

# BIODEGRADABLE FUEL CATALYST BPI \ BIO PETRO IMPROVER



## TECHNICAL INFORMATION

### 1- Introduction

Pollution is seriously affecting the environment that we are living in, especially in densely populated areas and in the large industrial zones. This has become a worldwide problem. We must find a way to control and reduce the production of contaminating gases, mainly those pertaining to the "C" Group which are considered polluting and reactive.

#### **GROUP "C" REACTIVE GASES**

NAME		SYMBOL
Methane		CH4
Carbon Monoxide		CO
Hydrocarbons	HG	
Nitric Oxide		NO
Nitrogen Dioxide		NO2
Ammonia		NH
Sulfur Dioxide	SO2	
Ozone		O3

Our company is aware of this situation and its increasing projection and has developed a catalyzer of organic origin which has been tested at a laboratory scale and in the field with highly positive results.

### II. - Technical Information

The BIO PETRO IMPROVER Catalyzer has an organic chemical formula, the main component being an enzyme. The medium in which it remains stable and active is a mixture of hydrocarbonic and aromatic substances. The BIO PETRO IMPROVER has the ability to modify the molecular properties of organic, liquid fuels, changing their structure and liberating the total amount of energy contained within. This is achieved due to the energy called Brownian movement, which consists, in this case, in the molecular agitation of the components of the polymeric chains contained in hydrocarbons. The characteristics, advantages and application, as well as tests carried out, are described in the following material.

A catalyst is that substance capable of accelerating or retarding a chemical reaction, without decomposing or combining, producing a transformation that modifies the molecule, thus liberating and changing the total amount of energy contained in said molecule.

Enzymatic catalysis has a large number of industrial applications, such as in the food, textile, paper, alcohol, organic chemistry and other fields. More than 8 million of these catalysts are known, and about seven thousand are commercially used. Their potential has not been fully explored.

Our product is one of these with specific application to petroleum derived, liquid fuels or those which have hydrogen and carbon as the main components. The following advantages are obtained when applying our Enzymatic Catalyst to such liquid fuels:

- The viscosity is reduced without the need of heating.
- The dew point and vaporization point are improved.

- c) The calorific potential is improved.
- d) A saving in fuel can be achieved for a given heat requirement.
- e) A reduction is achieved in corrosive combustion by-products that are harmful to the combustion equipment, such as engines, turbines and boilers.
- f) Polluting emissions are reduced.
- g) The Enzymatic Catalyst does not require special or costly installations for its use nor continuous supervision for its application.

The BIO PETRO IMPROVER has the property of modifying the physical state of the petroleum derived fuels, accelerating the separation of the covalent links of the polymeric chains of the hydrocarbons. This allows obtaining the same calorific energy from a smaller amount of fuel. It also leads to a total combustion of the fuel, resulting in a considerable reduction of gases of the Group.

Petroleum is a mineral oil formed by a mixture of hydrocarbons with different types of links, as follows:

- 1) Open chain or acyclic.
- 2) Homogeneous closed chain or cyclic.
- 3) Heterogeneous closed chain or heterocyclic.
- 4) Saturated or unsaturated, as well as simple or absorbent.

The hydrocarbons that comprise petroleum are organic compounds with hydrocarbonic chains of up to 50 or more carbons. Refining by thermal distillation (cracking) produces a series of compounds, the more important ones being:

- a) Natural Gas.
- b) Liquid Gas.
- c) Gasoline.
- d) Turbosine.
- e) Kerosene (Petroleo diáfano).
- f) Diesel.
- g) Petrochemical Products.
- h) Lubricating oils.
- i) Heavy Oils or Combustóleo.
- j) Asphalt.

Each one of these products has its own specific weight, as compared to 4° C water of equal volume.

One of the main properties of these fuels is as heating or calorific value which is released on burning in mixture with the correct amount of air. The high calorific value fuels require large amounts of air to release this calorific energy chemically associated with the proper combustion. The calorific value of the gasified fuels (air/fuel mixtures) varies from 8,900 up to 30,250 calories. The chemically correct air-fuel ratio can vary between 8/1 up to 34/1. The calorific values of the proper air-fuel mixtures only vary between 535° C and 960° C.

The volatility or evaporation of a liquid fuel is reflected by the air-vapor ratio which can be formed at a given temperature. This is obtained by the Inflammation Point which is considered as the temperature at which the amount of vapor produced is sufficient to form a momentary flammable mixture of air- fuel. This is a property of each specific fuel and is determined by the ASTM D 92-52 and D93 Standard. On lowering the temperature or Inflammation Point a Dew Point can be obtained with more evaporation, achieving an air-vapor mixture with more fuel saturation. This gives a higher calorific value with a lower amount of air-vapor mixture and a more complete combustion of said mixture.

