The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

An oilfield in Arabia

Posted by Heading Out on August 16, 2006 - 1:32am
Topic: Supply/Production
Tags: abqaiq, saudi arabia [list all tags]

Small grin, and if I can return to yesterday's post to add a short amount of additional information. . . . . As the technology improved, over the life of the field, it was found that oil also occurred in an additional mile of rock to either side of the zone that had been initially expected to hold it. It also turned out that the field extended about 7 miles longer than originally anticipated. However, with the new additions and as the field finally began to play out it turned out that the average thickness of the carbonate grainstone was only 240 ft. If you do the same calculation as before you will find that this changes the initial estimate of the original oil in place to be some 62 billion barrels. This change in reserves as the field is developed is not uncommon in oil fields and is one of the ways in which reserves grow, often quite significantly after the field has started to be developed.

However, this allows me to grin again, because those of you who have read "Twilight in the Desert" may now recognize the dimensions of the Abqaiq field in Saudi Arabia. (Although all the exemplary numbers other than the geometric size of the field, and its porosity and depth were made up by me as I went along to illustrate the developments of the technology that have been applied to that field). The oil has a 36deg API, with a gas/oil ratio of 860 cf/barrel. (It is also sour). The rock permeability is 400 millidarcies in the Arab D formation (this info is from "Twilight"). We can get some other information on this field from a number of other places. So, as a contrast between the myth and the reality you might want to read on.

The first well at Abqaiq was spudded in August 1940. It began production at 9,720 bd in October 1940, but had to be temporarily shut-in the following February because of the adjacent war. Early development was slow, but began to pick up as the conflict moved further away.

> If the expansion of 1936 had struck some of them as a period of hectic confusion, this 1944 expansion struck them as bedlam. Their goal by the end of 1945, they were told from San Francisco, was 550,000 barrels a day, nearly 25 times what they were turning out now in their standby operation, and much more than the capacity of their existing wells. There would have to be a massive drilling program involving perhaps 20 strings of tools, and drilling that many oil wells meant developing adequate water supplies both at Abqaiq and at Qatif, where they had been instructed to put down a wildcat. . . . . By June 13th, too, Phil McConnell had entirely shut down the Abqaiq field after completing No. 5, and had diverted his entire Drilling Department to Ras Tanura.

. By 1962 only 72 wells had been drilled in the field. In 1962 the gas was being extracted with the oil, and 50% of it was being used. Most of it was pumped back underground to maintain pressure and in some cases it was mixed with LPG (Liquefied petroleum gas) and this helped dilute and

increase the flow of oil from the reservoir. (But sometimes it did not work). It was used in Ain Dar part of the Ghawar field and right next door to Abqaiq. But in 1982 the gas was collected for sale abroad.

By 1972 Aramco was drilling a well at the rate of 1 every 2.1 days. Shortly thereafter Abqaiq peaked, at 1,094,062 bd. In the area of Abqaiq there were 4 drilling rigs and 5 workover drigs in the period around 1977, as the field fell back to a production of less than 800,000 bd. By 1981 production was down to 652,000 bd In the mid-80's it was partially shut-in, and flow was reduced to 200,000 bd as demand declined.

And while the rest of Saudi production continued to grow, in 1988 it had 550 wells in production by 1990 Abqaig had only 47 flowing wells, and by 2002 had dropped to 500,000 bd. It is currently 73% depleted, according to Aramco in 2004

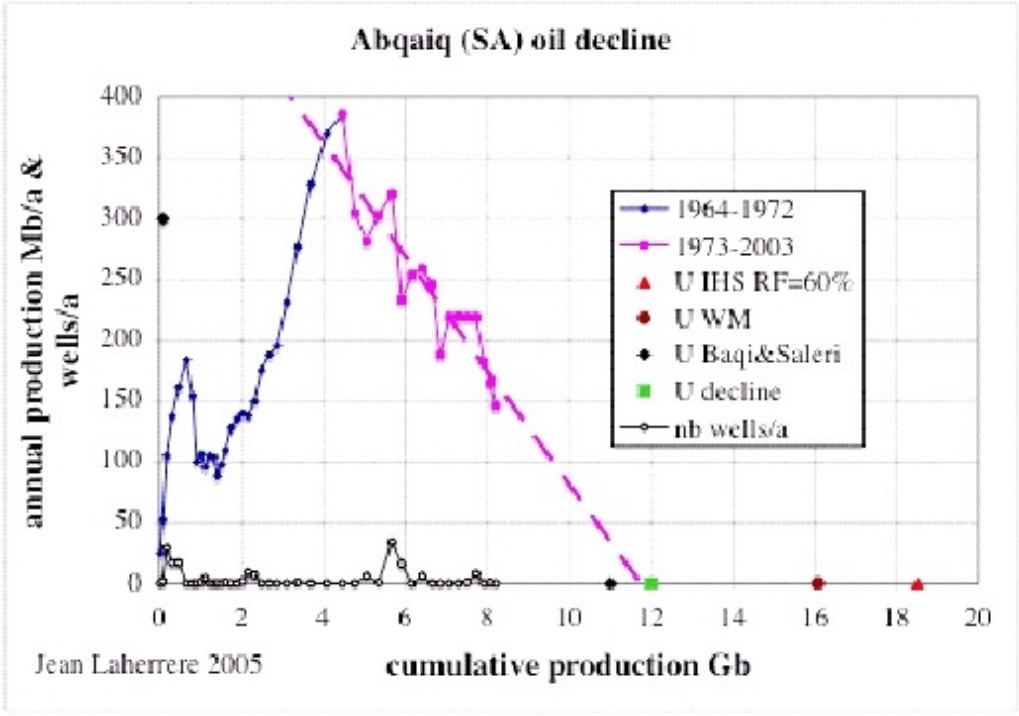
Now beyond this point there are some conflicting numbers. Let me just list some of the information that is out there.

