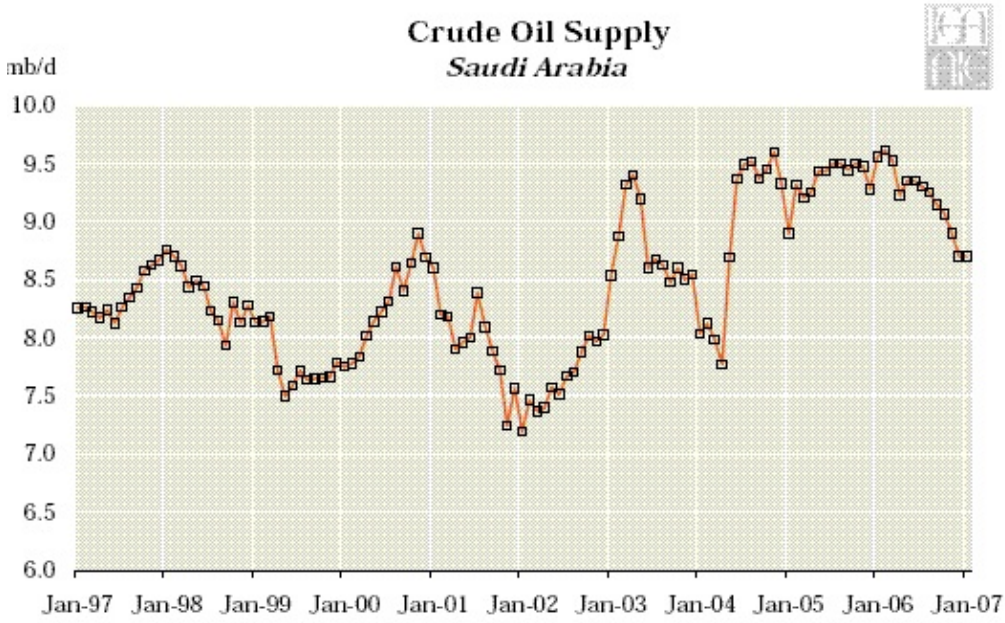
The Oil Drum: Europe
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Saudi Arabia and that $1000 bet

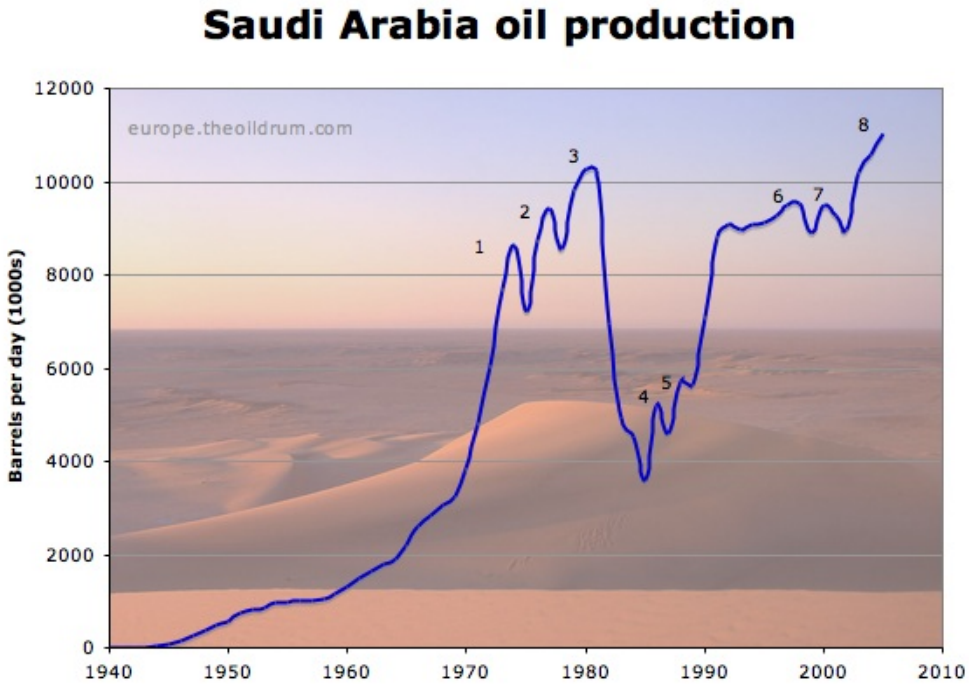
Posted by Euan Mearns on March 7, 2007 - 11:00am in The Oil Drum: Europe
Topic: Demand/Consumption
Tags: oil production, saudi arabia, swing producer [list all tags]

First of all congratulations to Stuart for busting some records with his post **"Saudi Arabian oil declines 8% in 2006"** published on 2nd March. I was unavailable to comment that day but feel there are several cautionary observations that need to be made before jumping to any conclusion about the end of the oil age. If Stuart is right, and he may be, then the consequences may be dire.

