

Cantarell Is Not Mexico's Only Oil Production Problem

By Jude Clemente,
San Diego
State University,
San Diego, CA



At 1.5 million barrels per day (bpd), oil from Mexico comprises about 11% of U.S. imports. As a top-three supplier to the U.S., Mexico has been a consistent and reliable source of oil for years. In the first half of this decade, that role increased even further as growing U.S. demand was met with rising Mexican production.

Since 2005, however, it has been increasingly apparent that Mexico's largest oil field – Cantarell – is in irreversible decline. Cantarell accounts for 26% of Mexico's proven reserves and provides more than half of the nation's oil output. But the field peaked in 2005 at 2.1 million bpd and by 2008 has fallen to only 1.46 million bpd – a decline of 31%. Further, the U.S. Energy Information Administration (EIA) has suggested Cantarell will likely average an annual decline rate of 14% through 2015. And even that may be an underestimate. An upstream industry magazine recently reported that Mexico's oil production dropped over 400,000 bpd in the first quarter of 2008 alone. Additionally, estimated production in April is down 12% from March levels.

The implications of Cantarell's decline are far reaching for both the U.S. and Mexico. For the U.S., less oil supply from Mexico means increased reliance on more distant and potentially unstable sources. For Mexico, any drop-off in oil exports could have reverberating socioeconomic and political impacts, as many social welfare programs are funded by oil revenues. In 2006, for example, of the \$97 billion in sales by the state-owned Petroleos Mexicanos (Pemex), \$79 billion went to the Mexican government. This energy revenue windfall accounted for about 40% of the national budget.

Given the consequences of Cantarell's decline, the Mexican government is intent on finding and developing replacement fields. As Cantarell's problems became obvious, the government expressed optimism that other domestic oil fields would not merely replace the declining resource but that overall oil production would increase. Consider this litany of news reports relating to official Pemex statements:

2005 – “the Mexican oil industry ...could have a world-class industry that could produce 6 million bpd or more at some future time.”

2006 – “Other fields will be able to substitute (for Cantarell's output) and increase production.”

2007 – “Pemex can offset declines at Cantarell with new production from other fields.”

2008 – “Pemex nonetheless (will) deliver the same volume of oil production in 2008 as in 2007 because other fields (will) compensate

for the decline of Cantarell.”

EIA Goes Along

Early on, even the EIA adopted this sanguine approach, as its 2005 forecast projected that Mexican oil production would increase 21% by 2015. As Figure 1 shows, however, in just two years, the EIA reversed course and now projects a 21% decline in production by 2015.

This 1.6 million bpd forecast reversal dramatically indicates the scope of the problem. The difficulty of replacing one of the largest, most prolific, and easily accessible oil fields in the world is a dawning reality (Mexico and the U.S.) must face.

Problems In Two Fields

There are problems in two other large oil fields, the Chicontepec Basin and Ku-Maloob-Zaap. These two fields make up 72% of Mexico's non-Cantarell proven reserves. The fields differ significantly from Cantarell in terms of geology, potential productivity, distance from distribution systems, and technical requirements.

(1) The **Chicontepec Basin (CB)** contains 54% of Mexico's non-Cantarell proven reserves. The region's geology, however, makes extraction extremely challenging because sand distributions restrict oil flow. This low permeability characterizes the Basin and has led George Baker, publisher of *Mexico Energy Intelligence*, to conclude that the prospects for the area are suspect. Baker argues the potential of the CB is “a highly speculative investment, given the adverse geological parameters of the field, the rapid annual decline rate of 50% and the low rate of initial production, typically below 150 barrels a day.”

The CB faces other issues as well: (a) this onshore system covers an extended area of 2,400 square miles, thus requiring extensive infrastructure development, (b) the overwhelming majority of the reserves are classified as heavy, (c) oil recovery rates barely reach 10% and the field is expected to peak in 2016. In his 2005 book, *The Coming Oil Crisis*, Colin Campbell claims

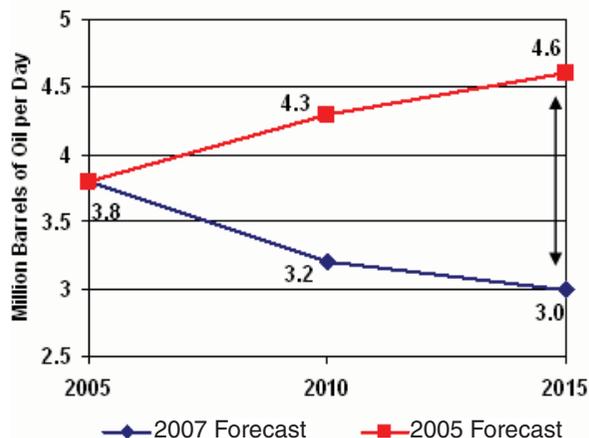


Figure 1: The Difference Between Energy Information Administration's 2005 and 2007 Forecasts of Mexico's Oil Production. (Source: EIA, International Energy Outlook, 2005 and 2007)

Mexico systematically exaggerates the recoverable oil in the CB.

