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Influence of Solar Radiation on Questionable Gasolines Sold in N'Djamena: ASTM D86 Distillation Analysis and Standardized Tests Related to Atmospheric Pollution and Corrosion

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Abstract In this work we experimented with an analysis of fraudulent gasoline distillation sold in N'Djaména. The first experiment carried out on the storage of gasolines in polymer cans showed that the nature of gasoline changed in color and density. The cans were also denatured depending on the type of gasoline and the weather. Laboratory analysis of the distillation for commercial specification gave different results compared to refinery gasoline. Several tests according to NF and ASTM standards have been carried out and the results show that gasoline sold illegally is a great danger to the population and to sellers. To do this, we characterized the duration of insolation in N'Djaména in order to be able to analyze the influence of solar radiation as a function of its heat on the essences stored and sold illegally in the city. The analysis results give us a figure of 3030.91 ± 176.33 hours of sunshine per year corresponding to 8.9 hours per day. An observation of the pyranometer and simulations of the Streamer radiative transfer code made it possible to characterize the seasonal variability of the global solar energy potential at the N'Djamena station at 4.71 kWh / m2 / d. The maxima are recorded in spring with values above 5.70 kWh / m2 / day, and the minima in winter with values below 4 kWh / m2 / day. We then measured the air quality with a Purple Air sensor and the results confirmed the presence of particles that could affect human health. Our research obeys two objectives: on the one hand, knowledge of the negative impact and danger of hydrocarbons stored and traded illegally, and on the other hand, the development of regulations in force to stop this danger.

Keywords: *pyranometer, streamer radiative transfer code, purple air sensor, polymer, gasoline, refinery*

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1. Introduction

Chad is among the most vulnerable countries to the projected impacts of climate change [1]. From North to South of the country, the sun shines from 2,750 to 3,250 hours per year. The intensity of the global radiation varies on average from 4.5 to 6.5 kWh / m2 / d. [2,3,4]. This radiation has a great positive asset if used wisely, unfortunately this sun impacts several things including hydrocarbons. Several works involving the use of solar radiation have been done in particular that of [5] as well as [6,7] But rare are the research implicating the influence of solar radiation for some impact. Besides this fact, the problem of pollution is not only one of emissions but also one of exposures. Pollution is linked in particular to the urban context which, by its topography and its architecture, concentrates masses of nitrogen oxides and high particles as much as it brings together populations. Due to the exposure of hydrocarbons in polymer cans and on the N'Djaména sun, other pollutants emitted are those which come out of the exhaust pipe and which are responsible for the concentrations measured in the atmosphere, resulting from " a match between the characteristics of the engine and those of the fuel used. The particles emitted today no longer have the same characteristics as those identified in previous toxicological and epidemiological studies on the health risk associated with transport [8]. New research has been demonstrated on the presence of polycyclic aromatic hydrocarbons in petroleum products including those exposed or spilled in the city of N'Djamena [9]. Thereby; Pollution by petroleum products has become a matter of serious environmental concern around the world, because of their extensive uses as an energy source, they are transported and distributed on a large scale in the biosphere by leaks or exhausts in entering the environment by accident, spill, industrial waste or products from commercial or domestic uses [10,11]. Today, the consumption of energy, especially of fossil fuels caused by the rapid development of the economy, causes an increase in the concentration of greenhouse gases in the atmosphere and leads to climate change. Since our work is interested in solar radiation and the impact that it can generate on the storage and use of gasoline, it emerges from a study that when the solar rays reach the earth's atmosphere, air, clouds, and the earth's surface directly reflect some (about 30%). Incident rays that have not been reflected back to space are absorbed in the atmosphere by greenhouse gases (20%) and on the earth's surface (50%). This last part of solar radiation absorbed at the earth's surface provides it with energy in thermal form, which it in turn releases back to the atmosphere in the form of infrared rays: it is the radiation of the black body. This is then partly absorbed by greenhouse gases, in addition to the energy received directly from the sun. Then, this heat produced by greenhouse gases is re-emitted in all directions and in particular towards the earth. It is this additional absorption of energy by the atmosphere that is at the origin of the greenhouse effect, thus providing additional thermal energy to the earth [12,13]. From this analysis, a question arises and remains open on the current state of warming in the city of N'Djaména. In addition to this phenomenon, the main GHGs resulting from anthropogenic activities are carbon dioxide, methane, nitrous oxide and tropospheric ozone which therefore clearly represents the influence of human activity and responsible for climate change [14,15,16,17,18]. Despite the great resources adopted by the Chad Downstream Petroleum Sector Regulatory Authority (ARSAT), users do not always comply with the standards established by them. In the town of N'Djamena, more than a dozen street vendors can be seen along the roads weaving through traffic. The town hall sometimes tries to regulate the situation and prohibit these illicit sales, but to the annoyance and refusal of the fraction which sometimes indulges in them in spite of itself..

