

# COBMA Impact on CO<sub>2</sub> Concentrations in the Mitigation of Air Pollution-Anthropogenic Climate Change from Mobile Sources Emissions

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**Abstract** – The purpose of this paper is to present implementation of COBMA as a crucial action to effectively abating Air Pollution, controlling CO<sub>2</sub> emissions, from mobile sources. It is supported on new analyses from new and past emissions tests results and recent announcements from authoritative sources. From WHO, April 4/2022, billions of people still breathe unhealthy air; NOAA's monitoring climate and IPCC reports, among others, are increasingly alarming to the extent that keeping the current levels of CO<sub>2</sub> emissions concentrations will warm the Earth to 1.5°C above pre-industrial temperatures in just nine years; **Announcements are pointing out the global ineffectiveness on cutting emissions, missing the right path to a sustainable future and thoughtlessly moving away increasingly fast from it, towards a close unstable-equilibrium. Implementation of COBMA and other proven actions constitute an urgent path we must follow right now to keep the planet temperature from rising above 2°C, averting a climate catastrophe. We only will achieve this goal working together as stated in COPs 26 and 27 but, globally integrated around a more comprehensive view of the Earth-Atmosphere system balance;** seeing the Earth as a planet that behaves as if it were alive, at least to the extent of regulating its climate and chemistry, as James Lovelock and other independent scientists have stated for long. Consequently, in this paper, we detailly analyze the recent alarming reports, highlighting the scientific heritage on diagnosing Climate-Change evolution; **The main roots of global ineffectiveness to guarantee a sustainable future are Characterized;** The importance of a balanced combustion and its connection with the Earth-Atmosphere balance is emphasized and, finally, from analysis of periodic tests results in 2 cars and 2 motorcycles, is concluded that COBMA, with and without pre-treatment, reduces efficiently CO and HC emissions concentrations controlling CO<sub>2</sub> emissions concentrations, keeping them steady after several weeks.

**Keywords:** COBMA (Combustion by Magnetic-Action), Unstable-Equilibrium, Geomorphic-Equilibrium, Synergistic Work, Comprehensive View, Global Comprehension, Anthropogenic Climate Change, Mitigation.

## 1. Introduction

Combustion Optimization by Magnetic Action (COBMA) aimed to abate Air Pollution controlling CO<sub>2</sub> Emissions, is not a Threat to the economy of large oil producers Countries, neither other one. On the contrary, its implementation would be a demonstration of real solidarity from high to low-income countries, which the world is needing. It is not a chimera. It is totally possible. It is based on real facts.

### 1.1 The Context. [1]

Global Ineffectiveness reducing anthropogenic emissions to the atmosphere is evident. Bureaucratic inertia too. Global indifference and bias could be worse. Continuous deterioration of fauna and flora reveal those behaviors, showing us as undaunted accomplices determined towards a fatal deserved fate. The Accomplishments pace of global Climate-Change policies is very slow, while the pace of the variation rate of CO<sub>2</sub> emissions concentrations is increasingly accelerated. Engaged countries implement and develop policies according to their political and socioeconomic conditions leading to delays, undermining global policies effectiveness. This is the context of the purpose of posing **COBMA** as an urgent effective action to mitigating burning fuel emissions from mobile sources. The contents in this paper summarize the theoretical and experimental basis supporting the purpose of presenting Combustion Optimization by Magnetic Action (COBMA) as

effective to tackle the Anthropogenic Climate change and Air pollution at the same time, determining its context, characterizing the comprehension of Anthropogenic induced Climate Change as an integral and indissoluble part of the comprehension of results conclusions. Without this context, results do not even have the consistency to be put in perspective for a possible implementation of COBMA. Moreover, a more comprehensive view of Anthropogenic Climate Change favors synergistic work, indispensable to solve the present climate crisis.

