

Crude Oil Pricing Formulas

Almost 21 years ago Pemex introduced spot-related formulas for determining the price of its crude oil exports. Other major players in the international oil market later adopted them and they continue to have a major influence on how oil prices are formed today. This might be a good time to remember the context in which they were originally developed, the objectives and constraints to which they responded and the role they played as part of the overall package of instruments of its commercial strategy. The recent dramatic structural changes and cyclical fluctuations in the level of prices, in price differentials and refining margins reflect shifting changes in fundamental market conditions and a redistribution of market power. At this juncture a full critical review of this pricing mechanism is warranted and could suggest possible adjustments to the formulas. However, an appraisal of the performance of the Mexican formulas is well beyond the scope of this brief memoir.

The government selling price regime was under growing stress after 1981 and in a clear state of disarray by the middle of 1985. Widespread price discounting was corroding the system. Substantial incremental production from Alaska, the North Sea, the USSR and Mexico had contributed to conditions of excess supply, given the contraction and changing structure of global oil demand. The burden of adjustment was imposed on OPEC member countries, particularly Saudi Arabia who had assumed the role of swing producer in order to protect prices and preserve the oil price regime. However, its position had become untenable. The Kingdom's production was curtailed from a sustained level of 10 mb/d in 1980–81 to 2.3 mb/d in August 1985. Official government prices had also become dysfunctional in Mexico. Export prices were slow to react to changing global and regional market conditions. Competitive price discounting was not a politically viable alternative. Ministerial discretion and governmental agreement in the setting of prices lagged behind Pemex's

commercial recommendations. There were a number of episodes in which significant sales volumes were lost. The most serious one was in June of 1985 when crude oil exports almost halved with respect to January–May volumes. Since 1981 export price determination had become highly politicised. A Pemex CEO with presidential ambitions had been dismissed after what was seen as an excessive unilat-

responded generously sharing with me his wisdom and deep knowledge of the industry.

Netback pricing turned out to be an infernal machine. The price collapse of 1986 was the result of the decision by Saudi Arabia and other OPEC members, to regain market share and to discipline producers who had been expanding production at their expense. In a short period of time the Kingdom's crude production recovered significantly. In the first quarter of 1986 production was 80 per cent higher than the previous August low and had almost doubled by the second quarter. OPEC as a whole had also recovered significantly. However, netback pricing was highly destabilising as customers had no interest in restraining the fall of prices given that they were effectively guaranteed a certain, and by no means ungenerous, margin. Under these conditions buyers were more interested in maximising throughput than in performing their traditional crude and product arbitrage function. Prices spiralled down for more than seven months until they bottomed out in July 1986. Most of the collapse took place during the first quarter of that year. Spot WTI fell from \$26 a barrel at the beginning of 1986 to \$10.25 at the end of March. The prices of Isthmus and Maya followed suit, dropping by more than 60 percent in the first seven months of the year. Also, the complexity and opacity of the price mechanism posed multiple problems. A long list of parameters and assumptions had to be negotiated, making it particularly difficult to assess the impact of specific changes on the level of prices. This lack of transparency opened opportunities for manipulation and corruption.

The Pemex team began to work immediately on three interrelated fronts: the design of the pricing mechanism, the development of a new standard term supply contract and the analytical infrastructure that would allow the monitoring and simulation of our customer's crude purchasing decisions. Timing was of the essence. In February 1986, during the annual Institute of Petroleum Week industry gatherings in London, Pemex would

Personal Commentary

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eral price reduction. This event had made ministers particularly risk averse to crude oil price adjustments.

In September 1985, at the Oxford Energy Seminar, Sheikh Yamani announced that his country would cease to play the role of swing producer and suggested the introduction of net-back pricing. Five Mexicans headed by Mario Ramón Beteta, the CEO of Pemex, were there. Immediately after the seminar session the five of us went off to the Oxford Botanical Gardens. My colleague Pedro Haas and I argued that the Yamani intervention had been an implicit declaration of a price war and that Pemex was badly prepared for it. Unfortunately we were right on both accounts. Clearly we had to act swiftly and decisively. As Managing Director for International Marketing I proposed to Beteta the immediate formation of an internal working group that would be supported by external advisors. At my request Bernard Minkow, a Director at McKinsey and Co., mobilised a high-powered team to work for Pemex. I also sought the advice of Joe Roeber, a reputed oil industry consultant, and retained George Kahale, a New York lawyer then a junior partner at Curtis, Mallet-Prevost, Colt & Mosle. In this project, as in many other junctures in my professional life, Robert Mabro

meet with its customers. It was a good opportunity to present and discuss pricing formulas and propose a new draft contract. Pemex wanted a transparent, semi-automatic pricing mechanism, with very limited managerial discretion, that could be easily supervised by government agencies. Managerial intensity was to be kept to a minimum, given the scarcity of skilled human resources in our commercial area. Realised prices would be in the public domain and simply replicated by applying the relevant price formulas. Mexican crude oil prices should be directly related to other actively traded crudes and not to products, as was the case with netbacks. The pricing formulas were associated to term contracts. Spot transactions would only be allowed for trail cargoes and with term customers. Resale would not be permitted in order to inhibit the development of a secondary market. This ensured term buyers that all customers were to be treated in exactly the same manner. Under the new contracts price flexibility counterbalanced volumetric rigidity.

