the effect that information on production by particular countries and on production quotas sometimes differs from one source to another. This is certainly the case, and is the reason I have almost always backed up such information in this book with a reference so that a reader can at least examine for him or herself the sources I have (usually arbitrarily) chosen.

This book is not an *introduction* to OPEC. It is an advanced treatise directed at experts already having knowledge of and insights into such things. Even so it might serve as a confidence builder for someone new to the subject area wanting subsequently to tackle the more detailed and specialised books and articles about OPEC.

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J.C. Jones.

1 The origins of OPEC and its primary aims

1.1 Introduction

The five founding member of OPEC in 1960 were Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. Plate 1 below shows the first OPEC conference, held in Baghdad that year. In understanding the development of OPEC it is helpful to know the oil production figures in the respective countries at that time and these are given in the next section.



Plate 1.1. The first meeting OPEC conference, Baghdad 1960. Taken from [1].
Reproduced with the permission of OPEC.

1.2 Oil production in Iran, Iraq, Kuwait, Saudi Arabia and Venezuela in 1960

Figures for oil production in the OPEC countries at the time of formation are in the Table 1.1 below. They are taken from [2] and a discussion follows the table.

Country	Oil production/million barrels per day	Further information
Iran	1.07	The National Iranian Oil Company (NIOC), formed in 1948, became a consortium of foreign companies in 1954.
Iraq	0.97	Iraqi Oil Company, owned jointly by British Petroleum, Shell, Mobil and Standard Oil, formed in 1958 [5].
Kuwait	1.69	Kuwait Oil Company owned jointly by BP and Gulf Oil [6].
Saudi Arabia	1.31	Aramco – Arabian American Oil Company – formed in the 1930s [7].
Venezuela	2.85	Corporacion Venezolana del Petroleo (CVP) formed in 1960.

Table 1.1. Oil production figures of the OPEC countries in 1960.

The total obtained from summing the figures in the second column is 7.9 million barrels per day, slightly higher than the US production for that year which was 7.04 million barrels per day. World oil production that year was 21.09 million barrels per day [3], so the contribution from the countries which joined OPEC was 37% which is not hugely different from the 2013 figure which is 40% [4]. The matter of the proportion of the world's oil provided by OPEC countries will be a recurrent theme throughout this book.

Turning our attention to Iran, we note that one of the companies in the consortium referred to is BP (previously the Anglo-Iranian Oil Company) which had 40% ownership. Various US companies had another 40% and Shell had 14%. The balance of 6% was in the hands of Compagnie Française des Pétroles (CFP) which was the forerunner to Total. In Iraq (following row) a similar arrangement existed, consolidation into an aggregate composed entirely of foreign concerns. In each country political and social instability had jeopardized the oil industry previously, and this was one reason for the grouping of the oil companies into a single larger company which, it was believed, would make the industry less vulnerable. A similar formal arrangement existed at that time in Kuwait (next row). In Saudi Arabia (penultimate row) Aramco had been formed as a partnership between Standard Oil and the government of Saudi Arabia. Texaco had a share in Aramco by the time OPEC was formed.

In Venezuela (final row of the table) in 1943, a forty-year agreement was made between the government and a group of oil companies, beyond which the companies' own assets would go to the government. When the CVP was set up, over 20 years before expiry of the agreement, it operated in co-operation with the foreign companies.

An account of the OPEC conference of 1960, an illustration of which is given on the previous page, follows.

1.3 The OPEC conference in 1960

1.3.1 Motives for convening the conference

The meeting, which took place over five days, was called at the initiation of Iraq. The president of the conference was the Iraqi minister for oil. Oil production in the countries which came together for the conference was in the hands of seven major oil companies. Often referred to as the 'seven sisters', these companies were BP, Gulf Oil, Standard Oil of California, Texaco, Shell, Standard Oil of New Jersey and Standard Oil Company of New York [8]. These companies had control over exploration, production and downstream operations such as refining. The arrangements whereby the foreign oil companies leased oil fields and paid royalties was seen as being to the disadvantage of the member countries. It was believed that the issues summarised in this paragraph needed to be addressed if oil prices were to be free of erratic rises and falls with their knock-on effects on national and international economics. Avoidance of conflict with the sovereignty of member states was seen as being important to the success of OPEC. For example [9], it was stated that OPEC could not take action against a member state which failed to comply with its decrees. The respective nations are represented at the conference by their oil ministers or equivalent who elect from amongst themselves a president who remains in office for one year.

1.3.2 Resolutions of the conference.

The reader is referred elsewhere (e.g. [10]) for the resolutions expressed formally. Their gist will be outlined here. The first was an admonition that the member countries must not show 'indifference' to oil pricing as previously the foreign companies working in the member countries often had. Member countries were therefore required to regulate the companies so that major fluctuations in oil prices did not occur. During the previous few years there had been a drop in oil prices. One of the resolutions of the OPEC conference was that member countries should work towards reversal of this trend and restore prices to the level that they were before the decline began. In one of the formal resolutions of the conference it was stated that regulation of production was required of member countries as one way of avoiding such drops: the earlier drops in price were believed to be due to over-production in some countries including Russia. At a time when a single company would undertake both production and refining as noted above, these countries were producing oil at a much greater rate than that at which they could refine it and the surplus was entering world markets. The regulation of production expected of OPEC countries would help to ensure that there was no such build-up of oil, rather that production and downstream operations kept abreast of each other.

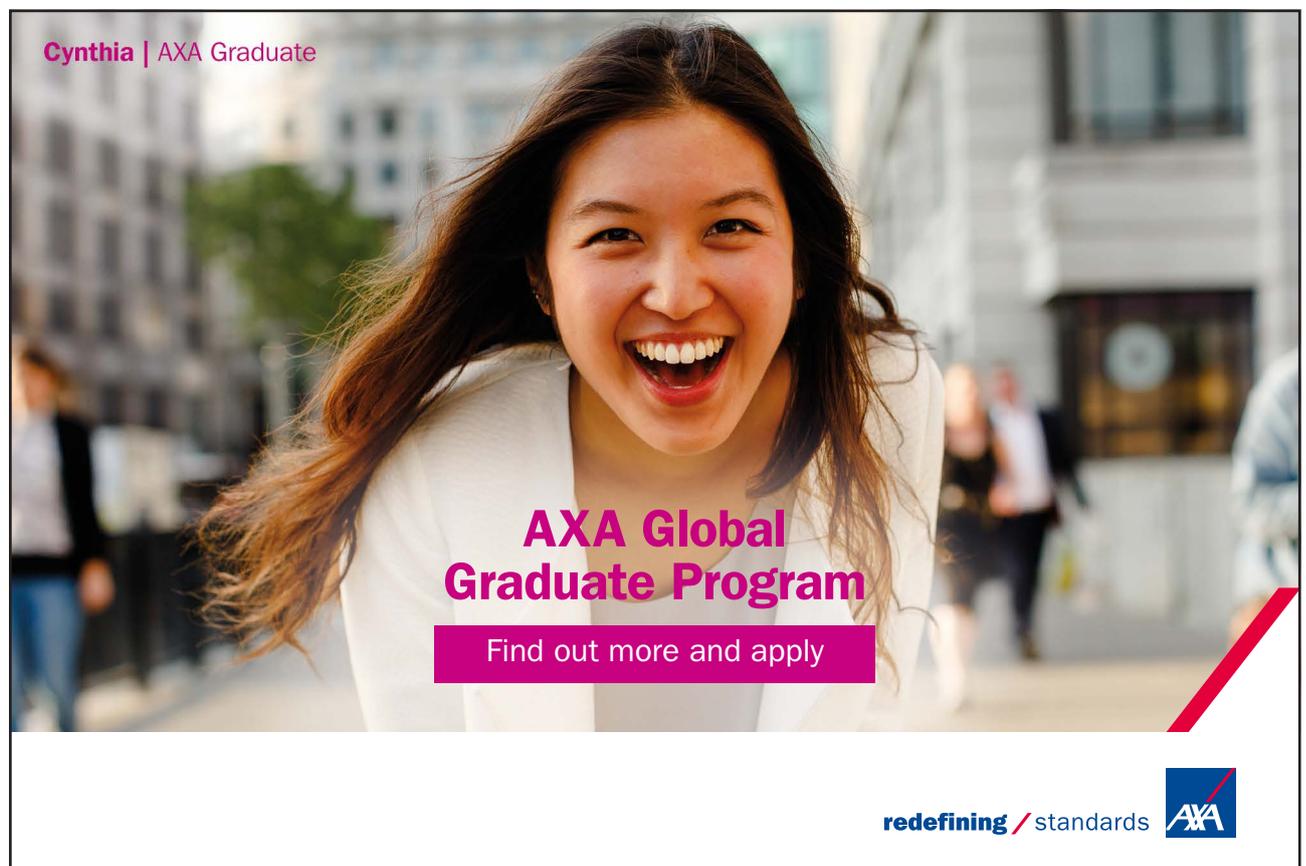
Another factor in oil price decline at that time had been the imposition of oil import quotas by the US in 1959, the Mandatory Oil Import Program (MOIP) [11]. This set limits on amounts of oil imported to the US. In its initial form the Mandate stated that imported oil must not exceed in quantity the 1957 level. Three years later this was changed to 12.2% of domestic production. Canada and Mexico were considered separately from the Middle East countries in implementation of the Mandate in a way that worked to the disadvantage of the countries which were to form OPEC. The reason for this was probably not political, simply a reflection of the fact that oil from Canada and Mexico could be brought overland into the US. In any case this was a factor in the decline of oil prices which led to the production regulation requirement decreed by OPEC at its first conference.

1.4 Other early OPEC conferences

The second and third OPEC conferences were held respectively in Caracas and in Tehran in 1961 [12]. These were concerned with OPEC's internal organisation, for example it was decided at the conference in Tehran to have the secretariat in Geneva. At the second conference Qatar was admitted to membership. The fourth conference was held in Geneva in 1962. Libya and Indonesia were admitted to membership at it. It must not be imagined that the creation of OPEC had eliminated the collective power of the oil companies. Previously oil companies had imposed a 1.5% deduction from the sale price of the oil on the basis that the country from which the oil originated should share some of the cost of marketing. At the 1962 conference the justice of this was questioned, and in 1963 the oil companies acting as a consortium reduced the deduction from 1.5% to 0.5%. Other changes to the accounting, and payment to the producing companies from the operators, were made at this conference [13].