(2) **Ku-Maloob-Zaap (KMZ)** contains 18% of Mexico's non-Cantarell proven reserves and is adjacent to Cantarell in the Gulf of Campeche. Mexico is relying on KMZ to offset much of Cantarell's decline in production. However, Pemex is discovering that oil at KMZ is much heavier than anticipated. In fact, KMZ oil is often about twice as heavy as the Maya oil that is found at Cantarell, which is already classified as heavy. Further, official Pemex documents have shown that oil quality and production at KMZ are falling, as water and salt seep into reservoirs. These quality issues make optimistic projections of future oil production at KMZ highly questionable.

Mexico is heavily investing in KMZ to offset the decline of Cantarell. A \$4 billion investment was aimed at raising oil output by injecting nitrogen and natural gas into wells to provide an enhanced oil recovery surge. Oil experts are skeptical that these procedures will make a significant difference. As

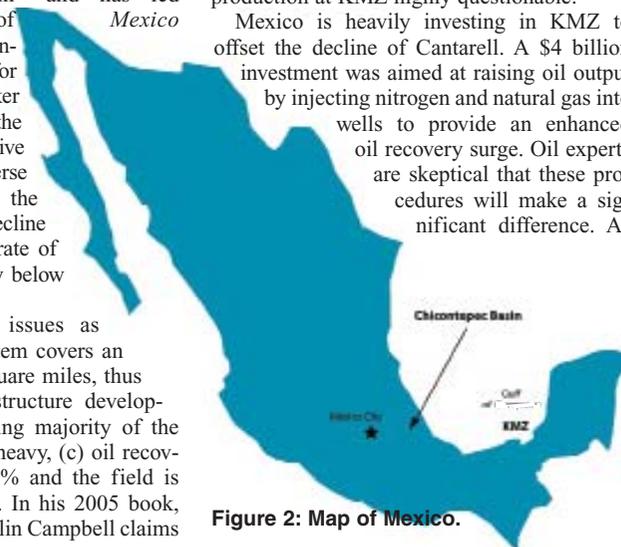


Figure 2: Map of Mexico.

John Padilla, an oil analyst with the energy-consulting firm IPD Latin America has stated: "The big question is, can they have that much production online from KMZ? The problem is they do not have a Plan B."

Great Expectations

There is little question that Mexico's officials are having a difficult time accepting the financial sea change that declining oil revenues implies. The willingness to grasp at straws is readily apparent. In March 2006, then-Mexican President Vicente Fox announced the discovery of Noxal 1 - a "huge" oil field in the deepwater Gulf of Mexico containing up to 10 billion barrels of oil. Fox stated: "With Noxal 1 we will begin a new era of oil exploration in our country."

The energy community immediately raised questions about the size of Noxal 1 and pointed out the field had never been tested. Subsequent events have indicated Fox's view was not based on geological fact. Tests have been so disappointing that Mexican oil analyst David Shields has labeled Noxal 1 "a confirmed failure."

Given the broad social, economic and political ramifications of declining oil production, it is difficult to fault government officials who hope for the best. Mexico has: (1) used its oil reserves as collateral for loans, (2) employed its oil profits to fund social programs, and (3) spent much of its increased wealth to develop a growing middle class with rising expectations. The grim reality of oil production decline, and the concomitant erosion of oil revenues, will take some time to filter through Mexico's national mindset. **P&GJ**

Author: Jude Clemente is a technical writer in the Homeland Security Department at San Diego State University (SDSU). He holds a B.A. degree in political science from Penn State University and a master of science degree in homeland security from SDSU. He also holds certificates in infrastructure protection and emergency preparedness from the Federal Emergency Management Agency, the American Red Cross, and the U.S. Department of Homeland Security. Clemente's research specialization is energy security at the national level, particularly in regard to Mexico. He is a member of the National Defense Transportation Association and energy adviser to LTL Corporation and Penn State's Research Project on North American Energy Supply. He can be reached at: judeclemente21@msn.com.

REFERENCES:

BBC News, March 15, 2005, "Mexico Discovers 'huge' oil field," Press release, London.

Campbell, Colin, 2005, *The Coming Oil Crisis*, Multi-Science Publishing Co. Ltd., Essex, England.

EIA, May 2007, *International Energy Outlook 2007*. USDOE: Washington, D.C.

Latin American Institute, March 22, 2006, "Mexico Confirms Discovery of Vast Oil Field in Gulf of Mexico," via the website www.allbusiness.com.

Shields, David, Reported in *Energy Bulletin* August 8, 2006, www.energybulletin.net.

Watkins, Eric, May 23, 2008, "Mexico's oil output continues to recede," via the website www.ogj.com, PennWell Publishing, Tulsa, OK.