## 1.2 Main Roots of Global Ineffectiveness [2]

The most important roots of global ineffectiveness are briefly explained as follows:

1. **Ineffective global Policies** [3] [4] [5] [6]: NDC And Carbon Pricing are real examples. NDCs (Nationally Determined Contributions) have not been enough global effective. The last published report on Nationally Determined Contributions showed that they would still condemn the world to a calamitous 2.7-degree increase. [7]
2. **Insufficient Synergistic work.** [8]: Rejection of the integrative idea to come together around, seeing the earth behaving as if it were alive, at least regulating its climate and chemistry.
3. **Weak Interaction Science-Engineering:** Essential independency of every special scientific or engineering activity involved and committed in the solution of The Climate Change Issue have given rise to scientific babel that induces an inertial behavior preventing an important global advance in the path to a real solution. [9]
4. **Insufficient Global Proven Actions to cut Emissions:** COBMA is an example.
5. **Transitions slowness:** In 2022 there were 1.46 billion light cars on the road worldwide [10]
6. **Insufficient Global Implementation Proven Actions:** Within the Reach of All Countries: Insufficient Mitigation Actions Facing the Increasing emissions of Pollutants.
7. **Complexity of Climate Change-Air Pollution.** [11] [12] [13] [14]: A Deficient Global Comprehension of the nature of Climate Change- Air Pollution, dual in its nature and manifestations:
8. **The slowness of transition from fossil fuel cars to electric cars** [15].
9. **The slowness of transition to clean energies.** [16]

## 2. Analysis of the recent alarming reports [17] [18] [19] [20] [21] [22] [23]

### 2.1. The recent alarming reports

**National Oceanic and Atmospheric Administration (NOAA):** December 2022 ranked as the eighth-warmest December in NOAA's 143-year record. the year 2022 was the sixth warmest year since records began in 1880. CO<sub>2</sub> level for December 2021 416.71 ppm to 418.95 ppm in December 2022; CH<sub>4</sub> level for September 2022: 1915.86 ppb 2021: 1902.68 ppb, (GML) National Oceanic and Atmospheric Administration

**Intergovernmental Panel on Climate Change Assessment Report Sixth (IPCC AR6):** The latest and most extensive recently confirmed report, later explained, it is a “code red” for humanity. Only a rapid and deep decline of CO<sub>2</sub> emissions in the coming decades could stabilize temperatures and prevent the temperature on the planet from rising above 2°C.

**Conference of Parties (COP27):** Scientists announced, November 6-18, 2022, in Sharm el Sheij, Egypt, that Global carbon dioxide emissions from fossil fuels were projected to increase by 1% in 2022, hit a new record of 37.5 billion tons. If the trend to increase continues, people could pump enough CO<sub>2</sub> into the atmosphere to warm Earth to 1.5°C above pre-industrial temperatures in just 9 years.

**United Nations (UN) GENERAL SECRETARY: Antonio Guterres (COP 26-27):** Our planet is fast approaching tipping points that will make climate chaos irreversible and, it is time for nations to come together for implementation. IPCC AR6 is a “Code Red” for humanity. The science is clear. We know what to do. First, we must keep the goal of 1.5 degrees Celsius alive.

**World Health Organization) WHO: Billions of people still breathe unhealthy air. April 4/2022**

**Environmental Protection Agency (EPA):** The most effective way to reduce CO<sub>2</sub> emissions is to reduce fossil fuel consumption.

**International Energy Agency:** GHG emissions are likely to rise to record levels in 2023 and the following years as investments in green technology drop due to the Covid-19 pandemic. Hence, based on the current forecasts for public spending, IEA expects new record emissions levels in 2023 and beyond. If these trends continue on the same path over the

years, consequences would be catastrophic. There are many discouraging announcements to refer. I would rather summarize them in the declarations of the UN General Secretary, as follows: Our planet is changing before our eyes from the ocean depths to mountains tops, from melting glaciers to relentless extreme weather events. We are on a highway to climate hell with our foot still on the accelerator. Humanity has a choice: cooperate or perish. [21]

### 2.2. The Analysis of the recent alarming reports

Announcements are pointing out the global ineffectiveness on cutting emissions, missing the right path to a sustainable future and thoughtlessly moving away increasingly fast from it, towards a close unstable equilibrium. Implementation of COBMA and other proven actions constitute an urgent path we must follow right now to keep the planet temperature from rising above 2°C, averting a climate catastrophe. We insist that this only will achieve this goal working together as stated in COPs 26 and 27 but, globally integrated around a more comprehensive view of the Earth-Atmosphere system balance; seeing the Earth as a planet that behaves as if it were alive, at least to the extent of regulating its climate and chemistry, as James Lovelock and other independent scientists have stated for long. [24].