The fifth OPEC conference was held in 1962–63 in Riyadh, by which time Qatar, Libya and Indonesia had become OPEC countries. At the time of the sixth conference the OPEC countries were producing 11 million barrels per day of oil and the cumulative amount over the period of OPEC's existence was approaching 40 million barrels [14]. Kuwait was at this time the strongest member in terms of production at 2 million barrels per day. At this time oil prices were falling and certain resolutions were passed in order to reverse this. One was a new way of calculating royalties, fully explained in [15]. Although the oil companies were opposed to this, it was in the event implemented. Here OPEC did not act as a corporate body; each member country negotiated internally. It was however seen as being collective bargaining and was the first time that the oil companies, previously a very powerful lobby, had yielded to an OPEC resolution. This was an indication that two to three years after its formation OPEC was having the influence it needed to control oil prices, therefore its *raison d'être* was evident.

The sixth OPEC conference was held in 1964 in Geneva, and was attended by representatives of countries including Trinidad and Tobago and Nigeria as well as the then OPEC countries. Trinidad and Tobago were at that time producing of the order of 120000 barrels per day [16]. Texaco had been active in the country since 1956 [17]. These non-OPEC countries were present at the conference as enquirers. Nigeria joined OPEC several years later: T&T did not join. In the same year the seventh conference was held in Jakarta. Algeria was also represented at the sixth conference, and was to apply for membership at the seventh conference, which was held in Jakarta.



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The year 1965 was a momentous one for OPEC: three OPEC conferences were held and the HQ was moved from Geneva to Vienna. The eighth, ninth and tenth conferences were respectively in Geneva, in Tripoli and in Vienna. The HQ is still in Vienna, so a suitable way of classifying the ‘early’ conferences for the purposes of this book is to consider those before the move of the HQ to be the early ones. A picture of the HQ in Vienna is given below.



Plate 1.2 World HQ of OPEC in Vienna.

1.5 Further information

At the stage where this chapter closes, the middle of the 1960s, the OPEC countries were producing close to 14 million barrels per day. The international production that was 32 million barrels per day, so the now enlarged OPEC was producing 43% of the world's oil, therefore the figure of $\approx 40\%$ from 1960 given previously was being sustained by the now expanded OPEC. Over the period covered by this chapter prices realised for OPEC oil were to fluctuate in the range \$1.50 to \$1.63 per barrel. There were to be no new members of OPEC until 1967 when Abu Dhabi joined. Abu Dhabi became part of the United Arab Emirates (UAE) in 1971, and the UAE itself entered OPEC in 1974. They were followed by Algeria (1969), Nigeria (1971), Ecuador (1973, withdrew 1992, readmitted 2007), Gabon (1975, withdrew 1996) and Angola (2007). The OPEC Statute [18] says:

...any country with a substantial net export of crude petroleum, which has fundamentally similar interests to those of Member Countries, may become a Full Member of the Organization, if accepted by a majority of three-fourths of Full Members, including the concurring votes of all Founder Members.

Against this background on the setting up and development of OPEC its activity will be discussed in the subsequent chapters. First an introduction to OPEC price will be given.

1.6 The OPEC basket price

1.6.1 Composition of the 'basket'

At the 79th OPEC conference, held in Geneva in 1986, the OPEC basket price was introduced as a benchmark price [19]. It comprised six crudes from OPEC countries and one from a non-OPEC country. The current composition of the basket, introduced in 2005, is given in the table below. The significance of the 2005 basket composition is that in contrast to the original one it contained no non-OPEC crude. The entry for Minas is in parenthesis because although this was one of the crudes in the 2005 composition of the basket it was omitted after Indonesia left OPEC in 2009. Similarly the Oriente crude was added after Angola joined OPEC. Minas crude alone is now a recognised benchmark crude.

Crude	Origin	Specifications
Saharan blend	Algeria	45.3 degrees API, 0.1% S [20]
Girrasol	Angola	29.9 degrees API, 0.33% S [21]
Oriente	Ecuador	24 degrees API, 1.59% S [22]
Iran heavy	Iran	30.6 degrees API, 1.8% S [23]
Basra light	Iraq	33.5 degrees API, 1.5% S [24]
Arab light	Saudi Arabia	32.6 degrees API, 1.8% S [25]
BCF-17	Venezuela	16.5 degrees API, 2.53% S [26]
Bonny light	Nigeria	35.3 degrees API, 0.15% S [27]
Murban	United Arab Emirates	40.2 degrees API, 0.79% S [28]
Kuwait export	Kuwait	31.4 degrees API, 2.52% S [29]
Es Sider	Libya	36.7 degrees API, 0.37% S [30]
Qatar marine	Qatar	32.6 degrees API, 1.85% S [31]
Oriente	Ecuador	24 degrees API, 1.59% S [32]
(Minas)	(Indonesia)	(33.9 degrees API, 0.09% S [33])

Table 1.2 Composition of the OPEC basket.

The pre-2005 OPEC basket price used a simple average of the properties of the respective crudes. Since 2005 have been a number of revisions of the basket composition, most recently in 2009.

1.6.2 Relationship of the OPEC basket price to other benchmark prices

A reader examining the above table will observe that several of the crudes in the OPEC basket are of low API gravity (= high density: see also section 4.3) and quite high sulphur content. By contrast the West Texas Intermediate (WTI) benchmark is 39.6 degrees API and 0.24% sulphur. The OPEC basket price at any one time tends to be \$2–4 lower than the WTI price. The Brent benchmark crude, applied *inter alia* to North Sea oil, has a comparable API to WTI but more sulphur. The OPEC basket price tends to be \$1–2 below the Brent price [34]. There are numerous web sites (e.g. [35]) which show graphs of two benchmark prices against time on the same axes for comparison, and these an interested reader can consult. The OPEC basket price on the day of writing this (late June 2014) is \$111.30 per barrel.

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2 Entrants to OPEC after 1965

2.1 Algeria, entered 1969

2.1.1 Background

Oil production in Algeria began in 1956 at the Edjelleh field. In the same year oil was discovered at Hassi Messaoud (Plate 2.1 below), an onshore field where production began in 1960 [1]. The formation at Hassi Messaoud is sandstone.



Plate 2.1 Gas flaring at the Hassi Messaoud oil field in Algeria. Photo taken from [2].

2.1.2 The lead-up to membership

In 1967, about the time when Algeria was making a bid for OPEC membership, cumulative production at Hassi Messaoud over the period since 1960 was 25 million barrels [3]. In the same year there were 30 productive wells, each yielding 6000 barrels per day or more. In 1979, ten years after Algeria's admittance to OPEC, the field produced 9.5 million barrels [4]. At that time the companies operating the field were SN Repal (France) and CFP (also France, as noted in the previous chapter).

The second largest oil field in Algeria is the Rhourde El Baguel oil field, also onshore, which at the time of Algeria's entry to OPEC had been producing for about six years [5]. In 1964, two years after Algeria's independence and five years before her admittance to OPEC, the Algerian oil company Sonatrach was set up. Its contributions to developing the hydrocarbon resources of Algeria were major. For example, in 1964 it constructed Algeria's first oil pipeline over a distance of 805 m [6].

2.1.3 Production performance at the time of admittance

Table 2.1 below gives the production information for Algeria for 1968–70, taking in the year of admittance and one year either side of it. The corresponding figures for Saudi Arabia and Qatar are also given. Saudi Arabia was a founding member, and Qatar the first member to be admitted after foundation.

Country → Production figures ↓	Algeria.	Saudi Arabia.	Qatar.
Production 1968/ million barrels per day	0.904	3.043	0.340
Production 1969/ million barrels per day	0.946	3.216	0.356
Production 1970/ million barrels per day	1.029	3.799	0.362

Table 2.1 Oil production in Algeria, Saudi Arabia and Qatar over the period 1968–70. Figures taken from [7].

The 14% growth in Algerian oil production over the period 1969–70, calculable from the figures in the table, can be compared with 24% growth in the total oil production by the OPEC countries over that time interval, calculable from information given in [7].

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2.2 Nigeria, entered 1971

2.2.1 Background

Exploration for oil in Nigeria began in the early years of the 20th Century, and was finally rewarded by a discovery in 1956 at Oloibiri in the Niger Delta [8]. Production began in 1958 at ≈5000 barrels per day. In 1965 the EA field, an offshore field in shallow water, was discovered by Shell. The Nigerian National Petroleum Company (NNPC) came into being and many of its operations have been jointly with foreign firms.

2.2.2 Entry to OPEC

There were five OPEC conferences in 1971, the year that Nigeria entered, the 22nd to the 26th. It was at the 24th conference, held in Vienna in July of that year, that Nigeria was admitted to membership. Its crude oil production in 1969 was 0.54 million barrels per day, increasing in 1970 to 1.08 million barrels per day. The large increase reflects of course the cessation of the Nigerian civil war (a.k.a. the Biafran war) in 1970. In 1971 there was another dramatic increase and a daily output of 1.53 million barrels per day was recorded.

2.2.3 The oil scene in Nigeria at the time of joining

In 1971 the Oloibiri field, referred to in section 2.2.1, was still productive. An onshore field, Oloibiri continued producing until 1978. By the time Nigeria joined OPEC there had been major exploration activity in the Niger Delta. The first export of oil from Nigeria was in 1958 (two years before Independence from Britain). By the early 1960s exports were being despatched from Bonny Island. Then as now, vandalism and theft have been a major difficulty in the oil industry of Nigeria. During Nigeria's early years in OPEC oil prices rose and Nigeria prospered. Yakubu Gowon, Nigeria's head of state from 1966 to 1975, is famously on record as having said that in Nigeria the problem is not money but how to spend it.

