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PROPERTIES EVALUATION OF BIODIESEL FUEL MIXTURES

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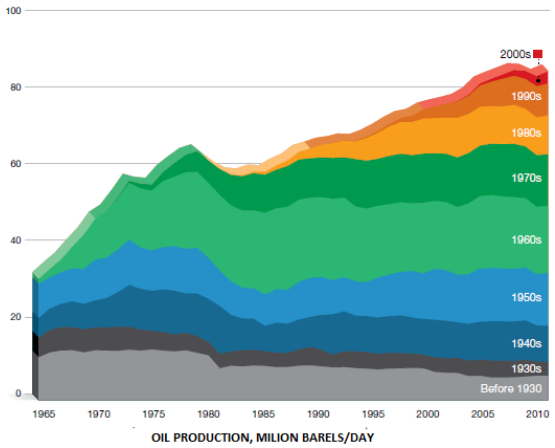
ABSTRACT: *To reduce organic volatile pollution and waste gases (VOC) has established itself as oil to be mixed with biodegradable products. The presence of 5% biodiesel in diesel and 5% ethanol in gasoline blending brings along problems of these products and the need to assess the quality of these mixtures.*
This paper aims to present the results of our research needs that must meet the two products (biofuels and oil products) to be mixed and how best to blending and mixing properties obtained from evaluating mathematical and laboratory results.
It also presents a numerical optimization method to mixtures of the components so as to achieve the desired results by the end consumer of petroleum products and bring changes to their quality and quantity.

KEYWORDS: oil, biofuel, mixture.

1. Introduction

In the 2007-2011 oil production increased from 84 million bpd to 88 million barrels per day with less variation of it in 2009 (the year beginning the global crisis). But although increased production and consumption is maintained at a constant level is observed that the price has not dropped very much.



Maintaining high price is due to:
a controlled level of extraction (and so few oil suppliers)
b Conditions increasing extraction (increasing costs).

For the period immediately following the global oil production will continue on a trend growth of 0.2%, the production capacity of 90 million barrels per day (14,310,000 cubic meters per day) [Oil-Supply Trends 2011].

This regression is due to extraction:

a. Reduce a growth of oil-consuming countries,

b Geostructures political change in Arab countries (unfolding revolution reduced oil and gas production),

C. Development of alternative energy (wind, bio-type products, etc.)

D. Increasing environmental requirements in oil consuming countries.

It also forecasts the development of oil production for the period 2012-2040 [Oil Supply Trends-2011] indicate a change in supply sources (sources conventional production will drop to 60 million barrels per day), increasing production LPG and oil and marine shale.

Decreasing the amount of oil from conventional sources is due to:

a decreasing rate of discovery of new conventional oil deposits,

b Growth natural decline of existing deposits (reduced production of oil during operation),

c Reduction of reservoir gas pressure during the extraction and thus reducing the amount of oil extracted due to this pressure,

d Oil deposit water front advancement due to lower gas pressure and thus increasing the water-oil ration during the extraction,

In the current system of exploitation of oil deposits, the level of extraction (recovery factor) is more than 45%. Also a deposit of oil exploitation takes place over a period of 30 years, production capacity is variable depending on the cutting active layers and the investment made.

In conditions of increasing oil prices on international markets and maintaining selling prices of petroleum products at a constant level, any refinery processing provide efficiency by:

a. bead of profit reduction of processing ensuring of cheaper crude processing

b. Ensuring similar blend crude type and quality at the design behind the refinery.

In these circumstances processed in the refineries in Romania during these types of oil:

Trees in a refinery to provide a crude mixture of type C and type selected selected,

c. in refinery Teleagen ensure a mixture of the crude oil type Petromar type Rebco (Russia),

d in Midia refinery ensure a mixture of oil type Kazastan (CPC) and Rebco (Russia),

d in Onesti refinery plant modifications are made to process a crude type CPC (Kazastan).

As shown refineries:

a. and a changed supplier of oil after 1990,

   b have changed the type of crude processed.

   Therefore the need for delivery of crude blend type is dictated by: Ensuring a constant volume of oil with strict conditions on physicochemical properties (for the ultimate quality of finished products in the refinery), considering that during the production deposit (which was the basis for designing refinery) it decreases decline due to the deposit,

b.