## 3. Basic Scientific Heritage

Apart from the alarming and discouraging announcements from authorized sources, the scientific heritage on the climate must be valued. It has not only made possible to know the evolution of the earth's atmosphere, since immemorial time, also allows us to understand the earth's climate in the past and its relationship with the present and future climate of the earth. The past is full of evidence of change, revealing that human influence after the industrial age has triggered the increase in the planet's average temperature. The following figures not only summarize what was mentioned above, but also allow us to approach the nature of the climate problem from a more comprehensive view supported by the concept of balance.

### 3.1. Stable CO<sub>2</sub> Concentration Cyclical Variations Over Past 400.000 Years [23]

Figure1 shows Human influence, in the last 120 years highly steepening the CO<sub>2</sub> variations slope.

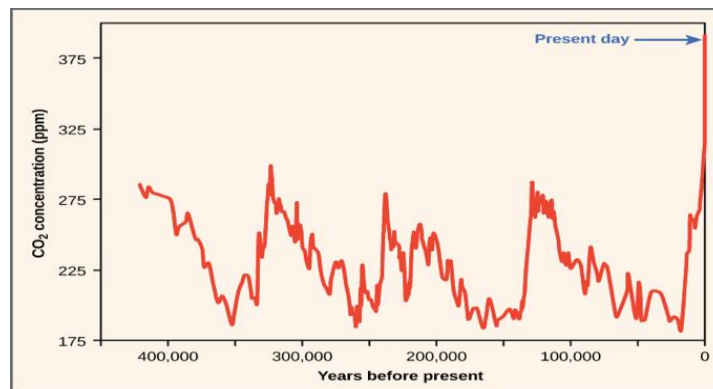


Figure 1. CO<sub>2</sub> cyclical variations over past 400.000 years

### 3.2 Global Temperatures variations [18]

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years. Changes in global surface temperature over the past 170 years (black line) relative to 1850–1900 and annually averaged, compared to CMIP6 climate model simulations of the temperature response to both human and natural drivers (red color), and to only natural drivers (solar and volcanic activity, green color) are shown in Figure 2. Human influence is clear. We are fast approaching to the 1.5 °C threshold above the preindustrial temperatures as can be noted. It can also be noted the abrupt change of temperature due to human influence distorting the natural temperature variations cycle.

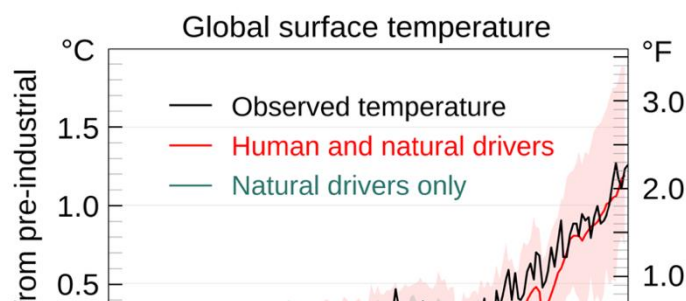


Figure 2. IPCC AR6th WG1 SPM figure SPM1 P SPM-7

### 3.3 Earth's Magnetic Field Reversals. [25]

Figure 3 shows, Again, a process of cyclical changes. Now with a time span of million years. According to studies of the Earth's core, the direction of the earth's magnetic field reverses about every million years. The influence of reversals in Earth atmosphere and evolution of life in the Earth has not been so important as its decrease. The Earth's Magnetic field is not only the protective shield from radiation and particles from the outer space. It is argued that the magnetic field of the earth is responsible for the formation of the steady ozone layer in the earth's atmosphere. The ozone layer in addition to protecting biological life from ultraviolet radiation has also been responsible for maintaining the water and oxygen balance in the atmosphere and consequently evolution of life in the Earth. In some periods The Magnetic field has weakened and consequently contributing to chemical, geological, biochemical, and other great transformations in the earth and its atmosphere.