2.2.4 Further information

It has been estimated that between the discovery of oil in Nigeria in the 1950s and the end of the 20th Century ≈\$US 340 billion had been raised from the sale of oil by Nigeria and, in the same source [10], pointed out that the country has little to show for it. In 1971, the year of Nigeria's admittance, the OPEC contribution to world oil supply was an unusually high 52% [9].

2.3 Ecuador joined 1973, withdrew 1992, rejoined 2007

2.3.1 Background

In 1972, the year prior to its joining OPEC, Ecuador produced a modest 0.08 million barrels of oil [7]. By the end of the 20th Century by which time quotas were being assigned to member countries of OPEC (see below), this had risen to about 0.4 million barrels per day. By a decade into the 21st Century half a million barrels of oil per day were being produced, still a fairly minor component of OPEC's total production. A major oil field in Ecuador is the Lago Agrio oil field, discovered in 1967 and producing since 1972. An onshore field, Lago Agrio (the name means 'sour lake' in Spanish) had a cumulative production of 1.7 billion barrels by 1992, a major proportion of which was exported to the US. Petro Ecuador had acquired most of the production capacity by the late 1970s and owns all of the refining capacity [10]. Both in production and in pipelining neglect of maintenance has been a problem, harmful to the environment as well as to the oil industry.

2.3.2 Withdrawal in 1992

In 1982 OPEC started to impose production quotas on member countries. That assigned to Ecuador for 1992 was 0.32 million barrels per day. OPEC had set the rather low quotas that year in order to keep prices up: too much oil on the market would have had the opposite effect. Ecuador wished to produce significantly more than that and was also unwilling to pay the annual membership fee of around \$US 2 million (1992 rating) [11]. Ecuador's withdrawal in 1992 was for these reasons, and the President of Ecuador pointed out that the UK, Norway (both major offshore producers by then) and Mexico (one of the first countries to enter the oil industry, together with the US and Russia) oil industries had not been not harmed by non-membership of OPEC [12]. The matter of conflict between a country's membership of OPEC and its rights as a sovereign state, expressly addressed by OPEC as described in section 1.3.1, has been alluded to in discussions of Ecuador's departure [12].

2.3.3 Re-admittance in 2007

By 2007 Ecuador was producing 0.5 million barrels per day. For the previous few years she had been importing some, and in 2007 the net exports – exports minus imports – were 0.2 million barrels per day [13]. The imports are from neighbouring Colombia by pipeline and are taken directly to a refinery [14]. In December 2007 at the 146th OPEC conference in Abu Dhabi, Ecuador was formally welcomed back to OPEC. At the same OPEC conference a quota for Ecuador of 0.52 million barrels per day was agreed to.

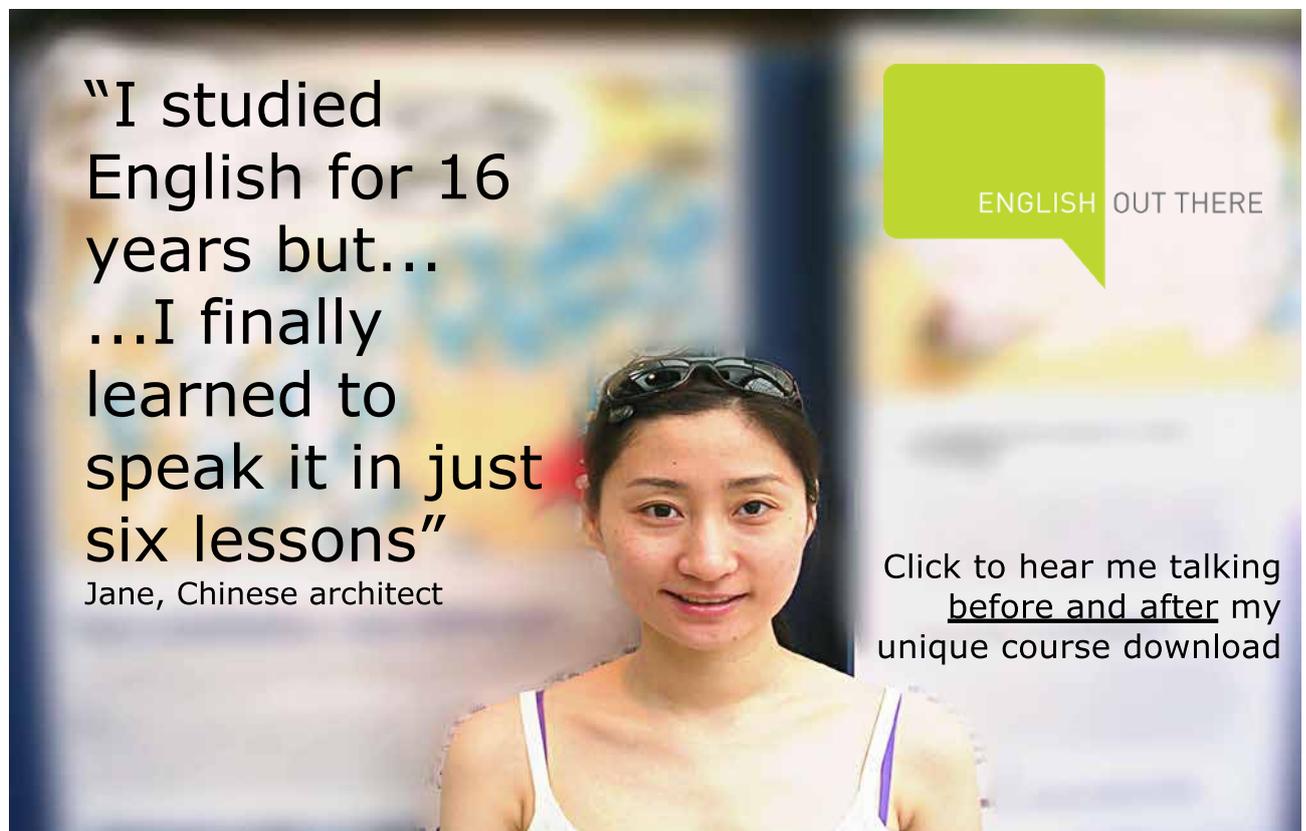
2.4 Gabon, entered 1975, withdrew 1996

2.4.1 Background

At the time of Gabon's entry into OPEC the Gambia-Ivinga field, an onshore field, was the major oil field of Gabon. It entered production in 1967 with Shell as the operator. In the same year the nearby Sogara refinery entered service [15]. The now highly productive Rabi Kounga field, also onshore, was then some 18 years from discovery. These oil fields are all close to Port-Gentil, a coastal city the culture and economy of which have been strongly affected by the presence of expatriates working for oil companies and oil field services companies such as Halliburton [16].

2.4.2 Major fields commencing production after 1975

At the Rabi Kounga field (see above) [17] production began in 1989, discovery having been by Shell-Gabon two years earlier. At that stage its estimated reserves were 1 billion barrels [18]. It has horizontal wells in addition to vertical ones, and is seen as a good example of the successes of horizontal drilling [19].



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Numerous fields offshore Port-Gentil have come into operation since Gabon's departure from OPEC. These include the Etame field, discovered in 1998 by Vaalco Energy and entering production in 2002 [20]. Another is the Avouma field, which commenced production in January 2007, a few months before Ecuador's re-admittance to OPEC [21]. Partners in the enterprise include Sasol. Avouma is 17 km south of Etame, and has shared infrastructure with it. This has involved pipeline transfer of oil from Avouma to a floating production, storage and offloading unit (FPSO) at Etame, to await further downstream operations. The FPSO is called the *Petróleo Nautipa* and was constructed in Japan in the 1970s having before the conversion been a tanker. An image of this is shown below.



Plate 2.2 The FPSO *Petr leo Nautipa* in service at the Etame field offshore Gabon, having received oil from the Avouma field. Photograph from [21].

There are other examples of developments offshore Gabon, and the point being made is that Gabon has a strong offshore oil and gas industry, and that this was not the case on withdrawal in 1994. The first quota assigned to Gabon after re-entry was 1.9 million barrels per day.

2.4.3 Withdrawal, 1996

This was in protest at the fee. The same fee is payable by all members of OPEC irrespective of oil revenue [22]. Gabon, like Ecuador and Angola (details to follow), was only ever a minor contributor to the total annual OPEC amount. In 1994 Gabon's proven oil reserves were 1400 million barrels in contrast to Saudi Arabia's 261374 million barrels [23], yet OPEC required the same membership fee from each. The fee is in Austrian schillings, and in 1994 it converted to ≈\$US 2 million. The Gross domestic product of Gabon in 1994 (when the intention to withdraw was first expressed) was \$US 3981 and that of Saudi Arabia \$US 7382. This might be factor in hypothetical scaling of membership fees.

2.5 Angola, joined 2007

2.5.1 Background

At the 144th OPEC conference in Vienna in March 2007, Angola was welcomed as a new member, its Minister of Petroleum being present to represent the country. At the 145th conference in September that year, also in Vienna, a decision was made to increase the OPEC output of oil by 0.5 million barrels per day. This meant adjustment of the quotas, although Angola was exempted from this as a new entrant. At the 146th conference in December that year Angola was assigned a quota (referred to in the OPEC record of the conference [24] as a production allocation) of 1.9 million barrels per day. The 146th conference was held in Abu Dhabi and it was at the same conference that Gabon was assigned the quota referred to in section 2.4.2.

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2.5.2 Angola at the time of entry

The first commercially significant oil production in Angola was at the onshore Benfica field, discovered in 1955 and coming into production the following year. The Cabinda fields (note the plural) offshore Angola were discovered in the late 1960s and were to become amongst the most productive oil fields in the world. An example is the Dalia field, discovered ten years before Angola became an OPEC country [25]. The field is 85 miles out to sea from the coast of the province of Angola called Cabinda, which is in fact an exclave [26]. The sea depth at Dalia is 1200 to 1500 m, making it a deep water field. This is not true of all of the Cabinda fields: the Takula field, also offshore Cabinda, has water depths of only 50 to 75 metres [27]. Production there began in 1982. Foreign oil field services companies including Stolt Offshore (HQ in Aberdeen) have been and continue to be active in offshore Angola.

