

Contributions to Keep Atmosphere Balanced: Anthropogenic Climate-Change Comprehension from Atmosphere Balance and CO₂ Emissions Pattern

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Abstract - The Anthropogenic Climate-Change issue is more than a complex science problem. Therefore, its Global Comprehension has not been achieved yet. The main goal of this paper is analysing, under the approach of earth's Atmosphere balance and natural CO₂ emissions pattern, increases of CO₂ amounts from two cars emissions results obtained in Cartagena, Colombia, February-May 2019, by magnetic action. Understanding the Anthropogenic Climate-Change as a rupture of the Atmosphere balance and the rhythm of CO₂ emissions pattern, favours global Comprehension, synergistic work, and consequently Climate-Change mitigation, as it will be detailly explained in this paper. Prescinding from that understanding delays and prevent to achieve the foresaid mitigation. An optimistic view of Earth using proper magnetic field action to get clean air and minimum CO₂ emissions is an effective way to arouse willingness for a global Comprehension of the real Climate-Change problem. The new approach is motivated by unquestionable realities: Climate varies through both natural and anthropogenic processes; Climate has changed throughout the history of the earth and will continue changing; natural evolution is a general law of the universe but at its own rhythm; human activities must not accelerate or retard natural rhythm; we must respect natural laws; the anthropogenic impact on the climatic system is returned through climatic changes that can put at risk the continuity of life on the planet. Therefore, Climate understanding is fundamental. **Climate Change caused by natural factors is not the real problem**; Climatic conditions have changed over million years. In some periods gradually in others abruptly, giving rise to chemical, geological, biochemical, magnetic, and other great transformations related with the earth's atmosphere. The real environmental problem is **the lack of an effective and opportune mitigation of anthropogenic emissions to the atmosphere impacting the earth climate-system**. So, global mitigation of **anthropogenic** Climate-Change must be started now.

Keywords: Real Climate-Change issue, Carbon-Dioxide Emissions Pattern, Synergistic Work, Comprehensive View, Global Comprehension, Anthropogenic Climate Change, Mitigation.

1. Introduction

1.1 Motivation and Justification of this paper Contribution

A very hard effort has been done in many countries to controlling air pollution. Restrictive measures, better plans of vehicles circulation, better fuels selection, obligatory use of pollution controlling devices, combustion optimizers among other devices to cut emissions, policies, strategies, actions, and plans [1], have helped a lot to reduce air pollution. Due to worldwide effort, million tons of polluting agents have not been released to the atmosphere but, no device has been so highly efficient and nor strategy or action enough to solve completely the problem alone or even in a synergic connection with the implemented others. On the other hand, international agreements since Kyoto Protocol [2], until the Paris Agreement [3], have not achieved their global goals due to political and socio-economic gaps between the countries. In the last UN Climate-Change summit, The Glasgow Pact settled concrete pledges that are really a completion of Paris Agreement. In a few words, despite the effort, for decades, Air Pollution continues worsening and average global earth's temperature increasing. This allow us to think that obviously air pollution and CO₂ emissions reduction has not been effective tackling the Anthropogenic Climate-Change problem, that beyond good intentions something is missing. Therefore, all proven efficient actions as **COBMA** must be globally properly implemented now. In a previous paper ten possible causes of delaying and preventing a global Solution of the real environmental problem are identified [4]. In this paper it is emphasized on those directly related with the **Comprehension of the problem, Synergistic work, and Proper and Opportune Mitigation**. These are: Complexity of the Climate Change-Air Pollution nature, Insufficient Synergistic work Insufficient Global Implementation of Proven Actions Within the Reach of All Countries and Insufficient Mitigation Actions Facing the Increasing emissions of

Pollutants from mobile sources. This context of **Comprehension of the problem, Synergistic work, and Proper and Opportune Mitigation** are the distinctive of our papers since 2020 and is strengthened by fundamental statements in COP 26 [5], especially, **More needs to be done, we can only rise to the challenges of the climate crisis by working together, Accelerate the transition to zero emission vehicles** [6]. This context gives rise to the motivation and justification of this paper purpose that emphasizes, above all, on comprehension of the real problem attempting to characterize it as the first step to tackle a global solution. Consequent with this purpose it is needed to present fundamental ideas and definitions which are indispensable to ease a global comprehension of the Anthropogenic Climate-Change problem, enough to mitigate it as it is needed.