2. Materials and Method

The materials and methods used for the experiments on this article are as follows: Materials used Purple Air sensor, a Pyranometer, Thermometer, graduated test tubes, flask with a neck, magnetic stirrer, metal support, heating plate, condenser, pipes, electric balance, refrigerator, sample holder and various samples of 100ml of gasoline collected in the 10 arrondissements from the city of N'Djamena.

2.1. Diagram of the Device on Gasoline Distillation

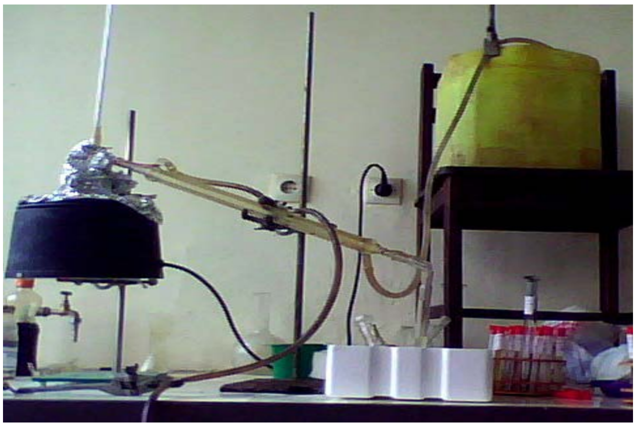

Figure 1. Photograph of the analysis device

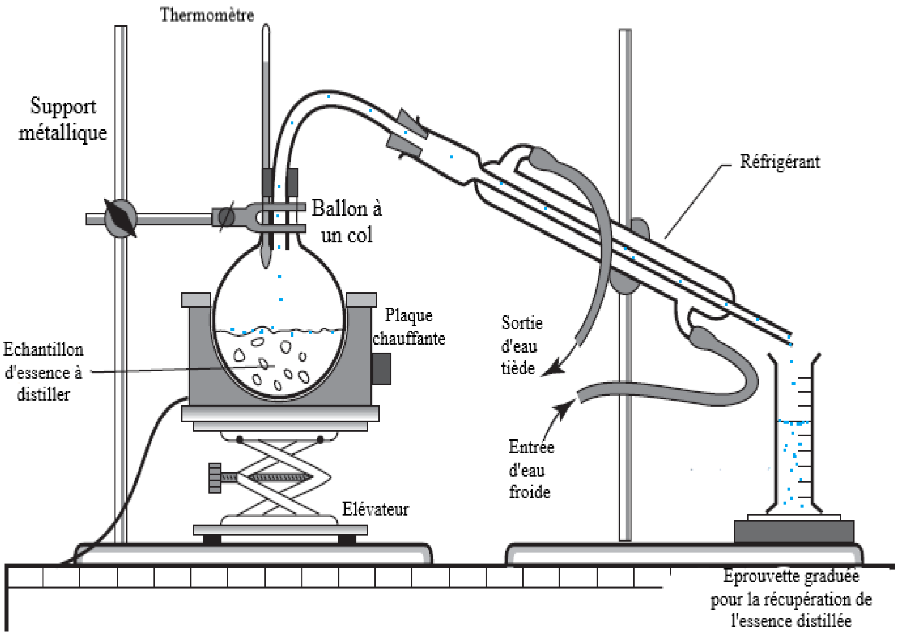

Figure 2. Explanatory diagram of the analysis system

Table 1. Census reference, monitoring and labeling of the different samples

district	different types of petrol samples					
	Gasoline samples exposed to the sun		samples of gasoline stored in an anarchic manner		comparative gasoline samples taken from gas stations	
	Number of points of sale	Samples taken	Total storage points according to this work	Samples taken	Not respecting the standards	Respecting the standards
1	111	5	29	5	5/13	5/7
2	123	5	18	5	5/11	5/5
3	138	5	22	5	5/15	5/8
4	134	5	19	5	5/12	5/6
5	134	5	18	5	5/12	5/6
6	90	5	29	5	5/13	5/6
7	145	5	31	5	5/16	5.9
8	128	5	18	5	5/9	5/8
9	100	5	21	5	5/12	5/7
10	58	5	20	5	5/10	5/7
Total	1145	50	225	50	50/123	50/70

The method adopted is that described by IFP: knowledge and control of physical and chemical phenomena; elements of chemistry-products: standardized tests for the control and quality of petroleum products [19]. In our case, after taking several samples per district, we labeled them and left to stand in a refrigerator. We took 5 samples of gasoline exposed to the sun per district, 5 other samples stored in an anarchic manner and 5 comparative samples taken from service stations meeting the standards The table below refers to the census and monitoring and labeling of the different samples.

Account of the means we took a chosen average of (5) Five samples per service station and per district

2.1.1. ASTM D 86 Distillation of Gasoline

Distillation is a process of fractionating a test portion under standardized conditions. Condensing vapors under conditions of 0° to 4°C, then raises the temperature to the indicated volumes, vaporize the transforms and condense them by part.

The GOAL is to: Determine the quality of the fractionation of the gasoline considered Define the purity criteria of the chosen sample Define the product storage criteria.