2.6 Further information

The OPEC statutes provide for associate membership and the below is taken from [28]:

Associate Members are those countries that do not qualify for full membership, but are nevertheless admitted under such special conditions as may be prescribed by the Conference.

Note the clear message that the conference is the decision making instrument of OPEC. Associate member countries are formally represented at OPEC conferences but do not have a vote. One would expect that associate membership would, with planned growth of the oil industry in the associate member country, lead to full membership. This is true of Gabon, which became an associate member in 1973. During the American occupation of Iraq the US represented Iraq at OPEC.

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3 Production quotas

3.1 Background

These were introduced in 1982 as reported in the previous chapter. Their formal introduction was at the 63rd OPEC conference in Vienna in April 1982. This chapter will examine country by country the production quotas over the period from then to the present and will attempt to draw out the significance of the quotas and their effects on supply. OPEC themselves now use the term ‘production allocation’ instead of ‘quota’. The two terms are used synonymously and interchangeably in this book. A great deal of the information in this chapter has been taken from the OPEC web pages.

3.2 Iran

Iran was assigned in 1982 a production allocation of 1.2 million barrels per day. The OPEC total production target for that year was 17.15 million barrels per day [1] so Iran’s allocation was 7% of the total. Iran was at this time producing 2.44 million barrels per day [2] well in excess of her quota which was doubled in the revised quotas, which ran from April 1983 to October 1984. In a break with tradition the 67th OPEC conference in 1983 [3] was held in London, and this kept the total OPEC production unchanged. The rise in the Quota for Iran was offset by a reduction in that to Saudi Arabia, as were much smaller increases in the quotas for the other countries. This is typical of how Saudi Arabia acts as a ‘swing producer’, a point which will be explained more fully later in this text. Quotas assigned to other OPEC countries at this time will be discussed in turn below.

Iran’s OPEC quota is now 3.3 million barrels per day, having over the 32 years since quotas were introduced risen without any dramatic increases or decreases although there was a dip around the year 2000. There have of course been sanctions against Iran because of her nuclear holdings and activity, and these have been a factor in production below the quota since 2011. In that year production fell short of the quota by about 0.5 million barrels per day [4]. At the 164th OPEC conference in Vienna in December 2013 the representative from Iran announced that with the lifting of sanctions Iran hoped to push its production up to 4 million barrels per day, and requested co-operation from the other OPEC countries. This was favourably received, for example the representative from Venezuela (current quota \approx 2 million barrels per day) indicated a willingness to adjust. Nevertheless Venezuela is seeking a rise in its own quota, to be accommodated by a rise in the scheduled total OPEC production to which a value of 30 million barrels per day applied at time of the 164th OPEC conference [5]. Clearly, quotas assigned to member countries and total OPEC production are finely balanced.

3.3 Kuwait

The initial (1983–84) quota assigned to Kuwait was 0.8 million barrels per day [6] and it rose in increments to 1.5 million barrels per day in 1990. Then came the Gulf war, as a result of which no quota was assigned to Kuwait or to Iraq. At the 87th OPEC conference in Geneva in July 1990, allegations by Iraq that Kuwait, by producing in excess of its quota, was causing a drop in oil prices were addressed. Tightening of adherence to quotas was enjoined across all of the OPEC countries. At the conference an upper limit of 22.491 million barrels per day for the OPEC countries in aggregate was imposed in addition to quotas applying to member countries: Kuwait was assigned quota of 1.5 million barrels per day. A reference price of \$21 per barrel for the OPEC basket (see section 1.6) was set [7]. Absence of Kuwait and Iraq from the quotas at that time meant that other OPEC countries could be allocated larger quotas. For example, the quota for the UAE, having been 1.5 million barrels per day in 1990, was raised in 1992 to 2.2 million barrels per day [8]. This large jump was not solely due to the Gulf war: OPEC had raised its total production target and some of the increase was incorporated into the UAE quota.

In late 1991 Kuwait expressed a resolve to restore oil production to the 1990 quota of 1.5 million barrels per day by the end of 1992 [9]. Burning of oil by the Iraqi forces had caused a loss of $\approx 2\%$ of the total oil reserves of Kuwait. By the time all of the wells which had been set alight during the war had been capped, Kuwait was producing 0.5 million barrels per day and did attain the pre-1990 OPEC quota (but not the pre-1990 production: there was an excess in 1990 as noted above), and in September 1993 a quota of 2 million barrels per day was assigned to Kuwait. In the first ten years of the 21st Century the OPEC quota for Kuwait remained fairly steady at ≈ 2.2 million barrels per day, and across this period there was consistent overproduction of up to $\approx 25\%$ [10].

3.4 Venezuela

Its OPEC quota in the first round of such quotas was 1.5 million barrels per day [6], rising incrementally to 2.7 million barrels per day by the end of the 20th Century. It is probably clear from what has been written in this book up to this point that one of the purposes of OPEC is to prevent oversupply of oil on to the world's markets at any one time. Such oversupply will reduce the price of oil, to the disadvantage of the nations which produce it.

In 1999 Hugo Chávez became President of Venezuela. It was his policy to increase Venezuela's prosperity through its oil and accordingly to push for lower oil prices realisable only by controlling production and curbing overproduction.



Plate 3.1 107th OPEC conference in Vienna, March 1999. Image taken from [11].

The first OPEC conference during the period of Chávez’ presidency was the 107th (see plate above) held in Vienna in March 1999, and at it Venezuela’s oil minister said that Venezuela would comply with reductions in quotas [12]. At that time Venezuela’s quota was reduced from 2.845 million barrels per day to 2.720 million barrels per day. The other OPEC countries also received cuts to their quotas, and it was at about this time that Iraq ceased to receive a quota, an issue which will be discussed later in the book. The policy of limiting production to raise prices was successful: the 2000 figure for the OPEC price, averaged over the months, was \$27.60, a major rise from the figure for the precious year which was \$17.48 [13].

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When Hugo Chávez died in March 2013 obituaries (e.g. [14]) emphasised his role in oil pricing. The fact that Venezuela is a major supplier of oil to the US – approaching one million barrels per day in 2013, having previously been higher [15] – strengthened his position in such matters.

3.5 Saudi Arabia

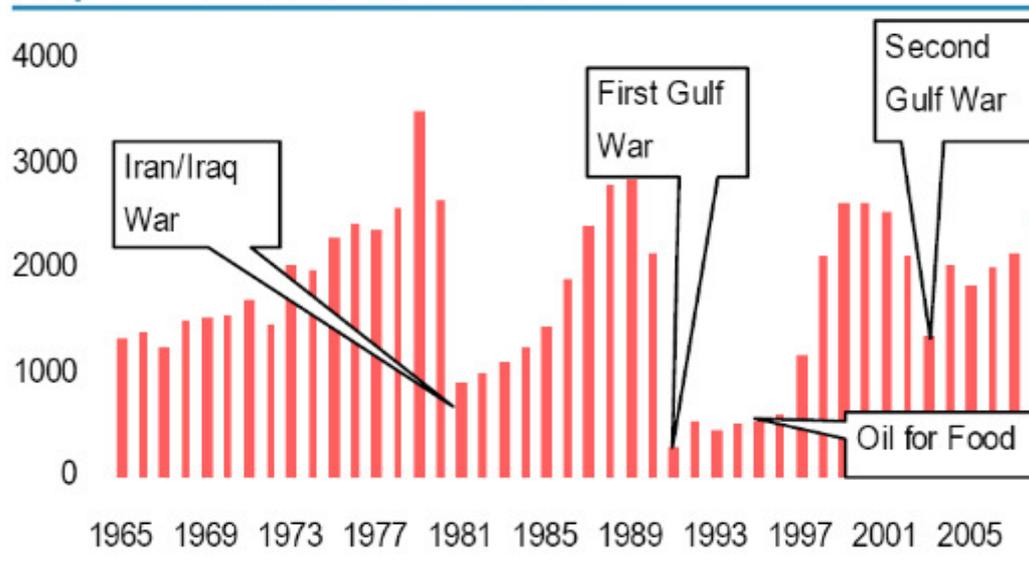
Saudi Arabia, the world's largest producer of oil, has the ability to vary and adjust her production from full capacity downwards, and this is why she became the 'swing producer' of OPEC. This has meant that when there has been oversupply by the other OPEC countries Saudi Arabia has reduced its production so as to maintain prices. Saudi Arabia began to function thus in the first half of the 1980s [16]. The term 'swing producer' was applied to Saudi Arabia in the formal documents from the 67th OPEC conference which was held in London in 1983 [17].

The mid 1980s saw the 'oil glut' and its effects on oil prices. The OPEC basket price for 1985 was \$27.01, that for 1986 \$13.53 [18]. Saudi Arabia, Iran and Iraq had all made huge reductions to their production over the previous seven years, in Saudi Arabia's case a reduction from 8.3 million barrels per day in 1978 to three 3.2 million barrels per day in 1986, a drop of 61%. In spite of the restraint shown by these major producers there was a large excess of oil on the market, a great deal of it from non-OPEC countries. The OPEC representatives were kept very busy during 1986: there were four OPEC conferences that year, one of which was reconvened once and another of which was reconvened twice. A major point arising from the lengthy debates and deliberations was that any future 'swing' role would be on the part of OPEC collectively and not solely by Saudi Arabia.

3.6 Iraq

Iraq's initial quota in the early 'eighties was 1.2 million barrels per day. Her OPEC quota was suspended in 1988, by which time it stood at 1.54 million barrels per day. It was restored for a period and suspended again in 1999, a state of affairs which continues.

Iraqi Oil Production, 1965-2008



Source: JPMorgan Energy Strategy, 2009 BP Statistical Review

Figure 3.1 Iraqi oil production showing events which have influenced it.

Figure 3.1 above, taken from [19], shows Iraq's oil production over a 40 year period, and indicates where production was adversely affected by war. The figure also refers to the oil-for-food programme. This was brought into being by the UN and its scope extended beyond food to medical supplies and educational requisites. The Iraqi oil exported was paid for by the importer and the proceeds made available for purchase of the goods after a proportion had been deducted as reparations from the invasion of Kuwait by Iraq in the early 1990s. Iraq was permitted to supply 2 million barrels per day under this programme.