In the last decade, monthly Saudi Arabian oil production has undergone cyclic decline on 4 occasions - 1998, 2001, 2003 and 2006. So how can anyone be sure that the present production decline signals a terminal slide in Saudi production?



*Monthly oil production for Saudi Arabia reported by the **International Energy Agency** (eia) believed to be crude oil+condensate (C+C).*



*Annual oil production for Saudi Arabia C+C+NGL. From 1965 the data are from the **BP statistical review**.*

The annual average production data from BP show that since 1970 there have been 8 peaks in Saudi oil production followed by decline. (note that BP quote crude + condensate + natural gas liquids (C+C+NGL) while the eia data are C+C). There is no disputing that the declines following peaks 1 to 7 were caused by voluntary restraint, Saudi Arabia playing the roll of swing producer. *The big question is whether recent declines from peak number 8 are voluntary or not?*

Stuart is arguing that at the beginning of 2005, Saudi Arabia switched from swing producer to a supply constrained producer and the main lines of his argument are:

> "They have never had declining production in the face of high and rising prices before. And they have never had supply side events show through in the production profile before" (from email correspondence)

So lets examine these two cornerstones of Stuart's argument.

Oil Price

According to the Energy Information Agency (eia), the decline in Saudi production began in April 2006. The oil price was indeed still rising at this time and did not peak until June 2006. **But since June 2006 both oil price and Saudi production have been falling.** The June 2006 oil price peak was the final spurt of a speculative boom fuelled by rising demand for oil, a narrowing of spare productive capacity and international tension over Iran, Iraq, North Korea to name but a few tense areas.

Monthly average oil price, 1998 to 2007.

High oil prices worked their magic, dampened demand growth and stimulated a global exploration and production effort with the oil industry working flat out, everywhere. There is no shortage of oil throughout the OECD. US and European inventories remain high.

Faced with this scenario, it seems plausible to me that Saudi Arabia and other OPEC countries have cut production in order to support prices at the $60 level which does not seem to present any problem to the developed world economies. That is what the Saudis say they have done and I can see no evidence or reason to doubt it.

Supply Side Events

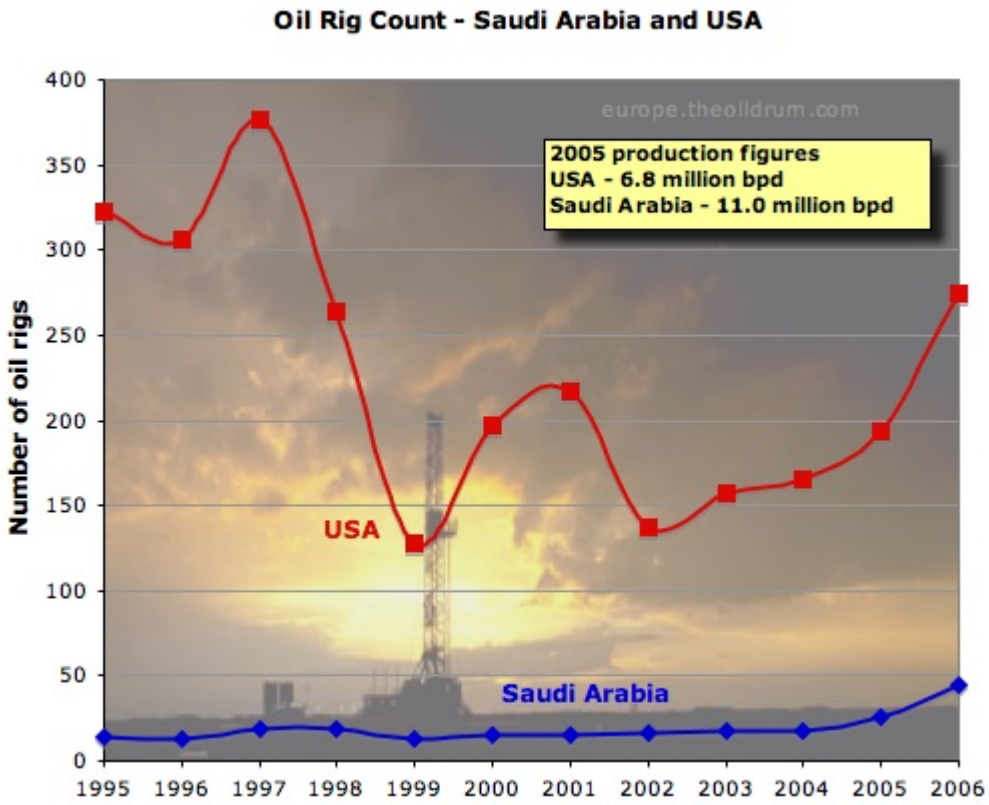
So what about Stuart's assertion that commissioning of the Haradh gas oil separation plant (GOSP) is recognisable as a 300 kbpd blip on the decline curve. Whilst I am not entirely convinced by this chart, produced by averaging three of four data sources, I am happy to accept the possibility that it may be a valid observation and offer an alternative explanation.