1.2 Reflections on Global Comprehension of Anthropogenic Climate-Change Problem.

The understanding of weather from earth's atmosphere conditions of a place in a short period of time, and climate from weather in a long-time span, is grasped, without a great effort, through our physical perception of the variables that characterize those physical atmospheric conditions [7]. To understand all the variables of climate and how they affect it requires basic knowledge of the phenomena physics [8] but, to deepen in the subject and eventually value human-climate-system influence and vice versa, it is necessary to understand the system that determines the climate of the Earth and the interactive processes that lead to climate change; consequently, more than basic physics knowledge is needed [9]. In consequence, Climate-Change is an Interdisciplinary Scientific Problem that must be deeply studied if has to be raised properly. The solution of Anthropogenic Climate-Change problem is more than to solve a complex science problem, because involves political and socioeconomic variables that today are beyond the domain of science [10], [11]. Therefore, Global thorough knowledge of Anthropogenic Climate-Change problem has not been grasped yet and, in fact, so its solution [12]. For comprehension of Climate-Change is indispensable to understand the atmosphere composition, its main constituent elements, and its balance; the main processes through which climate agents interact; atmosphere evolution; the climate-change and its drivers and other details.

It is worth to recognize the divulgation work done by several institutions as NASA, UN, and Scientists for different educational levels, to help common people to understand Climate Change. However, a global thorough understanding of the Climate Change issue is not possible. It is an Interdisciplinary Scientific problem, and its solution is more than that. Therefore, common people do not thoroughly understand the Scientific nature of the problem and many Scientists could not comprehend the political and socio-economic drives that delay and prevent the solution. Even, there is not complete agreement among scientists, so an extent, that there are two defined groups; those who believe in Anthropogenic Climate-Change and those who denies it. The work of teaching the different aspects of the climate to educators, media, children, among others, by institutions such as NASA, Scientists groups as IPCC and others have helped to guide the opinion and mitigate the environmental controversy that believed or not have influenced the delay of the solution. Crucial debates there were around **Hockey Stick Chart** [13], considered by deniers as the **Achilles Heel of global warming research** and they couldn't lock it, despite all the doubts they sew in the common people, media and even in the mind of some scientists [14].

The purpose of the present contribution and next ones is, in fact, an attempt to present a more comprehensive view of the anthropogenic Air Pollution-Climate Change problem and to attract the attention of organizations leading the Earth's environmental protection, to considering global implementation of **COBMA** and other effective proven actions.

Consequent with that purpose, we start referring briefly to: the rationale of the Earth's atmosphere composition stability, through various processes leaded by the mechanism of chemical redox reactions and its Interrelationships; the explanation and interpretation from carbon concentrations variation over past 400.000 years shown in figure 1 and figure 2; explanation and interpretation of the current global carbon cycle from figure 3; Atmosphere's Balance; Anthropogenic Climate Change problem comprehension based in former explanations and interpretations, and finally the analysis of results and conclusions.

1.3 On Earth's atmosphere evolution

One minute after the Big Bang, the universe was cool enough, so that, protons, and neutrons, in colliding, could stick together to form the low mass nuclei ^2H , ^3He , ^4He , and ^7Li whose relative abundances predicted by science are just what we observe in the universe today [15].

This is of fundamental importance because shows that nature points out to keep the proportion of its elements and laws that regulate how the changes must be. Hydrogen is still the most abundant element of the universe.

1.3.1 Redox Processes Are Great and Short Scale Mechanisms for Chemical Energy Transfer

The Reduction-Oxidation, Redox, processes form a very important class of chemical reaction. They are very important in Biochemical systems where they provide the mechanism for energy transfer in living organisms [16]. When a chemical reaction involves oxidation-reduction, the total number of electrons lost in the oxidation process must equal the total number of electrons gained during the reduction process.