The effect of our BIO PETRO IMPROVER allows lowering the normal Combustion Point, thus improving the evaporation or volatilization characteristics of the treated fuel. In this way, the Combustion Point is obtained at a lower temperature, increasing the amount of gases to be burned.

By Combustion Point, we are referring to the temperature at which a sufficient amount of vapor is obtained to maintain a constant flame.

**TEST N°1**

Inflammation Point (ASTM D92 -52 and D93)

FUEL TREATED	W/OCATALYZER	W/CATALYZER	%VARIATION
GASOLINE	FLAMMABLE AT ALL CONCENTRATIONS		
KEROSENE	72° C	70° C	- 2.77
DIESEL	64° C	64° C	- 3.12
FUEL OIL	101.5° C	90° C	- 11.33

The breaking of the hydrocarbon chains is evidenced by the drop in viscosity of the fuels, mainly of the heavier ones, like fuel oil, gasoleo and diesel. This effect on viscosity depends on the dosage of the BIO PETRO IMPROVER and time, as shown in the following test results:

**TEST N° 2**

Viscosity (ASTM 088 - 44- Universal Saybolt (S.P.S.) at 40 °C

FUEL TREATED	W/O CATALYZER	W/CATALYZER AT SEVERAL DOSAGE RATES / 100LTS.				% VARIATION
		3.5 Gr.	7.0 Gr.	10.5 Gr.	14.0 Gr.	
GASOLINE	1.40	1.40	1.40	1.40	1.39	- 0.71
KEROSENE	2.11	2.11	2.11	2.11	1.88	-10.90
DIESEL	2.14	1.96	1.90	1.89	1.88	- 12.14
FUEL OIL	858.70	813.7	794.8	684.6	651.0	-24.18

Test N° 3 refers to corrosion test carried out according to ASTM D 665 130 Standard. This was done by submerging test specimens of different metals (Iron, Steel, Aluminum, Copper and Bronze) in different types of fuels treated with our Enzymatic Catalyzer. The fuels used were the same as shown in tests 1 and 2. Different temperatures were used over a 5 hour period. No sign of change or corrosion was found in any of the test specimens.

**TEST N° 3**

Calorific Potential (ASTM D240 02015)

FUEL TREATED	W/OCATALYZER	W/CATALYZER	%VAR
GASOLINE	18.840	18.955	+ 0.80
DIESEL	15.841	16.438	+ 3.77
FUEL OIL	14.784	15.967	+ 8.00

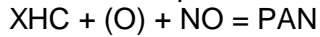
The modification in the structure of the fuels tested due to the breakage in the covalent links of the hydrocarbon chains, as a result of the addition of our Catalyzer, is reflected in the increment of the calorific potential, as shown in the previous table. This increment influences the combustion process, as follows:

- 1) The hydrocarbons are almost totally burned or combusted, suppressing their emission to the atmosphere in particulate form, lowering substantially the emission of crude hydrocarbons which are responsible for the formation of photochemical smog or reacting with light.
- 2) The reaction of Nitrogen with Oxygen at high temperatures results in the formation of NOx (Nitrogen Oxides) which occurs in ah combustion processes using air as the source of oxygen. The higher the

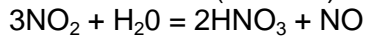
temperature and concentration of oxygen, the higher the formation of nitrogen oxides (NO<sub>2</sub>, NO<sub>3</sub>), which, on reacting with hydrocarbons in sunlight, form oxidants, such as ozone (O<sub>3</sub>) and atomic oxygen. NO<sub>3</sub> + sunlight = NO + O<sub>2</sub>.

The atomic oxygen reacts with molecular oxygen (O<sub>2</sub>) and molecular Nitrogen (N<sub>2</sub>). 2O<sub>2</sub> + O + N = O<sub>3</sub> = Ozone = 2 NO

The reaction with hydrocarbons leads to another type of combination, forming (Peroxi - Acetil - Nitrate) or PAN which is basic in the formation of Photochemical Smog, where X is a HC of double link known as Alquenos:



Another of the highly polluting compounds is Sulfur Dioxide (SO<sub>2</sub>) which is a by product of incomplete combustion. The mentioned fuels have variable amounts of sulfur (S), from 0.5% up to 4% or even more. The annual production is estimated at 190 million tons which, together with NO, cause acid rain. On reacting with water (H<sub>2</sub>O) sulfur trioxide or sulfite ions (SO<sub>3</sub>) are formed and, then, sulfuric acid (H<sub>2</sub>SO<sub>4</sub>). The nitrogen pentoxide (N<sub>2</sub>O<sub>5</sub>) goes through a similar reaction, yielding nitric acid and nitric oxide (reactive):



These compounds cause serious corrosion problems in boiler tubes, refractory walls, stacks, roofs, motors, mufflers and in the atmosphere.

With the addition of our BIO PETRO IMPROVER the degree or efficiency of combustion is greatly enhanced requiring less fuel in the air-fuel mixture. This allows for a better use of the oxygen, consuming from 42% up to 100%. This occurs not only in industrial combustion equipment, but also in reciprocating internal combustion engines. The result is a lower production of gases of the "C" Group.