Since 2011 Saudi Arabia has been seeking reinstatement of her OPEC quota having by that time raised her oil production to 2.9 million barrels per day [20]. Meanwhile OPEC is having to adjust the quotas of its other members to accommodate the very high production from Iraq. The need for a swing producer remains and there have been reports that Iraq and Iran jointly might take on that role. In that event Iraq might continue not to be assigned a quota, though for a totally different reason than previously. At the time of writing (mid 2104) Iraq has not been assigned a quota.

This chapter has now covered all of the five founding members, so attention will be turned to members having joined later, starting with Qatar.

3.7 Qatar

Qatar’s quota in the earliest days of such quotas was 0.3 million barrels per day, and this rose slowly to 0.37 million barrels per day by 1990. That was also the quota for 1997, and at the 103rd OPEC conference in Jakarta in November that year it was noted that Qatar was producing well in excess of that, actually ≈0.6 million barrels per day. The overproduction was in order to fund major expansion of natural gas production in Qatar. The graph below, taken from [21], shows how this tendency to overproduction has remained with Qatar. The information was compiled by the US Energy Information Administration (EIA).

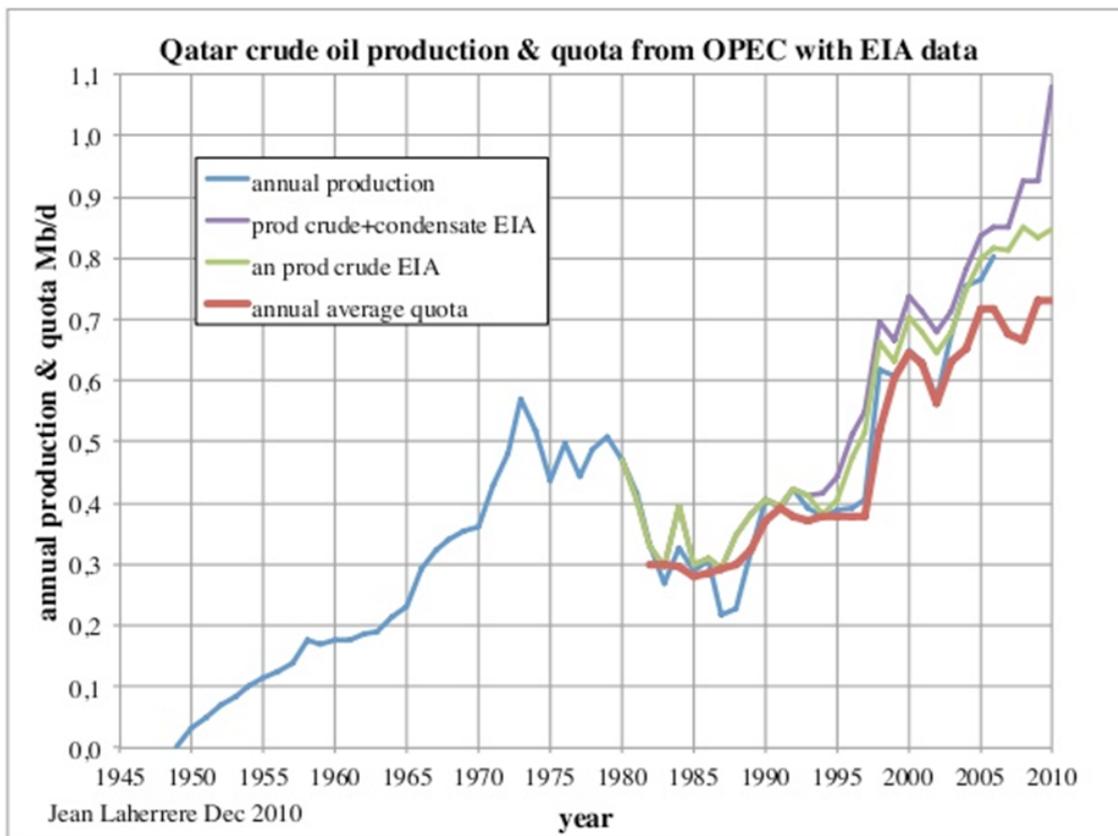


Figure 3.2. Hydrocarbon production by Qatar since circa 1950. Taken from [21].
Reproduced with permission.

The total – crude oil plus natural gas – plot above is increasing very rapidly. Qatar is a major gas producer and it is expected that its condensate production will exceed its crude oil production as soon as 2015. This raises a point of general interest: what is the attitude of OPEC towards condensate? OPEC distinguishes a condensate from a crude oil not on the basis of whether it was conveyed from the scene of production by an oil pipeline or a gas pipeline but according to certain properties the most important of which is the API gravity [22]. This for a condensate is set at 50 degrees API, corresponding to a density of 780 kg m^{-3} , or less dense still. It is pointed out in [22] that condensate from Sangu in Bangladesh (not of course an OPEC country) has an API gravity of 24 degrees (density 910 kg m^{-3}), therefore it does not conform to the OPEC classification of a condensate. Condensates are not included when OPEC quotas are decided even though the distinction between a condensate and light crude is, on the OPEC classification, fairly arbitrary. Of course, OPEC and non-OPEC countries alike blend condensate with crude oil, but the quota specifies crude oil, not oil after it has been so processed.

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3.8 Libya

The early quotas for Libya were in the neighbourhood of 1 million barrels per day. Libya's oil production dropped in 2011 because of the civil war, and the International Energy Agency (IEA) organised transfer of 60 million barrels of oil from the emergency reserves of its own member countries [23]. It was the first time this had happened since the 2005 Gulf Coast hurricanes. The IEA has 29 member countries and they include to US and the UK. At the end of 2013 Libya's oil production had dropped to < 0.5 million barrels per day. This was its production at time of 164th OPEC conference in Vienna in December 2013. Commentators [24] were asking how a million barrels per day could be deducted from the total 2014 production if Libya was able to resume compliance with its quota of 1.5 million barrels per day.

3.9 Indonesia

In the first round of quotas Indonesia was assigned 1.3 million barrels per day. The quota hovered in the range 1.2 to 1.4 million barrels per day up to Indonesia's withdrawal from OPEC in 2008 [21]. At the time Indonesia left OPEC its quota was 1.4 million barrels per day. Its production, including condensate, was 0.98 million barrels per day [25]. At that same time Indonesia's oil consumption was 1.26 million barrels per day making the country a net importer of oil by:

$$(1.26 - 0.98) \text{ million barrels per day} = 0.28 \text{ million barrels per day.}$$

Indonesia has imported oil from Saudi Arabia. Other significant suppliers included Nigeria, Azerbaijan, United Arab Emirates, Qatar, Malaysia, and Angola. Two of these countries are non-OPEC. A difficulty in Indonesia was aging fields, one example amongst many being the Bekapai field, discovered in 1972 and producing since 1974 (see Figure 3.3 below). It is in shallow water (23m [26]) offshore East Kalimantan. From 55000 barrels per day in 1978, its production has declined to 7000 barrels per day by the present time. Of course, such decline is not necessarily irreversible; it can be overcome by well workover and/or enhanced oil recovery (EOR).

These two factors – failure to meet the quota and becoming a net importer – led to Indonesia's decision to leave OPEC. It is clear from this that both overproduction and underproduction can be a difficulty with OPEC membership.

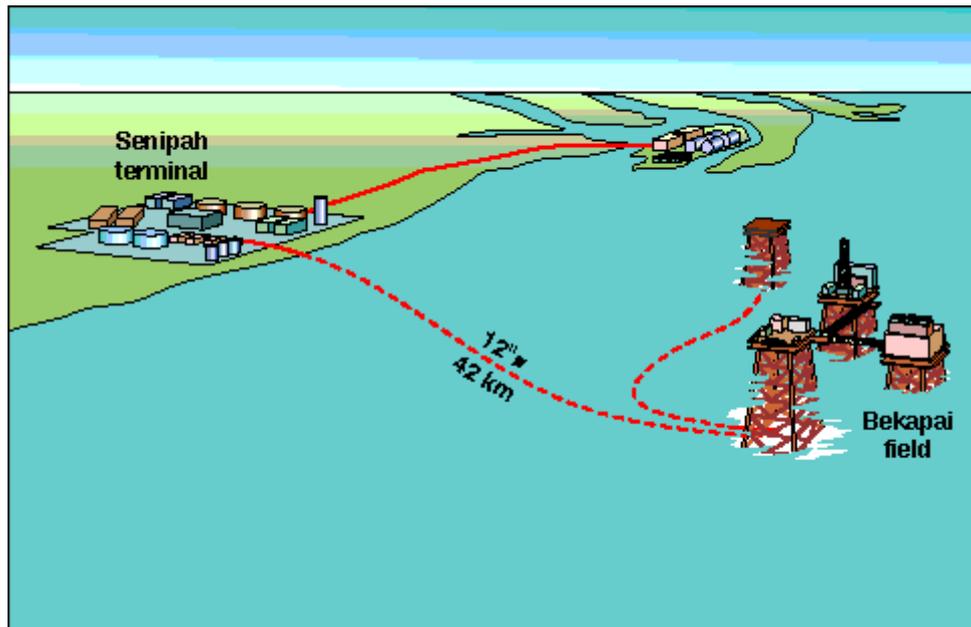


Figure 3.3 Offshore oil production at Bekapai, East Kalimantan. Taken from [27].
Note the floating storage and offloading (FSO) vessel, which is permanently moored at Bekapai.

3.10 The United Arab Emirates (UAE)

The UAE (the quota system did not exist when Abu Dhabi alone was a member) was initially assigned a one million barrel per day quota which gradually rose to about 2 million barrels per day by the year 2000.

The importance of overproduction of oil by Kuwait as a factor in the invasion of Kuwait by Iraq in 1990 has been widely discussed e.g. [28, 29]. In July 1989 Saddam Hussein criticised Kuwait and the UAE equally in this respect, and added that their overproduction was aiding the US policy of keeping oil prices down [30]. In the first half of 1990 not only the UAE but several other OPEC countries were overproducing, and this dominated the agenda of the 87th OPEC conference in June that year [31]. New production quotas across the entire group of OPEC countries were set. These were suspended in August 1990, as the invasion of Kuwait by Iraq meant that neither country was exporting oil. At that time the UAE was producing 2.1 million barrels per day. In March 1992, by which time quotas were again being assigned, the UAE quota was set at 2.2 million barrels per day [32].