Falling Saudi Arabian oil production, monthly averages from three sources - the US EIA, the OECD iea and JODI. From Staniford ***"Saudi Arabian oil declines 8% in 2006"***

The Saudis have to run their oil production on different planning time scales. The planning and construction of the Haradh 3 GOSP probably took several years and of course, once complete it was immediately commissioned. At the same time the Saudis claimed they were cutting production in response to flat world demand for oil. They have done this many times before and it seems likely that inefficient production from wells with high water cut and from low permeability reservoirs would be shut down (see below). There is no conflict between the Saudis cutting production from inefficient wells simultaneous with new, dry oil production being brought on stream. The 300 kbpd blip, if valid, may therefore reflect new production coming on at a time of voluntary restraint. Mothballed wells add to the Saudi's reserve capacity.

The Smoking Gun

There has been much debate about the increase in the number of oil drilling rigs operating in Saudi Arabia which are up from around 17 in 2004 to over 50 in 2006. The fact that oil production has actually fallen whilst the number of rigs has increased in seen by many as a sign of crisis.



*Saudi oil rig count compared with variations in the US rig count, believed to be onshore and offshore rigs. Whilst the relative growth in Saudi rigs is high (approximate 3 fold increase) this is starting from a very low baseline and the absolute rise of around 40 rigs over two years is trivial compared to the production volumes. **International rig count** and **US rig count** from Baker Hughes.*

Another way of looking at this however, is that Saudi Arabia maintained oil production capacity of over 9 million bpd for many years with only 17 drilling rigs. The recent increase is very modest in absolute terms. The additional rigs may be drilling new developments such as **Khurais**, reported to be using 23 rigs, which are not yet on stream. But even when these new developments come on, Saudi production may not necessarily rise - because the market is currently satiated.