   Ensuring a better quality oil with higher prices and therefore the sale of finished products

   Obtain products quality (given that oil is a declining sales trend).

Given the multitude of Deposits that provide a wide range of crude oils and evolution of external suppliers (Currently very expensive REBCO crude oil type oil-type near Brend) WAS Chosen as a way of working in the building blend crude Mixtures According to the provider at and less time depending on economic and Financial Analysis. This is due primarily to transportation company (Can not provide a separate transportation system for each batch of oil) and low storage capacity (Often lots of oil pumps with different properties in the Same tank). Just so a new strategy in Romania raw evaluation and Implementation of Principles of Their mixing

2. Experiments

In Romania the first research on mixing crude and petroleum products were performed in the Laboratory of Chemical Analysis of Petroleum Products Enterprise conditioning CHIMPEX Jenicu Nicolau found by engineer since 1970 [J.Nicolau-1970]. Studies have tried to establish: best recipes of a mixture of diesel and fuel oil for marketing as bunkering fuel, Recipes optimal mixtures of oil in order to ensure conditions pipeline. The end result of assimilation research conditions consisted of mixing oils (use indices Maurine Henry) to achieve blend crude type (with notes that before mixing to ensure rates are performed and laboratory tests).

Also in the paper "Mathematical programming in the oil industry" [M.Manea-1970], Mr. Gheorghe I. husband presented a linear mathematical model to ensure appropriate processing crude mixtures. In this model linearization tried oil mixtures based only on price and working conditions and less than physico-chemical components. Research has been resumed by Timur Chis [T.Chis-2011] by trying to find a mathematical model to ensure behavior mixing oil physico-chemical properties according to (density, viscosity and pour point).

In laboratory studies undertaken and published articles [T.Chis-2012] were presented:

Romanian oil with a viscosity behavior after their mixing, Effect of additives on oil mixtures, What is the best in solving the mathematical model of crude mixtures. In the literature world oil mixtures are studied to optimize them in creating the blends as economically viable. In his article "A Novel Scheduling Strategy for Crude Oil Blending" [L.Bai other-2010] presents a numerical model that aims to optimize the flow control mixtures from various components of the blend result. After applying this model can be a computer program useful in achieving blend crude, which considers only the flow of oil and its price (to create a more profitable blend).

Such properties can be additive (ie its final value is directly proportional to weight) or neaditive.

For additive properties determine the final value as follows:

$$M = \sum_{i=1}^{n} m_i$$

$$P = \frac{\sum_{i=1}^{n} m_i p_i}{M}$$

Where:

-M is the mass-mixing,

- I is the mass components,

- P is the property.

As additive properties have been defined:

a density,

b. content of sulfur

c specific gravity.

For properties ne additive relationships were established:

$$y_i = f(p_i)$$

$$M = \sum_{i=1}^{n} m_i$$

$$Y = \frac{\sum_{i=1}^{n} m_i y_i}{M}$$

$$P = invf(Y)$$

$$1 \le i \le n$$

where:
- i is the mass of component I,
- p_i is the property of component i,
- y_i is defined as pseudo property of component I,
- M is the mass of mixture,
- Y pseudo-mixing property,
- Real property P of the mixture,
- F function of obtaining property by pseudo property y p,
- Invf function to obtain real property P of the mixture with pseudo properties Y.

As neaditive properties were determined:
a pour point,
b freezing point
c boiling point,
d point of aniline,
e flash-point,
F. ASTM color,
g color of Union,
h distillation temperature at which 10%, 20%, 30%, 40%, 80% and 90% by volume.