The beneficial effect of our Enzymatic Catalyzer on sulfur emissions is shown in the following table:

TEST N° 5

Sulfur Emissions - ASTA 1552 Standard

FUEL TREATED	W/OCATALYZER	W/CATALYZER	%VARIATION
DIESEL	0.317	0.297	- 6.30
FUEL OIL	3.290	1.698	-48.38

SO<sub>2</sub> emissions are reduced mainly to the better or more efficient use of the oxygen in the combustion process, thus reducing the formation of polluting by products containing oxygen.

The favorable effect of our BIO PETRO IMPROVER on carbon and its liberation is shown in the following table:

TABLE N° 6

Carbon Content (ASTM D 2140 Standard)

FUEL TREATED	W/OCATALYZER	W/CATALYZER	%VARIATION
GASOLINE	71.55	76.54	+ 6.98
DIESEL	90.11	94.32	+ 4.68
FUEL OIL	89.71	92.74	+ 3.38

The effect on reduction of carbon residues using our BIO PETRO IMPROVER is shown in the following table:

TABLE N° 7

Carbon Residues (ASTM 189 - 52 Standard)

FUEL TREATED	W/CATALYZER	W/O CATALYZER	% VARIATION
DIESEL	0.162	0.142	- 12.30
FUEL OIL	4.864	2.122	- 56.37

The effect on ashes is shown in the next table:

TABLE N° 8

Ashes by Weight (A STM D 482 Standard)

FUEL TREATED	W/O CATALYZER	W/CATALYZER	% VARIATION
DIESEL	0.015	0.000	- 100.00
FUEL OIL	0.031	0.006	- 80.62

With complete or nearly complete combustion using our BIO PETRO IMPROVER emissions of particles is practically eliminated. For Diesel or gasoline engines, the Enzymatic Catalyzer comes in tablet form. One tablet should be added for every 25 liters of fuel.

### **III. - Use, Application and Handling**

To start the use of our BIO PETRO IMPROVER, the fuel tanks have to catalyze with the required dosage referred to the volume of these tanks. It takes about 8 hours for the Enzymatic Catalyzer to produce a visible effect, dissolving skim and HC incrustants in the tanks, pumps, piping and injection systems, cleaning as it flows through the system and with time. The time need for a 100% effect will depend on the amount of skim and incrustants that have been accumulated. The best time to add the BIO PETRO IMPROVER is when the fuel tanks are filled, as this will help to better distribute the granules. Once the fuel is catalyzed, an increase in the flame size will be noted with more intensity and uniformity and with a change in color. Combustion in the boiler will be more uniform, and dripping will be eliminated. Heat generated will be increased. Therefore, the amount of fuel can be reduced for a given steam generation. It is important to modify the air fuel ratio.

At the beginning, more smoke will be noticeable. This is due to the elimination of accumulated deposits of unburned or partially burned carbon and residues in the system. Once these have been eliminated, the amount of fuel and the air - fuel ratio can be optimized for the most efficient boiler operation. The BIO PETRO IMPROVER Enzymatic Catalyzer should be added, preferably in the day tank in the proper dosage, according to the feed of fresh fuel to this tank.

The BIO PETRO IMPROVER comes in sealed buckets in granule form and should be kept in a dry and fresh storage room. It is not toxic, nor flammable at room temperature. It is not soluble in water and is not harmful to the skin or lungs.

### **IV. - Conclusions**

- 1) The tests that have been conducted show that the Enzymatic Catalyzer favorably changes the physical-chemical, reactions of fossil fuels, improving their combustion properties and noticeably reducing the emission of contaminants, both in gaseous as well as particulate form.
  - 2) Besides improving the combustion properties of fossil fuels or hydrocarbons, the BIO PETRO IMPROVER produces favorable secondary effects, such as reduced formation of carbon and solid residues, corrosive acids and other reactive compounds.
  - 3) This catalyzer increases the life of the equipment: engines, boilers, burners, pumps, injectors, structures, roofs, etc., as well as the availability of the equipment.
  - 4) The cost of the catalyzer is quickly recovered by the savings in fuel and maintenance costs, as well as in the extended life and improved availability of the equipment.
  - 5) Another important aspect is the favorable impact that the BIO PETRO IMPROVER has on the environment, reducing harmful emissions, both in gaseous and solid form and in reducing the need and cost of anti-pollution equipment. This last impact has to be carefully analyzed in each case. In some cases, it may be possible to comply with anti-pollution regulations without investing in special and expensive anti-pollution equipment. As mentioned, this must be studied case by case.
- All these tests were done at an accredited laboratory, according to Mexican laws on Metrology, and are adequate to Mexican and international norms. The laboratory is "Industria Militar", from the National Defense Secretary.

