Depletion: The elephant in the parlor

Mike Killalea, Editor & Publisher

DEPLETION IS A CRISIS looming on the world threshold, but the conviction that the world is exhausting its principal energy supply is little consolation to E&P professionals obsessed with what the rig count and the price of oil will be in 6 months. It may seem wide of the mark to address depletion when the world is swimming in cheap oil. Nonetheless, oil depletion remains the elephant in the parlor of the global economy—everyone steps gingerly around it, but none dares to mention it.

Under a scenario determined by **Petroconsultants** Associate Consultant **Dr Colin Campbell**, his colleague **Jean H Laherré**, and Dr Campbell's associate **J J Zagar**, Engineering Associate with Denver-based **Malkewicz Hueni Associates**, we are less than 4 years away from the peak of world oil production. After that, production will irreversibly decline.

Mr Zagar is careful to dispel hysteria about energy shortages. The world, he said, is not "running out of oil".

"That will not happen for a long time," he said.

Mr Zagar, speaking at the 1999 IADC Directors and General Membership Conference, held in Amsterdam during March, predicted a 2-phased crisis for conventional oil supply beginning as early as 2001. This, he said, would take place when 5 Middle East nations—the "swing" producers—control more than 35% of world supply and when "non-swing" production—defined as that of the rest of the world—begins its irreversible decline. The second phase will occur around 2010, when 5 Middle East nations control more than 50% of world supply and are themselves close to the midpoint of their depletion.

This base case, Mr Zagar said, assumes that demand rises at 1.5%/year until swing share reaches 35% in 2001 and non-swing production begins its decline. "Higher prices [then] curb demand, giving a plateau of production lasting about 10 years," Mr Zagar said.

This is the onset of Phase 2. "Production then falls almost irrespective of price, resulting in chronic shortages of supply," he explained.

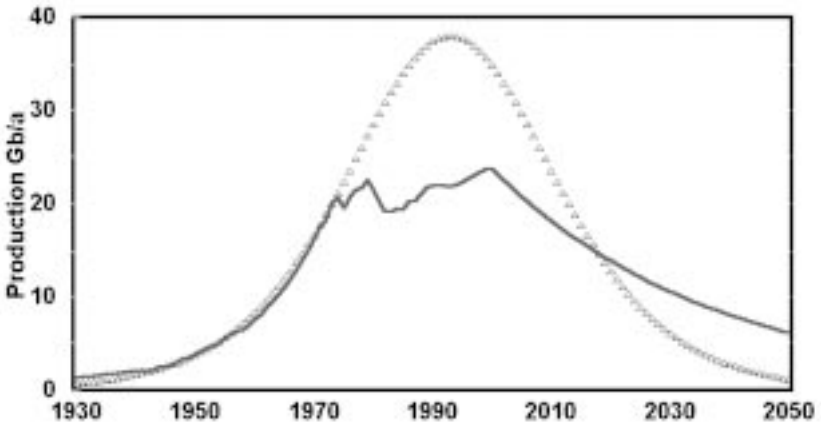
He notes that swing share fell to 16% in 1985, on the eve of the catastrophic 1986 fall in oil price. Now, however, it is 31% and rising, he said. "This time," Mr Zagar said, "it is set to continue to rise because there are no new provinces ready to come on stream, save perhaps the Caspian.

"On current trends, swing share will reach 45% by the year 2005."

BELL-SHAPED CURVES

Production trends, he explained, closely track bell-shaped curves, Mr Zagar ex-

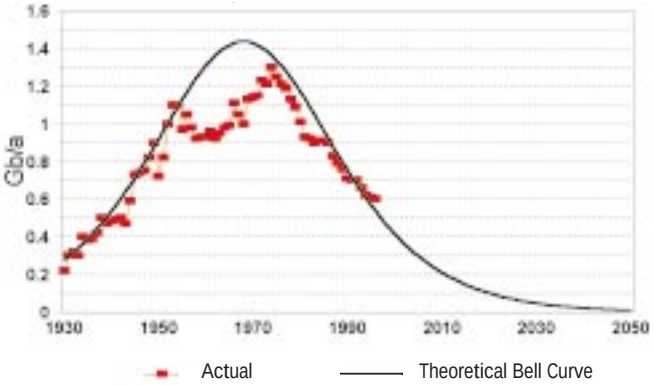
World production history & forecast



Inexorable trend? Increasingly, analysts point to the looming specter of depletion as central not only to the energy industry itself, but to the global economy. Studies show that, subject to certain artificial constraints, depletion follows a bell-shaped curve, as evidenced by the Texan and German data below. Applying this theory to world production produces the graph above. (Courtesy of Campbell and Zagar.)

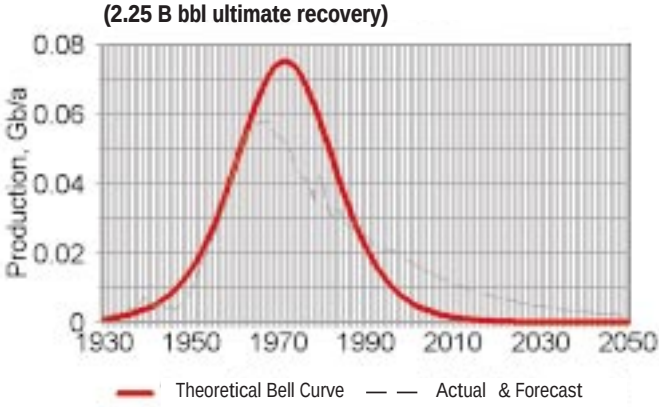
Texas Production History

(Midpoint of 37.5 B bbl reached in 1968)



German production history & forecast

(2.25 B bbl ultimate recovery)



plained. He demonstrated this with production data from Texas and Germany. In Texas, discovery peaked in the 1930s and production in 1974, slightly after that of the theoretical bell curve. Production declined about as quickly as it built up. In Germany, actual production peaked in the late 1960s, slightly before the theoretical peak. It is currently producing only about a third of its peak production.