Oxidation-reduction reactions have vast importance not only in chemistry but in geology and biology as well. The surface of Earth is a redox boundary between the planet's reduced metallic core and an oxidizing atmosphere.

Earth's crust is largely composed of metal oxides, and the oceans are filled with water, an oxide of hydrogen. The tendency of nearly all surface materials to be oxidized by the atmosphere is reversed by the life process of photosynthesis. Photosynthesis is a process in which plants containing chlorophyll convert the carbon dioxide into sugars in the presence of sunlight by a set of redox reactions. Because they are constantly renewed by the photosynthetic reduction of carbon dioxide, life's complex compounds can continue to exist on Earth's surface.

The burning of fuels that provides the energy to maintain our civilization and the metabolism of foods that furnish the energy that keeps us alive both involve redox reactions. Fuels constitute for industrial plants the same as carbohydrates or food for our bodies, but the way it develops its combustion is very different.

The earth's atmosphere, throughout its history has undergone a redox evolution [17]. Combustion of a fossil fuel, as gasoline, at a small scale, is the result of analogous processes as well.

So that, the former described chemical-energy transfer processes to maintain life confirm that nature laws rationales are the same at short and great scale, just developed differently. As it is up it is down.

1.3.2 Stable Rank of CO₂ Concentration Variations Over Past 400,000 Years

For hundreds of millennia, the levels of CO₂ in the atmosphere underwent slow fluctuations, which largely mirrored gradual cycles in the earth's orbit and varying levels of planetary ice coverage. The levels remained below 300 ppm for more than 400,000 years. But in the last century, the burning of fossil fuels has rapidly driven atmospheric CO₂ levels to new heights, overriding the natural cycle. At present the level is 418 ppm with a high probability to increase. The changes in CO₂ levels move in step with changes in Earth's temperature. Both levels and temperature track with cyclical variations in Earth's orbit, known as Milankovitch cycles, but they can't be fully explained by these cycles alone. Scientists suspect that the periodic spikes in levels might be related to changes in carbon cycling in the ocean during the cold/low periods, but this is still an active area of investigation. For our purposes here, the key point is that the levels shown in Figure 1 are higher in the present day than they have been for over 400,000 years, regardless of the cycles.