Formulas were developed for each one of the crude streams exported by Pemex to each key market it served. There were formulas for Isthmus crude, a 33° API sour crude similar to Arab Light and to WTS; for Maya, a 22° API, high sulphur and high metals content heavy crude; and, Olmec, an extra light stream with a high lubricant yield. The main markets were the US Gulf Coast, NW Europe, Japan and eventually the US West Coast. These markets were segregated through effective resale restrictions. The formula structure was kept simple. It included only two elements: a market tracking mechanism and a shift factor that allowed for minor adjustments in the level of pricing. For example, in the case of Isthmus crude for the Gulf Coast, the original tracking element comprised the spot prices of WTI, WTS and ANS, equally weighted, forming a synthetic crude whose gross product yield was very similar to that of Isthmus in a FCC refinery, the deemed marginal refining mode at the time. The shift factor was expressed as

a constant that could be adjusted on a monthly basis. It captured quality differences and random variations under changing market conditions. It was the only discretionary element of a semi-automatic price-setting mechanism that directly linked Mexican crudes to the spot prices of traded crudes in the relevant markets where they were sold. Maya posed slightly more complex pricing issues as it was not a general purpose crude. Its tracking mechanism also included high sulphur No. 6 fuel oil. This synthetic mix obtained similar yields to those of Maya. However, the shift element had to be adjusted more often and by a relatively larger amount. European formulas were linked to Brent in a similar manner and the ones for the Far East to Oman and Dubai crude oil prices.

Initial customer and specialised media reactions to Pemex's innovative proposals were mixed, ranging from offensive and dismissive reflexes to considered, if cautious, responses. Their explicit underlying analytical logic was particularly useful in our negotiations with the majors. Market responsive pricing of short-haul crudes offered important advantages to US Gulf Coast refineries. Protracted contractual negotiations were never interrupted, while crude oil continued to flow at prices that were determined by the new formulas. Meanwhile, a fruitful but not always successful, Maya crude technical sales effort was deployed. One of the key outcomes of the new marketing strategy was the discernible improvement in the quality of our customer portfolio. However, success in the implementation of the new price formulas and term contracts was far from assured. There were particularly tense moments during the first half of 1986. At the end of March Mexican export volumes had not fully recovered and prices continued to collapse. On the home front, doubts were growing with respect to the course of action that was being pursued. By the summer some of my principals thought that we were losing the price war. In June, the average realised price of Maya was down to \$7.63 a barrel. The government was facing serious

fiscal and balance of payments issues that had been triggered by the oil shock. Tough strategies to restore the macroeconomic balance were being considered. I remember talking over the phone with Pedro Aspe, then the Under-Secretary of the Budget, who was in the waiting room of the IMF's Managing Director, as consultations were about to begin. I conveyed to him my concerns and misgivings after having just sold a cargo of Maya at \$5.50 a barrel in Salina Cruz. Shortly after, the negotiations with the IMF regarding fiscal adjustments for 1987 began. The magnitude of the shock was enormous. The value of crude oil exports had contracted from \$13.3 billion in 1985 to \$5.6 billion in 1986.

Over the years the price formulas have been adjusted but their basic structure has remained unchanged. Changes in formula constants have been regularly implemented. New reference crudes have been selected and others discarded. Crude weights have shifted. Formulas for new markets have been added. The most important modification relates to long-term, 5 to 8 year, supply contracts that were conditional on the construction of cokers designed to run Maya crude. These included a mechanism that helped manage light-heavy price differential risk. However, looking back it is surprising to see how stable they remained in markets where everything else changed. They adapted well to developments in spot and future markets. They responded constructively to Pemex's objectives and constraints, as well as to the Mexican institutional framework. Nevertheless, their success should not be a source of complacency. Much higher price levels, unprecedented light-heavy price differentials and refining margins, non-linear product quality differentials, changing demand patterns, new forms of speculative activity and the cyclical transition from a buyers' to a sellers' market highlight the need for a fundamental review of the performance of spot related price formulas. The timely renewal of obsolescing price formulas could generate value and lengthen their life cycle.