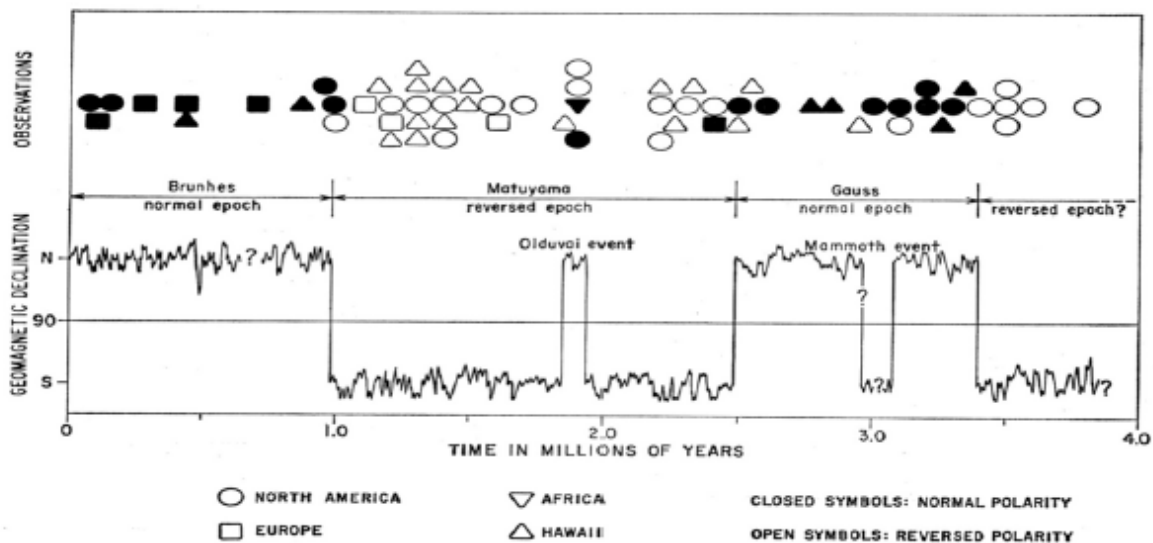


Figure 3. Earth Magnetic Field Reversals

### 3.4 Understanding the Problem Through a More Comprehensive View

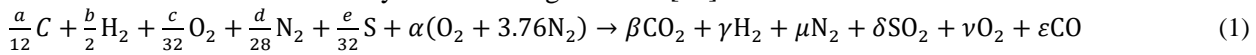
Natural Cycles are expressions of a more general and harmonious form of equilibrium. They are inextricably linked by universal laws; changes in CO<sub>2</sub> levels move in step with changes in Earth's temperature. Both track with cyclical variations in Earth's orbit. Figures 1-3 provide a more comprehensive view of the Climate Change issue through the concept of balance distorted by human influence in 120 years. We cannot control natural cycles. We must respect natural laws and adapt to natural changes.

## 4. The importance of a balanced combustion

The equation 1 represents a real fuel combustion. The importance of the combustion equation, in the case of gasoline equations lies in limiting and controlling HC and CO reductions as dependents on CO<sub>2</sub> increases below the international standards. Thus, allowing balanced combustion. This means that HC and CO emissions cannot be reduced at will without increasing CO<sub>2</sub> beyond the international standards. This equation is the theoretical basis to raise the climate ambition of tackling Air Pollution and Anthropogenic Climate change at the same time. The earth since immemorial time has kept its elements composition with a very low percentage of CO<sub>2</sub>, today about 0.04%, through a Redox equation. Therefore, fuel combustion Redox equation must be aimed to control CO<sub>2</sub> increases. Excessive air pollution abatement could give rise to high CO<sub>2</sub> concentrations increases tending to upset the atmosphere balance and consequently favoring Global Warming increase. Therefore, these actions must be in hands of persons with sufficient theoretical knowledge and experience to be precisely carried out.

### 4.1 Equations

Fuel combustion is controlled by the following reaction [26]:



Where:

a, b, c, d, e, are the fractions of the different reactants of the gasoline combustion,  $a + b + c + d + e = 1$   
 $\alpha$  = kmoles of O<sub>2</sub> in air per kg of fuel,  $\beta$  = kmoles of CO<sub>2</sub> per kg of fuel,  $\gamma$  = kmoles of H<sub>2</sub>O per kg of fuel,  
 $\mu$  = kmoles of N<sub>2</sub> per kg of fuel,  $\delta$  = kmoles of SO<sub>2</sub> per kg of fuel  
 $\nu$  = kmoles of O<sub>2</sub> in fumes per kg of fuel,  $\varepsilon$  = kmoles of CO per kg of fuel

