# Considering Real Options Techniques for the Release of New Crude Mixtures in Mexico

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**Abstract**

Blending operations are widely used in industrial plants including oil refineries, chemical plants, and cement plants. The operation mixes two or more streams with different properties to a given specification (e.g. temperatures, quality, etc.). The problem of optimal blending has been widely treated, mainly with a mathematical control theory point of view.

In Mexico, blending problem is of utmost importance. The three types of crude that PEMEX (a government-run company in charge of oil extraction, commercialization, management and administration of oil and its derivatives) currently delivers are: Olmeca, Itshmus and Maya. They all are mixtures and their sales represent an important income for the country. The differences between them are mainly in the API gravity[1] characteristic among others.

Up to date, the mixture procedure in PEMEX has not been fully systematized and it still requires partially processes of a handicraft nature. A recent work (Alvarez-Ramirez *et al*, 2001) has shown a better procedure for optimizing the way the mixture can be done keeping the desired characteristics. This methodology is based on the introduction of Robust Updating Controllers.

[1] An arbitrary scale expressing the gravity or density of liquid petroleum products devised jointly by the American Petroleum Institute and the National Bureau of Standards. The measuring scale is calibrated in terms of degrees API. Oil with the least specific gravity has the highest API gravity. The formula for determining API Gravity is as follows:

Degrees API Gravity= (141.5/Specific Gravity at 60 Deg. F) – 131.5

Approaching the basic scheme in the above mentioned work, there are some points at which seems to be worth considering real options techniques, namely, for introducing new crude oil mixtures for commercialization in Mexico and getting optimal timing for release.

The aim of this work is applying real options techniques to obtain conclusion about the optimal release timing of feasible new crude oil mixtures of Mexico crudes. This includes modeling some of the principal variables involved in the commercialization of a crude oil mixture.

On one hand, the consideration of the problem involves taking into account the uncertainty of the Mexican crude mixture prices, the possible price dynamics of new products, their possible demand and supply, the characteristics of inputs, and considering the inventories.

On the other hand, it requires the assessment of the following investment decision options: deferring, expanding, contracting, shut down, restarting, abandonment, switching, and relinquish, among others. These options are considered in the blending procedure as well as in the commercialization for the new products.

Keywords. Crude oil blending; Crude oil commercialization; real options.

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