"The actual peak relative to the theoretical bell-curve peak is often capped for all sorts of reasons, like cheap imports, market forces or optimum production facility capacities," Mr Zagar said.

Similarly, total world oil production closely mapped to a theoretical curve until the price shocks of the 1970s, when high prices curbed demand.

"Peak has been delayed a few years and the decline is less steep than would have otherwise been the case," he explained.

OVER-COUNTING OIL

Campbell and Zagar further contend that the world's reserves are overstated. Several nations with state-owned reserves announced large increases in reserves with no corresponding new discoveries evident. Further, the dating of discoveries is also critical in projecting depletion, since that is a statistical exercise in curve matching.

Similarly, throughout the industry, Mr Zagar noted, it is common practice to maximize discovery size when reporting discoveries. Consequently, most exploration estimates have, in reality, probabilities of no more than 20%-40%, he said.

"We read a lot about reserve growth and improved recovery," Mr Zagar said. "But most of it is in the reporting, not in the reservoir. It simply reflects a correction of initial under-reporting due to the conservative booking of the reserves. The notion of reserve growth delivers a good message to the stock market, but is largely an illusion."

NEW FINDS DECLINING

Mr Zagar pegged the world's cumulative endowment of oil at 1.8 T bbl. About 90% has been found and 45% produced. Production and consumption accounts for about 23 B bbl/year (about 2.2%/year).

"Yet we are finding only about 6 B bbl/year and that trend is falling," he said.

He noted that even the enormous drilling effort of the early 1980s did not replace production with new reserves.

"Since the 1980s, production has not been replaced with new discoveries," he said. "In other words, we now find only one barrel for every 4 we consume. We are using up our inheritance and looking bankruptcy in the face."

And depletion is already an important underlying factor in the industry, noted **Matthew R Simmons**, President of **Simmons and Co International**, speaking at the 1999 SPE/IADC Drilling Conference, also in Amsterdam during March.

In fact, the very technical breakthroughs the industry has developed have accelerated field decline in many cases. Advances such as 3- and 4-d seismic, deepwater E&P, subsea and satellite field technology, horizontal and lateral drilling, and multi-zone completions not only facilitate development of ever-smaller fields. They also allow operators a quicker and greater recovery from existing fields.

As an example of this, Mr Simmons cited statistics for the "Best in Class" Top 10 E&P companies. From 1988-97, he ex-

plained, these companies incurred $298 billion in E&P costs. However, the total daily oil and gas output only increased 0.7% (981,000 BOE/day, from 15,476,000 BOE/day in 1988 to 16,457,000 BOE in 1997.

"These companies spent $82 million/day to keep production 'flat'," Mr Simmons said. "This is an industry where you have to spend every dollar that is generated just to keep production flat."

As a consequence of depletion and depressed activity, Mr Simmons believes oil supply will plummet. "I don't think a 3 1/2 MM bbl to 4 MM bbl drop is necessarily a worst case," he said. Mr Simmons said that, as a minimum, depletion is running at 10% annually worldwide.

Globally, he observed, of today's 110 MM BOE/day production, some 70% (77 MM bbl/day) comes from fields older than 30 years. Giant oilfields, he said, represent more than 95% of this 77 MM BOE/day of production. The remaining 30%, or 34 MM bbl, is produced from fields brought on stream after 1969. This includes just 3 giant fields. "In 30 years, we've found just 3 major fields," he said, adding that deep water and the Middle East are likely to be the sites of future finds.

"Depletion has become an infinitely more powerful influence on supply than anything related to demand," Mr Simmons said. He made 4 key points about depletion:

• Oil and gas production ultimately declines;

• The rate of depletion generally accelerates;

• No depletion rate estimates exist;

• This is why the "Best in Class" E&P firms spent so much for so little.

RISING FINDING COSTS

Not only are discoveries disappointing, but finding costs for them are up, noted **James K Wicklund**, Managing Director of **Dain Rauscher Inc**.

Mr Wicklund, also speaking at the IADC Directors and General Membership Conference, noted that finding costs rose by 65% and 57% for offshore and onshore, respectively, from 1995-97.

And despite hype about rig shortages and rig rates allegedly rising to the level of extortion, drilling costs were not the primary driver in the increase. Offshore, 52% of the increase, Mr Wicklund said, owed to reduced exploration success rates and field size. Another 20% was due to increases in the costs of other services. Only 19% is attributable to drilling costs.

The onshore statistics mirror that trend, he added, at 63% for reduced success rates and field size, 20% for other services and just 17% for drilling costs.

And despite the increasing importance of depletion, and of prices, politics and capacity, Mr Wicklund cautioned that this industry remains cyclical.

He anticipates that partnerships between oil companies and rig owners will increase, even to shared-risk contracts.

Even more radically, Mr Wicklund said the industry must seriously consider vertically integrating itself: i.e., returning to the days when the oil companies owned essentially all products and services.

"The need to vertically integrate is upon us," he said. "Every industry is cyclical. This one began with the oil companies owning everything, and it may end up there again." ■