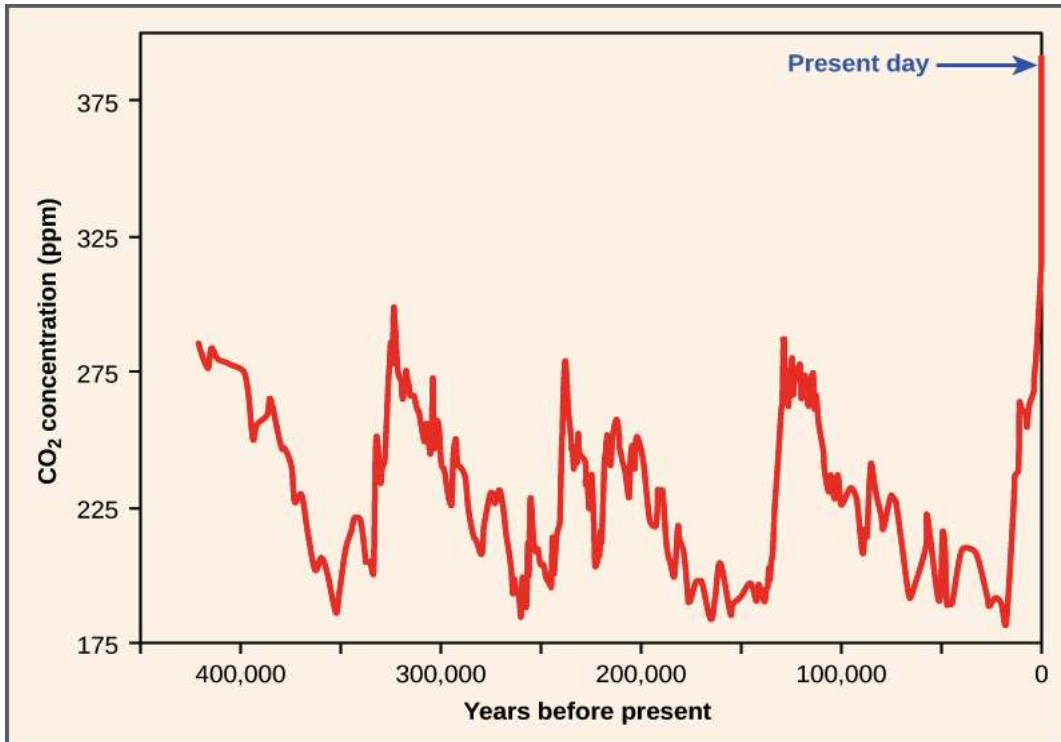


Figure 1. CO₂ Levels Naturally Rise and Fall Cyclically Over the Past 400,000 Years Image credit: "Threats to biodiversity: Figure 1" by OpenStax College, Biology, CC BY 4.0

1.3.3 Schematic Representation of CO₂ Concentrations Variations

We attempt to explain, from Figure 1, the idea we have about the more general equilibrium than the stable equilibrium we study, in mechanics schematizing it and interpreting in the Figure 2. No importance is given to all values but to maximum and minimum values in each substage because they are the critical ones that define the equilibrium. The other points on the circumference could have their equivalent on the graph in Figure 1 but they do not matter so much because they are not critical. Question marks show we do not know what will happen if carbon dioxide increase is not stop.

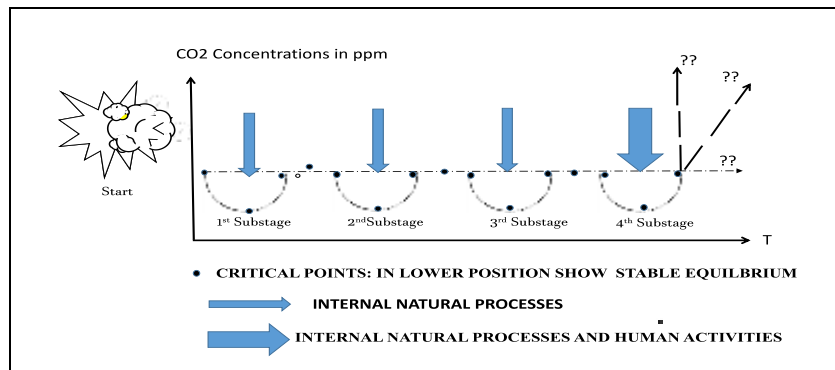


Figure 2. Schematic Representation of CO₂ Concentrations Variations

1.3.4 Global Carbon Cycle.

Amount of CO₂ in GT (Gigatons) due to human activities is shown as the main unbalancing Factor of the Carbon Cycle is shown in Figure 1. The natural cycle adds and removes CO₂ to keep a balance; humans add extra CO₂ without removing any. Human CO₂ is a tiny percentage of CO₂ emissions. The oceans, land, and atmosphere exchange CO₂ continuously so the additional load by humans is incredibly small. The atmosphere contains 720 billion tons of CO₂ and humans contribute only 6 GT additional load on this balance. Before the industrial revolution, the CO₂ content in the air remained quite steady

for thousands of years. However, natural CO₂ is not static. It is generated by natural processes and absorbed by others. As can be seen in Figure 3, natural land and ocean carbon remains roughly in balance and have done so for a long time.

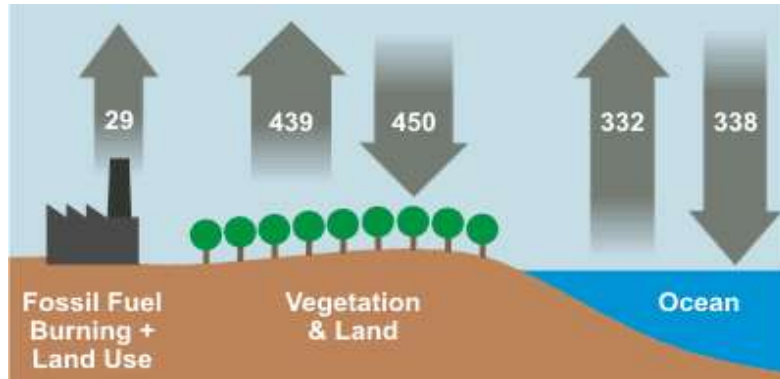


Figure 3. Global carbon cycle. Numbers represent flux of carbon dioxide in Gigatons (Source: Figure 7.3, IPCC AR4).