3.11 Algeria

A fairly minor producer in comparison with say Saudi Arabia, Algeria was assigned a quota of 0.65 million barrels per day in 1982. She is a major overproducer, especially since the ROD (Rhourde Oulad Djemaa) fields entered production in 2004 at 18000 barrels per day [33]. The fields are onshore and in a desert environment. Initial operators were Eni (Italy), BHP (Australia) and Sonatrach (Algeria) [34]. Production had risen to 84000 barrels per day by the end of 2008 [35]. The issue of the equivalence or otherwise of crude oil and gas condensate as it applies to Algeria is discussed in [36]. There it is stated that in 2011 Algeria produced 1.27 million barrels per day of crude oil as well as 0.61 million barrels per day condensate/NGL, and that the condensate/NGL did not contribute to the OPEC quota. An interesting point is that there might be a stronger case for considering crude oil and condensate together for Algeria than for the other OPEC countries as Algerian oil is unusually light. A major Algerian oil field is the Bir Rebaa North field, also in the desert. Foreign operators there have included Agip and Eni. Crude oil from Bir Rebaa North has the exceptionally high API gravity of 53 (density 767 kg m^{-3}) [37] which is above the minimum API gravity (maximum density) in the OPEC classification of a condensate. There are other oil fields in Algeria crudes from which have an API gravity above 40 degrees.



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At the 150th OPEC conference in Vienna in August 2008 a ceiling was put in place for the OPEC countries in aggregate and each country was assigned a *decrease* in production accordingly instead of the production quotas previously imposed. Algeria was requested to drop her production by 71000 (0.071 million) barrels per day, which is of the order of 10–15% of the quotas she had in recent years been assigned [38]. The 151st OPEC conference was held in the Algerian city of Oran [39]. At this the ceiling was lowered and countries were assigned new values for the decreases in production. Intuitively we'd expect regulation by this means to be more efficacious than production quotas compliance with which was often the exception rather than the rule. This approach was however a contingency measure and quotas on production were later reintroduced.

3.12 Nigeria

The earliest quota allocated to Nigeria by OPEC was 1.3 million barrels per day. At that time (early 1980s) she was producing 1.3 to 1.4 million barrels per day. In the first decade of the 21st Century Nigeria's quota was each year around 2 million barrels per day. An ongoing difficulty with Nigeria is attacks by rebels on oil facilities, and it is reported in [40] that production losses as high as half a million barrels per day – a significant proportion of the OPEC quota – have sometimes resulted. Shell, which has had a presence in Nigeria since 1937, has recently experienced sabotage by militants at its Forcados Terminal in the Niger Delta and is invoking force majeure in defence of its inability to deliver [41]. This sort of thing is as indicated prevalent, as is theft of oil. For example [42], in 2002 Nigeria could not meet its OPEC quota of 2.108 million barrels per day because of vandalism and theft.

The Nigerian National Assembly recently introduced the Petroleum Bill, the aim of which is to increase revenues from oil to fund further industrialisation of the country [43]. Its passage will require major response from the oil companies and the uncertainty that it will become law has caused there to be deferred production [44]. It is not only the decline in fuel *per se* that is a difficulty for Nigeria. When OPEC quotas are assigned a steady and stable production over the previous few years is required for a rise in quota to be considered. Nigeria's current bid for a rise in quota [45] will be placed in jeopardy by the disruptive factors outlined above.

3.13 Ecuador

At the time Ecuador left OPEC she was overproducing [10]. On rejoining OPEC in 2007 she was assigned a quota of 0.52 million barrels per day [46]. By 2011 her quota had been reduced to 0.429 million barrels per day, and she was producing 0.5 barrels per day and therefore overproducing. The graph below shows the step change in quota, also the production figures before and since re-entry to OPEC.

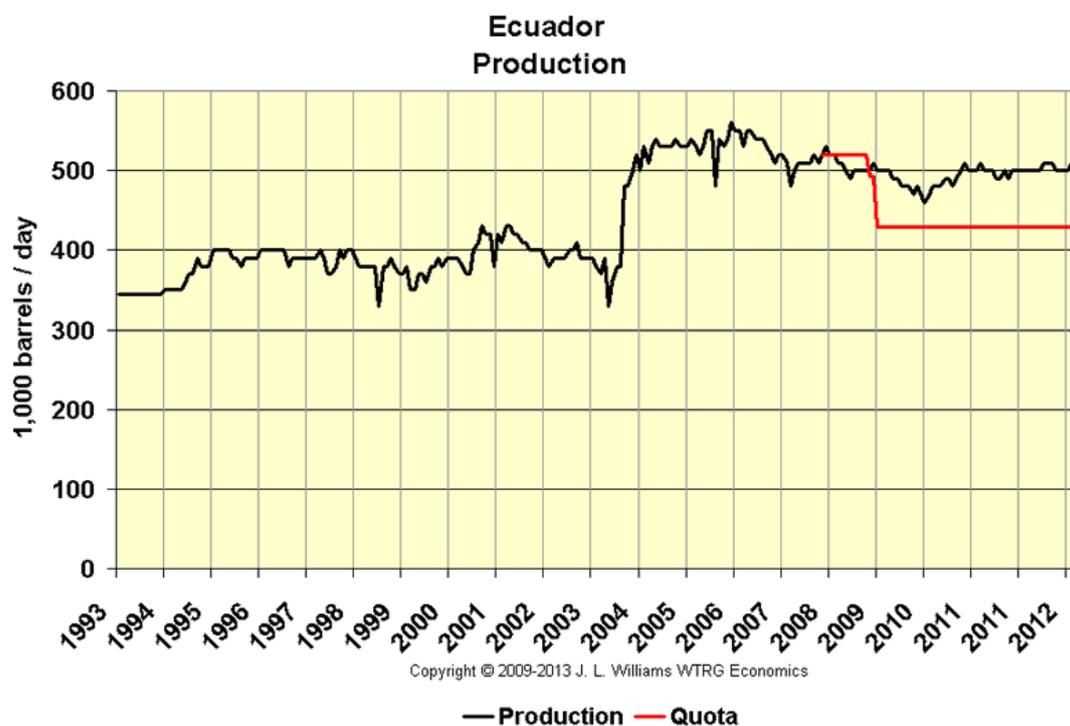


Figure 3.4. Production figures and OPEC quotas for Ecuador. Taken from [47].

It is clear from the graph that in the 2–3 years before re-admittance Ecuador was producing strongly.

Being weak in downstream capability, Ecuador imports refined products from crude oil [48]. This is set to change when the Refineria del Pacifico refinery is set up on Ecuador's Pacific coast [49]. When the at the 150th OPEC conference in 2008 countries were required to cut their production levels as described in section 3.10, Ecuador was assigned a reduction of 27000 barrels per day. Inspection of Figure 3.4 reveals that there was quite a sharp dip in production at this time.

3.14 Gabon

At the time of her withdrawal from OPEC Gabon had a quota of 0.287 million barrels per day and was producing 0.335 million barrels per day [50]. It did not go unremarked that Gabon failed to send a representative to the 98th OPEC conference in Vienna in June 1995 and withdrawal, as noted in an earlier chapter, came the following year. Gabon had previously had difficulties with adhering to OPEC quotas. It is recorded [51] that at the 78th OPEC conference in Brioni, Yugoslavia in June 1986, Gabon's representative declared himself unable to accept the total production ceiling for OPEC and left the conference in protest.

3.15 Angola

Angola entered OPEC in 2007 as noted, and in 2009 made a case for exemption from the quota system [52]. Its representative argued that it needed to produce more oil than the quota allowed for because of rebuilding after the civil war, which ended in 2002. A comparison was made with Iraq which was exempted from quotas because of reconstruction after war. At the 156th OPEC conference in Vienna in March 2010 Angola was assigned a quota of 1.65 million barrels per day and was at that time producing 1.75 million barrels per day.

3.16 Further comments

Clearly the setting of quotas is a major part of OPEC's function even though such quotas have often been honoured in the breach. In the coming months the matter of a quota for Iraq will be a major issue, the setting of the quota and possible reductions in the quotas of the other member countries to accommodate it. It is clear that in the allocation of quotas there is push-pull between OPEC's aims to keep oil production down and the needs of member countries to increase production so as to maintain export revenue.



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4 Organisations operating alongside OPEC

4.1 The national oil companies

Table 4.1 below gives details of the national oil companies of all of the current members of OPEC. Information in [1] has been used.

Country	National oil company	Comments
Saudi Arabia	Saudi Aramco	Noted in [2] that other OPEC countries follow best practices developed by Saudi Aramco.
Kuwait	Kuwait Petroleum Corporation (KPC)	Several subsidiaries: Kuwait Oil Company (KOC) responsible for exploration, drilling and transfer of oil to tankers. Kuwait National Petroleum Company (KNPC) responsible for refining. Q8 responsible for marketing.
Venezuela	Petróleos de Venezuela S.A. (PDVSA)	Activity in the Caribbean as well as in Venezuela.
Iran	National Iranian Oil Company (NIOC)	Targeted in recent sanctions against Iran (see section 3.2).
Iraq	State Organisation for Marketing of Oil (SOMO)	Responsible for all of the crude oil sold by Iraq.
Libya	National Oil Corporation [of Libya] NOC	Works in association with several foreign oil companies.
Algeria	Sonatrach	See section 2.1.2.
Nigeria	Nigerian National Petroleum Corporation	All upstream activity in association with other oil companies.
Qatar	Qatar Petroleum (QP)	Through its subsidiary Qatar Petroleum International, activity in many other countries including the UK.
Ecuador	Petroecuador (PE) Petroamazonas (PA)	Both state owned.
UAE	Abu Dhabi National Oil Company (ADNOC)	Formed in 1971, the year in which Abu Dhabi joined OPEC (see section 1.5).
Angola	Sonangol	Norway's Statoil also active offshore Angola.