## 5. Evolution of COBMA Start, Rise, Fall, Retake

We have been working in the last 15 years proving the efficiency of COBMA as it is shown in our referenced RTESE papers. Especially, [27] [28] [29] [30] [2]. COBMA started successfully as early as 1940's improving the fuel performance of USA Air Force and Royal force aircrafts when magnetic field was obtained by electric current and declined in less than 12 years. Six decades later with the Neodymium Magnets advent, the magnetic devices and COBMA had their peaks for about 10 years. Unfortunately, COBMA has been discredited because economic interest has prevailed over the interest of protecting the planet. We are still on time to retake this unbeatable technique, indispensable, to counteract the main unbalancing factor of the carbon cycle, while transitions to electric cars and clean energies are made.

## 6. Magnetic Units for Tests, Measurements, Results, Analyses and Conclusions

### 6.1 Magnetic Units for Tests.

6.1.1 Power Pack, unit with hydraulic pretreatment, built by Henry Guerrero in San Francisco USA.

6.1.2 Unit without hydraulic pretreatment designed by Raul Guerrero for lab experiment, Colombia 2017.

### 6.2 Measurements.

Measurements for a Chevrolet Sail Car (October 2022-March 2023) periodic tests were performed in authorized ADC, according to governmental Colombian regulations. CO, HC, CO<sub>2</sub> and O<sub>2</sub> initial and final emissions results were obtained from an ADC gas analyzer using standard gasoline RON 87. Drastic final tests results for a Toyota Tercel and 2 motorcycles (2008) were reported in paper to RTESE'2017 [2]. Now they are shown connected to its initials and average variations, as well as with its CO<sub>2</sub> variations not reported before. Additionally, they are compared with the correspondent variations obtained for a Chevrolet Sail Car, according to tables and bar diagrams confirming the theoretical and experimental certainty of COBMA. Bar diagrams for O<sub>2</sub> were not drawn. O<sub>2</sub> is not a GHG nor a pollutant. All O<sub>2</sub> concentrations met the norm  $\leq 5\%$ . O<sub>2</sub> variation could be adjusted using the equation of Incomplete Combustion, for lowering CO<sub>2</sub>. Tests results were arranged according to Tables 1- 4. From Tables 3-4 it can be noted that O<sub>2</sub> variations for motorcycles are not significantly and tending to get steady. From tables 1-2, it can be noted a final O<sub>2</sub> decrease with respect initial value of 68% in the Toyota favoring CO<sub>2</sub> increase. In the Chevrolet Sail a final O<sub>2</sub> increase that is almost double the initial value favoring CO<sub>2</sub> reduction. In both cases variations ten to get steady. Small O<sub>2</sub> variations show its trend tending to get steady. Bars diagrams for O<sub>2</sub> variations were considered not necessary.

**Table 1. Emissions Tests Results for Toyota Tercel 2008**

Emissions/Days	0	1	7	15	21	30	45	60
HC	787	424	472	420	385	364	350	336
CO2	10	9,85	12,5	12,5	10,5	12,2	12,1	12
CO	3,5	4,1	1,52	1,25	2,39	2,5	2,515	2,53
O2	5	1,5	0,9	0,8	4,1	1,5	1,55	1,6
Mileage	185400	185559	185879	186255	186725	187011	187264,5	187518

**Comparison of Initial, Final and Average Variations Between Chevrolet Sail and Toyota Tercel Cars**

Table 1.1			Table 1.2			Table 1.3		
Initial Emissions Reductions	Toyota Tercel	Chevrolet Sail	Final Emissions Reductions	Toyota Tercel	Chevrolet Sail	AVERAGE EMISSIONS REDUCTIONS	TOYOTA TERCEL	CHEVROLET SAIL
HC (PPM)	-46%	-5.4%	HC (PPM)	-57%	-75%	HC (PPM)	-50%	-76%
CO (%)	17.14%	-10.11%	CO (%)	-28%	-73%	CO (%)	-47%	-84.4%
CO2(%)	-1.5%	0.76%	CO2(%)	20%	- 5.3%	CO2(%)	16.7%	-5.4%