The Quality of Saudi Reservoirs

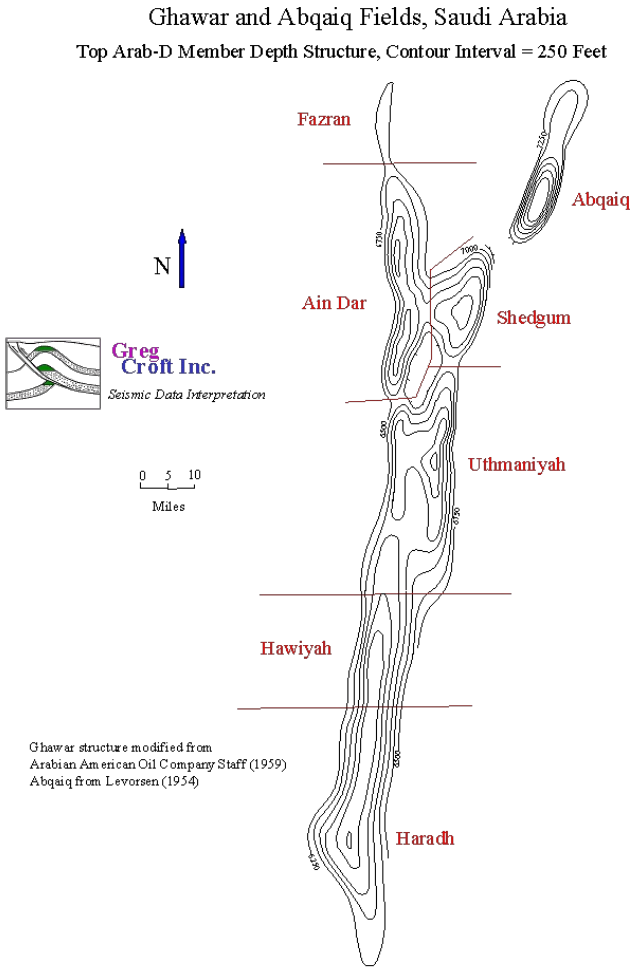
Most of the oil reservoirs in the Middle East are limestone and the quality of those reservoirs is highly variable. Without going into detail, Saudi reservoirs have two significant problems which are both related to permeability (the ease with which fluids may fow through the rock).

Low permeability reservoirs - not surprisingly, the Saudis developed their best (high permeability) reservoirs first and are now having to fall back upon the second tier, lower permeability assets. The problem is amply demonstrated in Ghawar where the north end of the field has fabulous reservoir quality, average permeability over 500 mD, whilst the south end of

the field (which still contains a lot of oil) has poor reservoir quality with average permeability under 70 mD (see below). The low permeability reservoirs produce more slowly and require a larger number of wells (hence the increase in drilling rigs?). Saudi reservoir engineers will welcome the opportunity to rest the low permeability reservoirs to allow pressure to rebound as described by Matthew Simmons on p171 of Twilight in the Dessert.

High permeability streaks - also known as super-K horizons. These lead to injected water flooding producers prematurely and unpredictably giving rise to the much-publicised problems associated with water flooding and reservoir management. Again, reservoir and petroleum engineers would welcome any opportunity to trade wells with high water cut for new dry oil production.

Wells mothballed on grounds of high water cut or low reservoir pressure will benefit from the rest and when production is resumed, as needs require, they will for a short while perform much better than prior to shutdown.



	average porosity	average permeability
Ain Dar	19%	617mD
Shedgum	19%	639mD
Uthmaniyah	18%	220mD
Hawiyah	17%	68mD
Haradh	14%	52mD

*Map of Ghawar and reservoir properties from **Greg Croft Inc.***

A balanced perspective

I am trying to bring some balance to the debate on Saudi oil production. On the one hand, Saudi Aramco and the eia are forecasting "forever rising" production whilst Matthew Simmons now joined by Stuart are forecasting rapid and terminal decline in Saudi oil production. As is often the case, reality probably lies somewhere between these two extremes.

- There is little doubt that Saudi oil production has fallen steadily since April 2006. The fact that this can be measured in **four different ways** means very little. It would be surprising if the different agencies were not in general agreement with each other.
- In my opinion, there is no hard evidence to support that this fall in production is involuntary.
- Similarly, there is no hard evidence to prove it is voluntary. But given the long history of Saudi Arabia acting as global swing producer, in my opinion, hard evidence would be required to prove that this had ceased to be the case. Such evidence may include: 1) falling global oil production 2) escalating oil prices and 3) falling OECD inventories. Right now, none of these tests are satisfied.
- Saudi petroleum engineers would welcome the opportunity to rest wells with low reservoir pressure or high water cuts and their is no conflict is substituting this type of inefficient production for dry oil production from new projects.
- I am in total agreement that Saudi oil production is entering a new era. In the past, over 9 million barrels per day could be achieved with relative ease. Their best assets are mature and may be in decline. In the future, much greater effort will probably be required to sustain production over 9 million barrels per day.

That $1000 bet

> I'll bet $1000 with the first person who cares to take me up on it that the international oil agencies will never report sustained Saudi production of crude+condensate of 10.7 million barrels or more. **Stuart Staniford, 2nd March 2007**

High stakes and long odds! If Stuart was so confident that Saudi production was heading south for good then he would not have set the bar so high.