In the 50 years since discovery it yielded 7.5 billion barrels (pdf file) of oil.

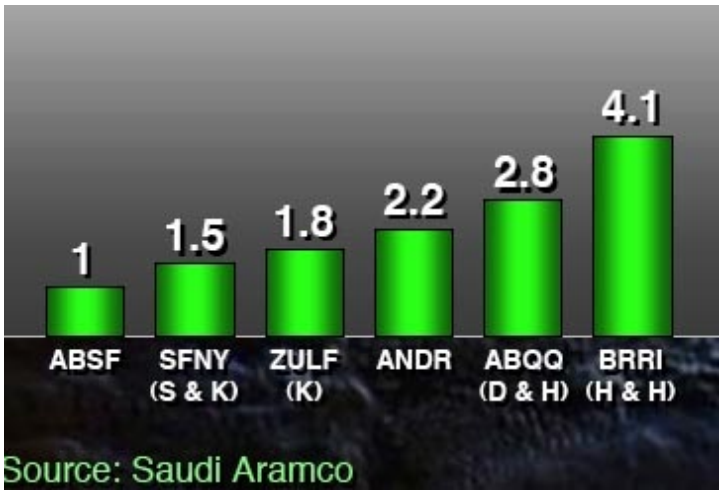
The EIA considers that Abqaiq has 17 billion barrels of proven reserves. This is in contrast with the recent "World Energy Outlook 2005", which projected (through 2004) that Abqaiq had 5.5 billion barrels remaining and had produced some 13 billion. (But it got the start date wrong as well). It uses IHS data for its projections.

From that data, quoted by Jean Laherrere, one can estimate the total oil contained in the field. Using their anticipated total of 19 billion barrels, and that this is considered to have a recovery factor of 60% indicates that the overall oil in place is about 31 billion barrels. This is about half of the theoretical prediction I had made, using total volume and porosity, but given the variations in geology over the region, that the field has about 50% of the oil that the general assumption predicted is not bad.

However using the Aramco statement that the field is 73% depleted implies that the total oil that can be recovered from the field is around 11 - 12 billion barrels, which is in line with the HL projection created by Laherrere.

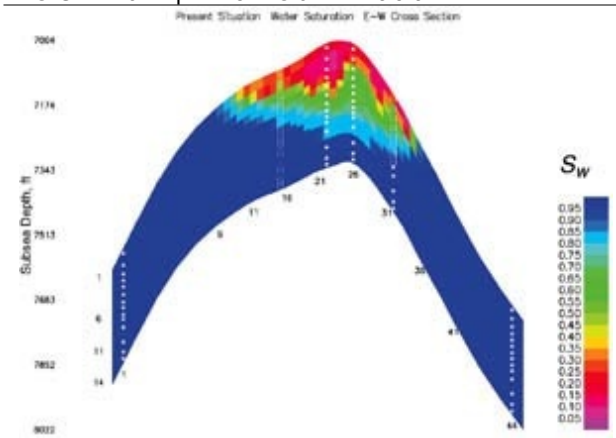


The field is variously currently reported as producing between 250,000 bd and [434,000 bd](). The IEA consider the latter figure - which yields 158 million barrels a year, sustainable through 2010. (At 8% depletion, although Aramco are claiming that they are holding depletion below that - by continuing in-field drilling). However if the OIP is 31 billion and they are only able to recover 11.5 billion, then this gives a recovery factor of some 37%, which is a fair bit less than is derived by other approaches.



From the Saudi presentation in rebuttal to Matt Simmons, CSIS, 2004.

And, it was from this field that this image was derived.



Original discussion of which was here