Saudi Aramco (first row of the table) has a production capacity of 12 million barrels per day. Clearly Saudi Arabia owes its ability to act as a 'swing producer' to this. The logo of the KPC (next row) is shown as Figure 4.1 below. The company is aiming at production of 4 million barrels per day by 2020 [3].



Figure 4.1. Logo of the Kuwait Petroleum Corporation.

Petróleos de Venezuela S.A. (next row) has a production capacity of four million barrels per day [4] which of course signifies over capacity. PDVSA are the sole owners of Citgo [5] which operates three refineries in the US, one in TX, one in LA and one in IL. The joint capacity of these is 0.75 million barrels per day. They receive imported crude oil from Venezuela and refine it for the US market. NIOC (following row) produces ≈ 0.5 million barrels per day of condensate in addition to crude oil. This includes condensate from the South Pars field, which has an API gravity of 54 degrees (see section 3.7). An offshore field of water depth 65 m, this was developed by Petropars in which, at the time of initial development, the NIOC pension fund had a 60% stake. SOMO (next line) is not at this stage expected to export oil from the parts of Iraq now forming Kurdistan. The performance of Libya's NOC (next row) was affected adversely by the civil war in 2012 and is still not back to pre-war production levels. One of the most recent activities of Sonatrach (next row) is, with two other oil companies, development of the offshore condensate field Tsila [6]. There have been fraudulent dealers in oil claiming the authority of NNPC (next row) selling oil at about \$6 below the OPEC price on the grounds that the oil is excess to the OPEC quota [7]. Such oil, if it is from Nigeria at all, has been misappropriated and dealings in it are quite illegal. Theft of fuel is a continual problem in Nigeria as already noted. By 2015 QP (next row) will be producing as much condensate as oil. There has been recent partial merger of PE and PA (next row) with PA taking over E&P from PE. ADNOC (penultimate row) produces condensate and is set up to refine it at a rate of 0.28 million barrels per day. In this way jet fuel is supplied to the major international airport at Abu Dhabi. Sonangol (last row) has had overseas activity in countries including Iraq, from which it has recently withdrawn because of the unsettlement there.

4.2 OAPEC

4.2.1 Introduction

The Organisation of Arab Petroleum Exporting Countries was set up in 1968 and its present membership is, with year of joining in parenthesis, Algeria (1970), Bahrain (1970), Egypt (1973), Iraq (1972), Kuwait (1968), Libya (1968), Qatar (1970), Saudi Arabia (1968), Syria (1972), and United Arab Emirates (1970) [8,9]. Seven of the members are also members of OPEC. The international HQ of OAPEC is in Kuwait. Tunisia was initially a member but withdrew in 1986.

4.2.2 The 1973 oil embargo

OAPEC was set up a few months after the 1967 oil embargo. On October 3rd (the Jewish holy day of Yom Kippur) 1973, Egyptian and Syrian forces initiated an attack on Israel in order to recover for the Arabs territories they had lost as a result of the six day war in 1967 which, as noted, had itself led to an oil embargo. After President Richard Nixon granted aid to the tune of \$2.2 billion in support of Israel OAPEC imposed on oil embargo on the USA as well as on other countries including the UK, the Netherlands and Japan. Oil prices rose dramatically [10] and were never to return to the level before the Arab-Israeli war.

4.2.3 OAPEC vs OPEC?

Given that several countries are members both of OPEC and of OAPEC one might intuitively expect that situations would arise where there was conflict of duty and loyalty between the two.

Possibly OPEC's most important role is the setting of quotas. OAPEC does not set quotas, so there is no potential for disagreement over the quotas. Of course, the production of a particular country might be influenced by OAPEC and this in turn will determine whether the OPEC quota is adhered to. Sometimes OPEC and OAPEC consult each other [11].

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OAPEC sees an important part of its function as providing facilities for member countries. One of these [12] is the Arab Maritime Petroleum Transport Company (AMPTC) which is based in Kuwait. Set up by OAPEC in 1973 [12], AMPTC owns oil tankers as well as liquefied petroleum gas (LPG) vessels. One of its tankers – the Album – came under pirate attack in the Strait of Hormuz in March 2014. Plate 4.1 shows the vessel. Other enterprises of OAPEC [12] include the Arab Shipbuilding and Repair Yard Company (ASRY) in Bahrain. Its position is seen as being strategic in that it can receive for repair vessels having been damaged in an attack [13].



Plate 4.1. The Album crude oil tanker, part of the Arab Maritime Petroleum Transport Company (AMPTC) fleet.

4.3 The standards bodies

Table 4.1 on the following page gives details of the standards bodies in each OPEC country with one example of a standard issued that is relevant to hydrocarbon production. Comments follow.

SASO 619-1990 (first row) is the local counterpart of [15]:

ASTM D1298 – 12b Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

It is an anomaly that either SASO or the much more influential ASTM should issue a standard for the API (American Petroleum Institute) gravity when API is itself a major standards body. Moving to the following row, KOWSMD represents Kuwait at ISO, the international standards body with its HQ in Geneva, and itself promotes ISO standards. The KOC standard cited in the table itself draws on other standards including one by the National Fire Protection Association (NFPA, HQ near Boston MA). The Iranian standard appertaining to gasoline in the next row is sourced from an ASTM (American Society for Testing and Materials, HQ in Philadelphia PA) standard. Moving to the following line we note that no Venezuelan standards body is a member of ISO; it is the only OPEC country not so represented at ISO. Algeria, in the following row, uses ISO 14001 as do many other countries. The full name of this is:

ISO 14001 Environment management systems and standards



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Country and standards body.	Example of a standard.
Saudi Arabia: Saudi Standards, Metrology and Quality Organization (SASO) [14].	SASO 619-1990: 'Methods of Testing for Crude Petroleum and Petroleum Products – Determination of Density, Relative Density and API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method Arabic Version'.
Kuwait: Kuwait Public Authority for Industry Standards and Industrial Services Affairs (KOWSMD) [16]. This represents Kuwait at ISO. Kuwait Oil Company (KOC) develops standards for in-house use.	KOC-MV-007: 'Standard for field erected storage tanks' [17].
Iran: Institute of Standards and Industrial Research of Iran (ISIRI) [18].	ISRI 4192: 'Standard test method for lead in gasoline by atomic absorption spectroscopy'.
No Venezuelan standards body a member of ISO.	-
Algeria: Algerian National Institute of Standardization (IANOR).	ISIRI 10726-1: Applies to the inter alia to the shipping of liquefied gases [19].
Qatar: Laboratories and Standardization Affairs (QS). Issuance of in-house standards by Qatar Petroleum (QP).	QP-REG-S-001: 'HSE Regulations for Contractors': Health, safety and environmental Incorporates several British, European and US standards. See main text.
Nigeria: Standards Organisation of Nigeria (SON). Nigeria Industrial Standards Centre (NIS). Iraq: Central Organization for Standardization and Quality Control (COCQC).	NIS 141: 2006 'Specification for Kerosene' COSQC 86 'Determination of Flash Point by Pensky- Martins Open Cup' COSQC 134 'Determination of Fire and Flash Points by Cleveland Open Cup' [21]
Ecuador: Instituto Ecuatoriano de Normalización (INEN).	(RTE INEN) No. 008 'Welded steel tanks and cylinders for liquefied petroleum gas (LPG) and accessories thereof'
United Arab Emirates: Emirates Authority for Standardization and Metrology (ESMA).	UAE.S 477 :2013 Diesel (Gas Oil)
Libya: Libyan National Centre for Standardization and Metrology (LNCSM). Libyan Petroleum Institute (LPI).	-

Table 4.1. Standards bodies in the OPEC countries.

For example, BP report [20] that their drilling operations in and offshore Algeria are ISO 14001 compliant. Amongst the standards contained within QP-REG-S-001 is API Spec. 6A for wellhead equipment. NIS (following row) have a comprehensive range of standards relating to hydrocarbons. They include and NIS 371: 1997 Standard for Hydraulic Oil. Standards are not usually accessible online free of charge, and that is true of these NIS standards which, therefore, the author has not been able to examine. Intuitively we'd expect that the one for kerosene given in the table would contain the particle deposition temperature. Kerosenes are of course used as jet fuel and particle deposition at the low temperatures experienced at altitude has to be prevented. We'd expect that the one relating to hydraulic oils would involve the flash point. Flash points are the subject of the two Iraqi standards cited in the row below, and it is interesting to note that they both use the open cup method to the exclusion of the closed cup. In the standard from Ecuador in the following row RTE stands for Ecuadorian Technical Regulation in the local language. For a helpful commentary on ESMA (penultimate row) a reader can consult [22]. In addition to ESMA (next row) there is a body called the Gulf Standards Organisation (GSO). Often, where a standards body is a member of ISO, a standard it issues becomes an ISO standard. An example is:

UAE.S/GSO ISO 13879 :2008 Petroleum And Natural Gas Industries –
Content And Drafting of a Functional Specification First Edition

which is also a standard of GSO. Libya (last row of the table) do not through either of the bodies named issue standards relevant to hydrocarbon production at the present time but use existing ones including many from ASTM.

4.4 Concluding remarks

The national petroleum companies and OAPEC have quite a direct bearing on OPEC, the *raison d'être* of which is regulation of the marketing of oil. The standards discussed and the numerous related ones to a varying degree are relevant to OPEC's mission. Three which have such direct relevance, all from ISO, are listed below. One of them is in five constituent parts.

ISO 9029:1990 Crude petroleum – Determination of water – Distillation method.

ISO 3735:1999 Crude petroleum and fuel oils – Determination of sediment – Extraction method.

ISO 1998-1:1998 Petroleum industry – Terminology – Part 1: Raw materials and products.

ISO 1998-2:1998 Petroleum industry – Terminology – Part 2: Properties and tests.

ISO 1998-3:1998 Petroleum industry – Terminology – Part 3: Exploration and production.

ISO 1998-4:1998 Petroleum industry – Terminology – Part 4: Refining.

ISO 1998-5:1998 Petroleum industry Terminology – Part 5: Transport, storage, distribution.