Although 29 gigatons of CO₂ released by burning fossil fuels, from outside of the natural carbon cycle is tiny compared to the 750 gigatons moving through the carbon cycle each year, it adds up because the land and ocean cannot absorb all the extra CO₂. About 40% of this additional CO₂ is absorbed. The rest remains in the atmosphere, and consequently, atmospheric CO₂ is at its highest level in 15 to 20 million years. A natural change of 100ppm normally takes 5,000 to 20,000 years. The recent increase of 100ppm has taken just 120 years). Human CO₂ emissions upset the natural balance of the carbon cycle. Man-made CO₂ in the atmosphere has increased by a third since the pre-industrial era, creating an artificial forcing of global temperatures which is warming the planet. While fossil-fuel derived CO₂ is a very small component of the global carbon cycle, the extra CO₂ is cumulative because the natural carbon exchange cannot absorb all the additional CO₂. The level of atmospheric CO₂ is building up, the additional CO₂ is being produced by burning fossil fuels, and that build up is accelerating [18].

2. The Atmosphere in Balance

When we have referred to atmosphere in balance it does not mean that there are no changes in the Atmospheric system. That is not the condition of the atmosphere, nor of the earth, nor of the solar system, nor of the universe that began to cool down after the Big Bang. Evolution is a general law of the universe. So that, the equilibrium concept is not understood from the definition given by Webster Dictionary: a state of static or dynamic balance between opposing forces or actions [19]. The stable atmosphere balance can be visualized in figure 1 and schematized in figure 2. Variations in figure 1 are understood as a form of more general stable equilibrium (Geomorphologic Equilibrium) [20], not exactly the equilibrium that basic mechanics and physics talk about. It is a natural harmonic and complex balance. As a result, it has a stable elements proportion of 78% of N, 21% O and 1% of other gases: Argon 0.934% and CO₂ 0.036%. For 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today. About: 80% N₂, 20% O₂ and less than 1% of CO₂, H₂O + Noble Gases.

In each stage of the earth's atmosphere over 4.6 billion years there have been natural changes that have allowed evolution to continue. The problem is that in the last 150 years of the last stage we have caused changes that are not natural and break the harmonic balance of the atmosphere. This could lead to our end but not as it happened naturally with other species but abruptly.

The additional CO₂ concentration of human emissions is a tiny percentage of total CO₂ emissions. However, it cannot be stated that it has nothing to do with global Climate Change because CO₂ concentration, in the atmosphere, in approximately 120 years after pre-industrial era, have increased in 100ppm. This results in a concentration increase rate of $\frac{0.83\text{ppm}}{\text{year}}$. A natural increase of 100ppm occurs in a period from 5000 to 20000 years. Given rise to a maximum increase rate of $\frac{100\text{ppm}}{5000\text{year}} = \frac{0.02\text{ppm}}{\text{year}}$, or minimum increase rate of $\frac{100\text{ppm}}{20000\text{year}} = \frac{100\text{ppm}}{20000\text{year}} = \frac{0.005\text{ppm}}{\text{year}}$. An increase rate comprised between $\frac{0.02\text{ppm}}{\text{year}}$ and $\frac{0.005\text{ppm}}{\text{year}}$.

This means the concentration variation rate of the human made CO₂ is from 42 to 167 times greater than the natural one. This has triggered the Earth Systems changes in the last 120 years as it is explained later in the next paragraphs.