3. Viscosity oil mixtures

a. Method H.Maurin

In this paper Programation Lineair Apliquee [H.Maurin-1967] was able to define a system of analysis of mixtures of oil viscosity behavior, which can be useful and oil mixtures.
It stretches from the use of indices to calculate viscosity.
Equation to calculate the mixture viscosity is

$$IHM = \sum_{i=1}^{m} m_i \cdot IHM_i$$

where:
- IHMi is pseudo properties (in this case index Henri Maurine),
- I is the amount required mixture.

b.Method of viscosity index (Equation Refutas)
VBI is denoted by the mixture components viscosity index.
VBI = 14.534 × ln [ln (v + 0.8)] + 10.975
In eqution above v is viscosity (cSt) and ln is the natural logarithm.
In the second stage [Robert E. Maples -2000], is calculated:

VBIBlend = [wA × VBIA] + [wB × VBIB] + ... + [WX × VBIX]
Where w is the weight fraction (% ÷ 100) of each component. Once we obtain the mixture viscosity index is to determine the viscosity reversing equation :
v = ee (VBN - 10.975) ÷ 14.534 - 0.8
where VBN is the mixture viscosity index and e is the transcendental number (Euler number = 2.71828).

Techniques for mixing oils

Blend crude type (resulting from mixtures of compounds) must meet the following conditions:
a. uniformity,
b final product properties meet the requirements of the beneficiary,
c To ensure continuity in providing final produslui.

To obtain a mixture of type blend can apply these techniques:
a mixing of components in lines a pumping
b mixing components in tanks,
c Mixing components in airflow.

Blending mode to obtain a necessary component of type oil blend is achieved by:
a product of mechanical agitation,
b Injection of gas flow,
c circulation fluid jet mixing.

Also mixing of components can be performed in a continuous or discontinuous.

3. Results obtained

To see the behavior of physical parameters of compounds during oil and biofules to achieve mixtures in the laboratory, Chemistry, Electronics and Petroleum Faculty Technology we performed a set of tests on a mixture of oil.

By studying the density and viscosity to try:
a.Determination of variation of these properties with a mixing ratio,
b. Checking the results with numerical models described above,
c. Making a model of numerical simulation.
Viscosity was determined according to standardized ASTM [ASTM D1665 - 98 (2009)] Engler Viscometers.
Density was determined according to standardized ASTM D1298 99 (2005).
He conducted an experiment to see the influence of ration on the viscosity and density mixing.
They mixed one crude oil PETROMAR and Biodiesel has the following properties:

PETROMAR OIL
Density from 0.8255 to 15^0C,
Viscosity 4.66^{0}E

BIODIESEL
Density from 0.8702 to 15^0C,
Viscosity 1.88^{0}E

RATIO BIODIESEL	RATIO OIL	DENSITY OF MIXURES
200	0	0.8702
190	10	0.867965
180	20	0.86573
150	50	0.859025
50	150	0.836675
20	180	0.82997
0	200	0.8255

VISCOZITY MIXTURES (S)	VISCOZITY GRADE (E)
96	1.882352941
99	1.941176471
103	2.019607843
112	2.196078431
172	3.37254902
208	4.078431373
238	4.666666667

OIL PETROMAR	VISCOZITY,E	VISCOZITY (HM)
0	1.882352941	23.59
10	1.941176471	23.877
20	2.019607843	24.164
50	2.196078431	25.025
150	3.37254902	27.895
180	4.078431373	28.756
200	4.666666667	29.33

VISCOZITY BY CALCUL	DIFERENCES	%
1.85	0.032352941	3.235294
1.912	0.029176471	2.917647
1.972	0.047607843	4.760784
2.155	0.041078431	4.107843
3.332	0.04054902	4.054902
4.032	0.046431373	4.643137
4.63	0.036666667	3.666667

CONCLUSIONS

Making a crude mixture of surgery is increasingly used to make recipes for refining both the economic and especially to ensure crude oil that provides the best results for the existing plant,
It is easier to create an appropriate oil installation requirements designed only to modify the facility,
To ensure the successful sale of heavy crude

oils can be made as close to the crude mixtures better quality and more expensive
For the mixtures of oil can successfully use linear programming with application software WinQsb with boundary conditions supplied oil flow optimization function content processing finished products or cost (acquisition cost),
To determine the point of viscosity of the mixture can be successfully applied indices Maurine Henry (with error less than 5%), methodology best mixing technique is to inject the mixture of the easiest line (in turbulent flow regime) to control flow injection
Researches suggest that future to diversify in these directions:
Analysis of mixtures of oil a viscosity treated polymer
Analysis of the pour point oil mixtures,
Develop computer programs to determine optimum mixing ration in order to obtain oil with better quality and so economical.

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