**Table 2. Emissions Tests Results for Chevrolet Sail October 2022-March 2023**

Emissions/Day	0	1	99	125	132	139	146	153
HC	168	159	10	8	40.4	22.0	1.6	42.0
CO2	13	13,1	12,2	14,2	11,6	11,4	11,5	12,3
CO	0,89	0,8	0,01	0,01	0,06	0,03	0,04	0,24
O2	1,13	1,1	3,42	1,16	3,4	3,72	3,45	3,38

**Comparison of Initial, Final and Average Variations Between Motorcycles**

Table 2.1			Table 2.2.			Table 2.3		
Initial Emissions Reductions	Motorcycle 1	Motorcycle 2	Final Emissions Reductions	Motorcycle 1	Motorcycle 2	AVERAGE EMISSIONS REDUCTIONS	Motorcycle 1	Motorcycle 2
HC (PPM)	-10.02	-20.62	HC (PPM)	-28,65%	-72%	HC (PPM)	-23%	-47.4%
CO (%)	- 6.15%	-3.98%	CO (%)	-41,53%	-15.92%	CO (%)	-25.71%	-17.5%
CO2(%)	3.85%	19.04 %	CO2(%)	-43.5%	33.30%	CO2(%)	-28.8%	27%

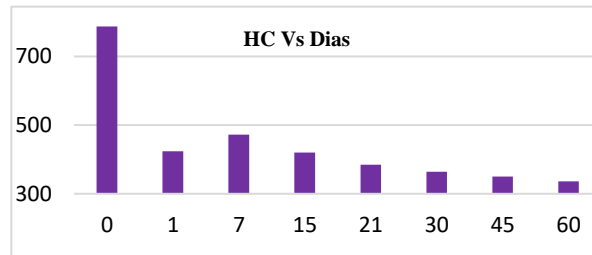
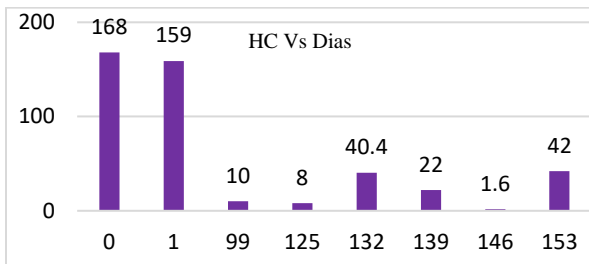
**Table 3. Motorcycle 1. Suzuki 1996 (Plates XHL 36A)**

Emissions/Days	0	1	7	15	21	30	45	60
HC	349	314	298	268	253	249	249	249
CO2	2,6	2,7	2,2	2,1	1,5	1,49	1,48	1,47
CO	2,6	2,44	2,435	2,43	1,57	1,57	1,545	1,52
O2	14,3	14,2	14,3	15,1	16,7	15,1	15,05	15
km	7197	7210	8208	9001	9923	10540	11534,5	12529
norma	2000	2000	2000	2000	2000	2000	2000	2000

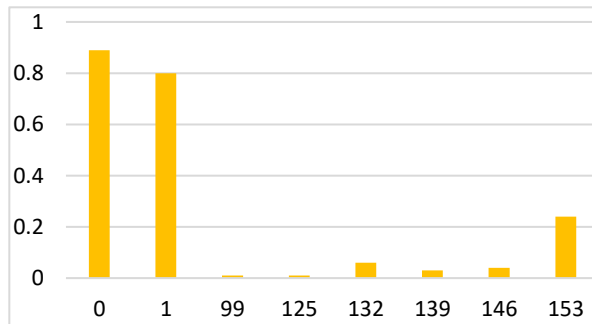
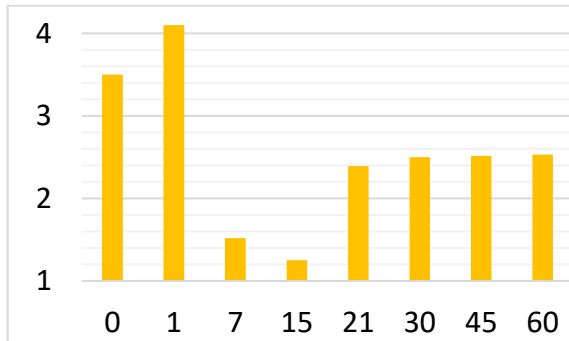
**Table 4. Motorcycle 2. Auteco Boxer model 2008 plate JIS 07B**