3. Understanding the Problem Through a more Comprehensive View

Today, there is no doubt that emissions from anthropogenic activities, using fossil fuels, are the main cause of Air Pollution and increase of the planet average global temperature, affecting ecosystems, and threatening human life. Though it is truth, it does not help to state that solution of Anthropogenic Climate-Change problem is more than solving a complex science problem, because involves political and socioeconomic variables that, presently, are beyond the domain of science. Rather, it is better to understand the earth nature, to grasp what the essence of the Climate Change problem is, through the condition of the atmosphere balance and its irrefutable facts. This ease global comprehension, synergic work, and favors mitigation. Poor understanding of the real environmental problem delays its solution and can even prevent it from ever being solved.

Climate-Change represents a disturbance to the driving variables. Physical systems respond to a disturbance by altering their morphology to accommodate the new driving forces. But this response does not happen instantaneously. There is a time span of instability until the Earth physical Systems, after a relaxation time are, again, in equilibrium with the new driving forces. How a system responds to change depends on the presence of positive or negative feedback processes. A negative feedback process is one that tends to restore the system to its previous state when it is disturbed, while a positive feedback process tends to accelerate the disturbance. Hence, systems with negative feedback tend to be stable, while positive feedback systems are unstable. Natural processes allow to restore the systems because they can change (reaction) relax and then equilibrate the new driving forces. When driving forces are fast increasing continuously, the Earth systems cannot react to equilibrate the driving forces, until sudden changes may equilibrate the driving forces. Today we are experiencing those changes. Those sudden changes can result in breaking, abruptly, the earth balance putting at risk human life. Today, there are signs of those changes in some regions; disappearance of the snow-capped mountains, increase in the average sea level, increase and decrease of the frequency of rains; Artic Meltdown and the degradation of ecosystems. **How an increasing driving force can break a system balance could be better understood through an analogy with the behavior of system Mass-Hookean Spring and perhaps much better from the behavior of a system Mass-Non Hookean Spring because of generality and complexity of the Earth's Systems. However, this is out of the purpose of acquiring Global Comprehension of Climate Change issue because is not within the reach of every person. It could be explained to people who are working within the scientific or technological field.**

To acquire Comprehension of the Climate Change issue, in this context, is not only to grasp its essence through the condition of balance of earth's atmosphere balance but, first rejecting the apocalyptic vision of Climate Change on earth and changing it for an optimistic one; with clean air and global warming controlled, arousing illusion, and willingness to understand the nature of the problem and help to solve it. The mind does not know neither understand about results, but it understands illusion and willingness to do things, that is what moves it. Thinking about results will limit it, as it will only serve to create nervousness, tension, and fear of not obtaining them. So, let's focus on the illusion and enthusiasm to do what we want ... Then, the results will come alone " [21].

COBMA and other proven actions could be effective ways to arouse illusion, and willingness

All what has been declared in all the previous paragraphs can be highlighted as follows:

- 1. The real Climate-Change problem is caused by the lack of an effective and oportune mitigation of emissions to the atmosphere from human activities that are impacting the earth climate system. Implementation of proven effective actions must start right now.**
2. The levels of CO₂ in the atmosphere underwent slow fluctuations, remaining below 300 ppm for more than 400,000 years. In the last century, burning of fossil fuels has rapidly driven atmospheric CO₂ levels to new heights, overriding the natural cycle.
3. If the Earth's Atmosphere has kept its concentrations composition stability and balance over hundreds of millennia, we must not keep on changing them, Earth will continue reacting to keep its stable equilibrium with terrible consequences for human life.

All what has been expressed about what Global Comprehension of the Anthropogenic Climate-Change can be summarized in the following James Lovelock Statement on the importance of knowing the earth’s nature to acquire the will to change our way of life and help to save the planet:

“Unless we see the Earth as a planet that behaves as if it were alive, at least to the extent of regulating its climate and chemistry, we will lack the will to change our way of life and to understand that we have made it our greatest enemy” [22].

4. Objective: Based on theoretical and experimental knowledge, the main goal is to analyze new results and concluding under the new approach, promoting **COBMA** and other proven mitigating actions, reinforcing the ideas explained in previous papers [23], [24].