Such standards are subject to constant review and frequent revision. Such review and revision are the responsibility of the technical committees (TC) which comprise representatives of member standards bodies. All of the OPEC countries except Venezuela are represented at ISO and these countries have, as an inspection of the ISO web pages will confirm, made their contributions to the committee work of ISO. Finally we note that OPEC is not itself a standards body.

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5 New Members?

5.1 Introduction

Over a quarter of a century went by between the entry of Nigeria to OPEC and the entry of Angola. There were no new entrants over that period. Of the present OPEC countries four are in Africa, six are in the Middle East and two are in the Americas. The Asia-Pacific region was represented by Indonesia up to its withdrawal. The author would not for a moment assume to role of a prophet and express a view as to which country will enter next or even whether OPEC itself will survive into the 'beyond oil' era. What he can do is identify countries which are formally eligible under the OPEC Statutes.

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5.2 The identification of possible eligible countries

Table 5.1 below gives details of a few such countries.

Country	Details
Brazil	Production 2 million barrels per day (2013 figure [1]). A net exporter.
Kazakhstan	Production 1.65 million barrels per day [2]. Imports \approx 0.12 million barrels per day. A net exporter.
Malaysia	Production \approx 5 million barrels per day. 0.27 million barrels per day exported [3].
Uzbekistan	Production 0.1 million barrels per day. Imports 0.05 million barrels per day. No export. [4,5].
Azerbaijan	Production \approx 0.9 million barrels per day [7].
Argentina	Production 0.73 million barrels per day. Exports 0.09 million barrels per day. Imports about the same in the form of refined products. [8].
Cameroon	Production \approx 0.06 million barrels per day. Sharply declining since the 1980s. Consumption 0.03 million barrels per day [9].
Vietnam	Production 0.34 million barrels per day and expected to rise [11]. Imports \approx 0.2 million barrels per day. Consumes 0.39 million barrels per day.
Oman	Production 0.9 million barrels per day. No import. Consumption 0.14 million barrels per day.
Colombia	Production \approx 1 million barrels per day. Exports \approx 0.4 million barrels per day. Consumes \approx 0.3 million barrels per day.
Taiwan	See main text.
Syria	Produces 0.33 million barrels per day (2013 figure).

Table 1. Selected oil producing countries.

Examining the information in the first row, 90% of the oil production in Brazil is offshore, sometimes in deep waters (> 2000 m). The country is a net exporter only by quite a small margin and was a net importer up to 2009 [2]. Note that there are two different definitions of net exporter: it can mean either that the exports minus the imports are a positive number or that the exports minus the country's own consumption is a positive number. The former is more common.

Kazakhstan (following row) is quite a strong net exporter, and importers of oil from Kazakhstan include the EU. In the hypothetical event that Kazakhstan were to join OPEC it would be the first country from central Asia to do so. At a cultural or religious level we should note that Malaysia, like all of the Middle East countries in OPEC as well as Indonesia, is Muslim. There is also a significant Islamic population in Nigeria, the only member of OPEC ever to have been part of the British Empire. That Islam and oil supply are both factors in world stability is of course undeniable and their inter-relatedness is impossible to comprehend fully. Uzbekistan (next row), though not an exporter of oil, is an exporter of natural gas. Uzbekistan is landlocked, so oil exports would have to be by pipeline, the whole distance or to a terminal. The absence of a suitable pipeline structure is noted in [6] so what has been said here about Uzbekistan really shows her *ineligibility* to become an OPEC member in contrast to nearby Kazakhstan: Azerbaijan (following row) would be a stronger candidate. Figure 5.1 below shows how on the second of the definitions above Azerbaijan has been a net exporter for over twenty years, a track record which would surely strengthen any bid to join OPEC.

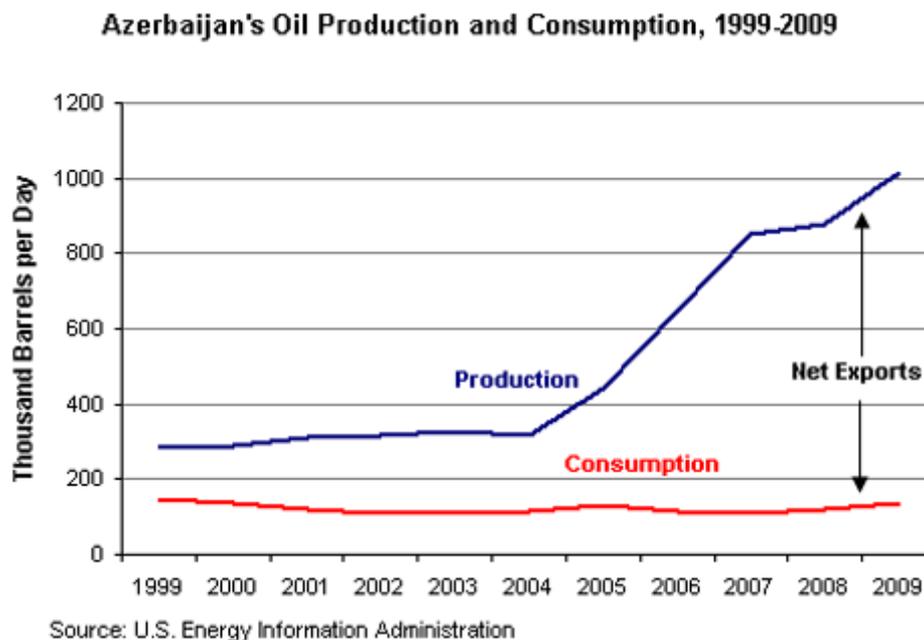


Figure 5.1 Oil consumption and production in Azerbaijan.

Argentina surpasses Ecuador, a current OPEC country, in production. She imports at a level about the same as the imports in the form of refined fractions, being herself under-capitalised with refineries. This comes mainly from the US. Cameroon, in the next row, is in decline in oil production terms through depletion of the oilfields. Significant exploration is taking place there (e.g., [10]) which could halt the decline. The oil products imported into Vietnam, following row, are largely used for blending with oil from Vietnam before processing and marketing. On the basis of the figures in the table Vietnam is a net importer although this is set to change with new oilfields being brought into production. Oman, next row, is clearly a net exporter by a considerable margin. It owes this state of affairs to the implementation of enhanced oil recovery methods [12]. Colombia in the following row is also comfortably on the side of being a net exporter and we note in passing that its production rate is the same as that of the UK. An interesting point which has not previously featured in this book appertains to Taiwan (next row). We are told in [13] that Taiwan consumed in 2012 a quantity of oil of 1.1 million barrels per day and that the reported production of 22000 barrels per day for the same year is due to refinery gain. The same claim for Taiwan is made in [14] where a figure for 2007 of 800 barrels per day is given for production of crude oil in Taiwan and a figure of 10000 barrels per day for refinery gain. Taiwan has a total refining capacity [13] of 1.3 million barrels per day so the figure of 1.1 million barrels per day for production can be taken to be the rate of refining; this would have the refineries operating at 85% capacity, a quite acceptable hypothesis. That means that the refinery gain on the basis of the figures in [13] is 2% which is rather low: refinery gain is frequently as high as 7% [14]. When a gravimetric device such as a Coriolis meter is used in measuring quantities of oil the refinery gain is of course nil. On a volume basis simple correlation to include refinery gain would be:

$$\text{total production} = [\text{crude oil production} + (\alpha \times \text{amount processed downstream})]$$

each of the three terms in millions of barrels per day

where α is the percent refinery gain expressed as a fraction. In an appendix to this chapter this is applied to two OPEC countries.

Finally Syria, a member of OAPEC but not of OPEC, exports about 80% of the oil it produces. It imports refined products including diesel and figures and these at this stage make the country a net importer. However, the refining capacity is being expanded and net export for Syria is expected.

There are as many countries in the table above as there are in OPEC, yet the total of the production figures is only 13 million barrels per day which is about half the current OPEC production. Malaysia is the only 'heavyweight' amongst the countries in the table.

5.3 Concluding remarks

The current energy supply milieu is dominated by emissions of carbon dioxide and the pressing need to reduce these. The author has written elsewhere [16] of the involvement of the OPEC countries with carbon-neutral fuels. It is reasonable to expect that such fuels, for example ethanol which is widely blended with gasoline, will start to feature in some way or other in OPEC accounting.

5.4 References

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- [15] Jones J.C. 'Hydrocarbon Process Safety' 2nd Edition. Whittles Publishing, Caithness (2014)
- [16] Jones J.C. 'Global Trends and Patterns in Carbon Mitigation' Ventus Publishing, Fredricksberg (2013)

Appendix to Chapter 5

Application of the correlation incorporating refinery gain to Saudi Arabia and to Angola.

Saudi Arabia:

Using a production figure of 9.8 million barrels per day, a value of 3.7 million barrels per day for the downstream capacity (obtained by summing the capacities of all the refineries in Saudi Arabia given in a web source) and a value of 6% for refinery gain, a value for the total production of **10.0 million barrels per day** is obtained, a 2% increase over the crude oil only figure.

Angola:

Using a production figure of 1.6 million barrels per day, a value of 0.072 million barrels per day for the downstream capacity (obtained by summing the capacities of both refineries in Angola given in a web source) and a value of 6% for refinery gain, a value for the total production is obtained which is indistinguishable from 1.6 million barrels per day to two decimal places.

These calculations bracket the most and the least productive OPEC countries.

Postscript

The world has changed so much over the 54 years since OPEC came into existence. The year 1960 long predates the IT revolution. The period since 1960 has seen the collapse of Communism and other major changes in the world order. The term 'greenhouse effect' had been applied to planet earth long before 1960 but it was not until the early years of the 21st Century that this issue started to dominate world affairs.

Will another 54 years see the dissolution of OPEC? He or she would be a brave analyst who attempted to answer that. World economy is closely linked to oil, but it remains to be seen whether the current urgency about global warming and the need to reduce carbon dioxide will lead to a milieu in which carbon credits are more saleable on international markets than oil is. What an analyst *can* do is review OPEC's activity and evaluate it, as in this book. Comments from readers will be welcome.