Emissions/Days	0	1	7	15	21	30	45	60
HC	1169	928	829	210	267	274	300,5	327
CO2	2,1	2,5	2,1	3	2,8	2,7	2,75	2,8
CO	2,26	2,17	1,83	1,49	1,87	1,89	1,895	1,9
O2	15,2	14,7	15	14,7	14,6	14,96	15,58	16,2
km	6272	6277	6292	6881	7389	7969	8432,5	8896
norma	2000	2000	2000	2000	2000	2000	2000	2000

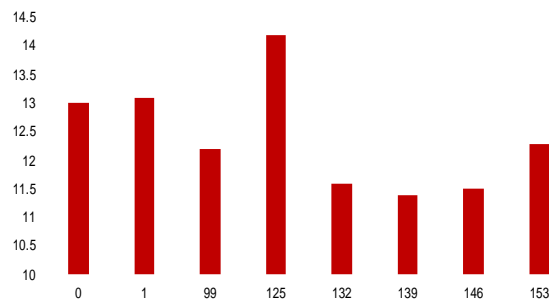
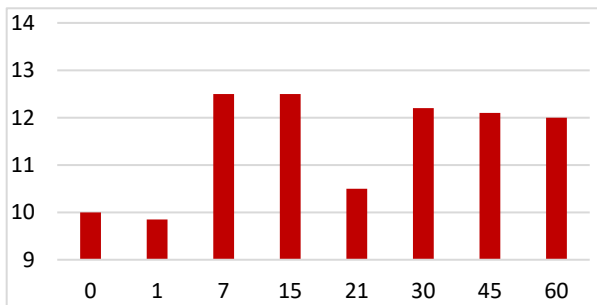
Bars diagrams to compare devices with and without hydraulic pre-treatment performance:



Figures 4.1 and 4.2. Drastic final high HC percentage reductions for Chevrolet Sail that are higher than those for the Toyota Tercel. Both variations in different time span tend to get steady in the last weeks.

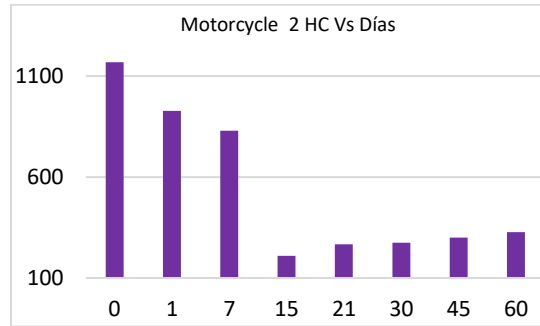
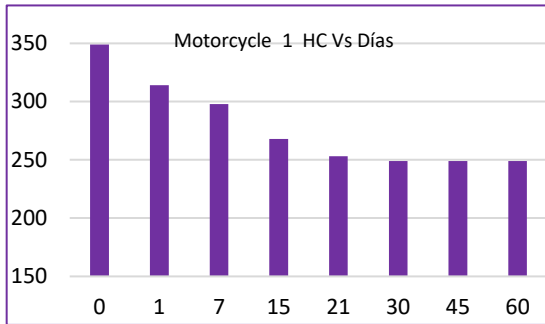


Figures 5.1 and 5.2. Drastic final high CO percentage reductions for Chevrolet Sail that are higher than those for the Toyota Tercel. Both variations in different time span tend to get steady in the last weeks.

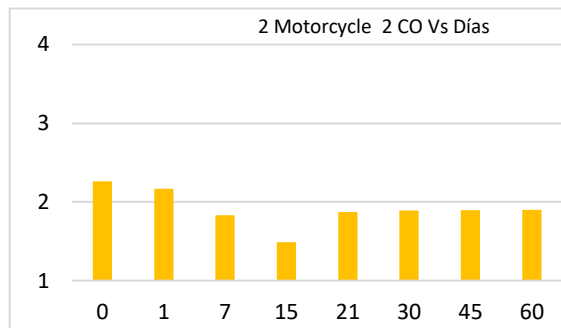
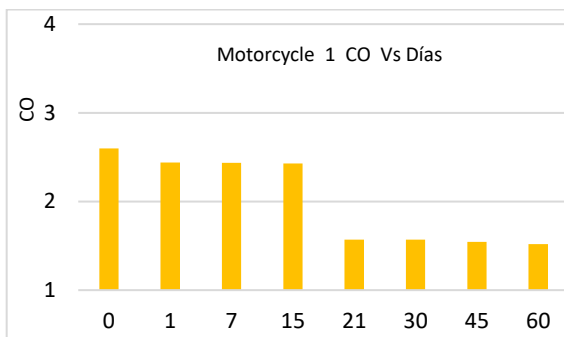