5. Measurements:

A Van and a Renault car were tested using a magnetic unit with and without pretreatment respectively with two Single Day Tests; without the device and with the device installed, after traveling 6-7 Km Carbon monoxide (CO) and hydrocarbons (HC). Emissions results were obtained from a gas analyzer in the private auto mechanic workshop, Mekanos, in the city of Cartagena, Colombia in April 2019, using standard gasoline.

6. Single Day Tests

6.1 Units Used for Tests

Fig 2. Magnetic Unit with pretreatment built by Henry Guerrero in USA

Fig 3. Simple Magnetic Unit Built in Cartagena by Mekanos Workshop



Fig 2: Unit with Hydraulic Pretreatment Built in USA by Henry Guerrero



Fig 3: Unit Without Pretreatment Built in Mekanos Workshop

6.2 Tests Results

Tests results were arranged according to tables 1 and 2 respectively.

Table1. Unit with Hydraulic Pretreatment in Van

Emissions	DFSK WEQ 579 2015	
	Initial	Final
HC((PPM)	114	98
CO2(%)	10.7	10.7
CO (%)	0.33	0.28
O2(%)	1.55	1.48
Drive (Km)	0	6
Mileage (Km)	70000	70006
Magnetic Induction B= 4800 Gauss		

Table 2. Unit without Hydraulic Pretreatment in Car

Emissions	Renault 2012 DLL 112	
	Initial	Final
HC((PPM)	28	2
CO2(%)	12.1	13.3
CO (%)	0.32	0.00
O2(%)	2.19	1.85
Drive (Km)	0	6
Mileage (Km)	24351	24357
Magnetic Induction B= 6500 Gauss		

Conclusions

According to the analysis of the results from Table 1 it is found that the unit with pretreatment allows to keep the international standards for CO and HC emissions, with reductions of 15.1% and 14%, respectively with no CO2 emissions concentrations increase for **Single Day Tests**, in the DFSK Van. According to analysis of the results from Table 2 the simple

prototype allows to keep the international standards for CO and HC emissions, with respective drastic reductions of 100 % and 93%, and CO₂ emissions increase of 10 % magnetic unit installed. When this increase is compared with the correspondent 0.7% increase obtained from a Hyundai car, in RTESE'20 paper [23], it is found that CO₂ emissions concentration increase for the Renault, using for everyone a device with the same magnetic Induction **B** of 6500 Gauss, is about 14 times higher than for the Hyundai car. All this allows to conclude, as follows:

1. According to the analysis of the results from Table 1, using the unit with pre-treatment, it is found that the magnetic minimizer of 6500 gauss, installed in the Van reduces CO and HC emissions without increase of CO₂ for **Single Day Test**. Consequently, CO and HC emissions are suitable and the magnetic device it behaves as a **MEB**. No more tests are needed.
2. According to the analysis of the results from Table 2, it is found that the magnetic minimizer of 6500 Gauss, installed in the Renault car is highly efficient to reduce CO and HC emissions obtaining drastic reductions but with excessive CO₂ emissions increase. We can say CO and HC emissions reductions are unsuitable and the device does not behave as a MEB. Consequently, magnitude of magnetic induction **B** must be adjusted, and new emissions tests are needed.
3. The units with hydraulic pre-treatment (PP) could also behave as a MEB and that is why they should not be discarded. It is an option that requires a lower magnetic induction. However, design and its installation usually are not simple and straight forward and its construction and control are more demanding than the simple magnetic units without pre-treatment.
4. Again, it is shown that CO and HC emissions reductions cannot be made at will, without increasing CO₂ emissions beyond what standards allow. The chemical redox reaction of gasoline combustion limits and controls reductions of CO and HC in relation with CO₂ increases.
5. If the Earth's Atmosphere has kept its concentrations composition stability and balance over hundreds of millennia, we must not keep on changing them, Earth will continue reacting to keep its stable equilibrium with terrible consequences for human life. It is a conclusion from a basic physics idea. While electric cars and clean energies are globally implemented. Pollutants and CO₂ emissions, from mobile sources, must be mitigated using properly **COBMA** and all other proven actions.

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