Figures 6.1 and 6.2. Final low CO<sub>2</sub> reduction percentage for Chevrolet Sail and high final increase for the Toyota Tercel. Both variations in different time span tend to get steady in the last weeks.

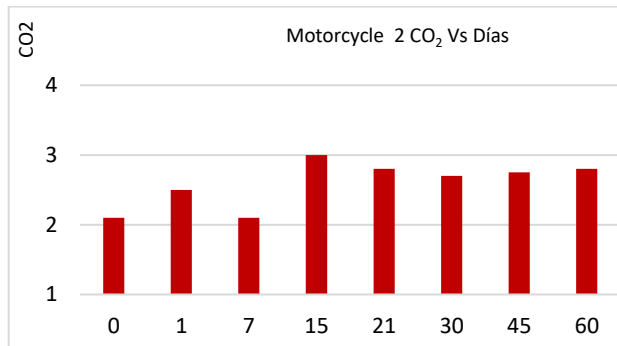
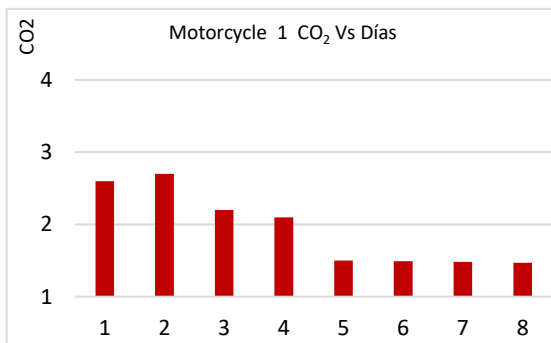
Bars Diagrams to Analyze CO<sub>2</sub> results (not done before) in Motorcycles Using a Device with Pre-treatment:



Figures 7.1 and 7.2. Greater HC percentage reductions in motorcycle 2, implying important CO<sub>2</sub> increases.



Figures 8.1 and 8.2. Greater CO percentage reductions in motorcycle 1, implying important CO<sub>2</sub> increases.



Figures 9.1 and 9.2. High CO<sub>2</sub> percentage final reductions in motorcycle 1 and important CO<sub>2</sub> increases, due to important CO and HC reductions in motorcycle 2. Both variations tending to get steady.

## 7. CONCLUSIONS

Helping to solve the environmental crisis must not be a lucrative activity. The following conclusions are drawn from this study:

1. Initial HC and CO reductions are greater using magnetic devices with hydraulic pre-treatment but, in general, CO<sub>2</sub> increases.



2. Magnetic devices, without pretreatment, able to behave as a MEB, are good reducers of HC and CO and better controlling CO<sub>2</sub> emissions. They favor the climate ambition of tackling air pollution and anthropogenic climate change at the same time. They are very economical, easier to build and to install but not easy to design.
3. The design, building, construction and updating of the devices must be in hands of a experts in that field and under the control of a Authoritative and responsible institution in charge of the protection of the Global Environment.
4. Tests for many other types of cars and motorcycles must be done. Last year 1.46billion of vehicles powered by gasoline and diesel were on the road worldwide.
5. CO<sub>2</sub> emissions reductions tend to get steady after several weeks. CO<sub>2</sub> emissions concentrations increase rate tend to lower and concentrations to get steady after several weeks.
6. The first motorcycle tests results show reductions of CO<sub>2</sub> but lower reduction of HC than the second and higher CO emissions with high emissions of O<sub>2</sub>. The second motorcycle tests results show increases of CO<sub>2</sub> a little higher reduction of CO with high emissions of O<sub>2</sub>, that in both cases get steady.
7. The device without pretreatment is better controlling CO<sub>2</sub> but both devices can control CO<sub>2</sub> emissions, lowering HC and CO reductions and O<sub>2</sub> with Incomplete Combustion Equation.

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