Operating mode:

Take 100ml of gasoline in a beaker then put in a flask, introduce the thermometer through one of the necks of the flask and the condenser through the other neck. Place the flask on the hotplate and follow the process. The distillate is collected in a test tube then the residues are recovered from the flask and the yield is calculated to determine the loss. The test tube collecting the distillate is placed in the medium having a temperature of 13° to 18°C. The initial point means the appearance of the first drop and the end point is the maximum temperature point that a distillate can reach and read on the thermometer indicating the end of the operation.

2.1.2. Determination of Copper Strip Corrosion

Copper blade corrosion is a qualitative test which reveals corrosive bodies and / or pollutants such as mercaptan and hydrogen sulphide. Operating mode Take 30ml in a tube and bring in a water bath at a temperature of 50°C, introduce the Blade and leave for 3 hours. Once the process is complete, compare the plunged blade to a control blade.

3. Results and Discussions

In this work, we have made several experiments and standardized test. First, we started with data on the duration of sunshine in N'Djaména to be able to analyze the influence of solar radiation as a function of its heat on the essences stored and sold illegally in the city and in particular on the main arteries. of N'Djaména, around markets or in front of public institutions [20]. The analysis results give us a figure of 3030.91 ± 176.33 hours of sunshine per year corresponding to 8.9 hours per day. An observation of the pyranometer and simulations of the Streamer radiative transfer code made it possible to characterize the seasonal variability of the global solar energy potential at the N'Djamena station at 4.71 kWh / m2 / d. The maxima are recorded in spring with values greater than 5.70 kWh / m2 / day, and the minima in winter with values less than 4 kWh / m2 / day [21]. The first observation made on the storage of gasolines in polymer cans showed that the nature of gasoline changed in color and density. The cans were also denatured depending on the type of gasoline and the weather. The following figure represents the monthly change in overall irradiation measured between 2017 and 2018 in N'Djamena and simulated at the Afric-Lab laboratory between 2019 and 2021.

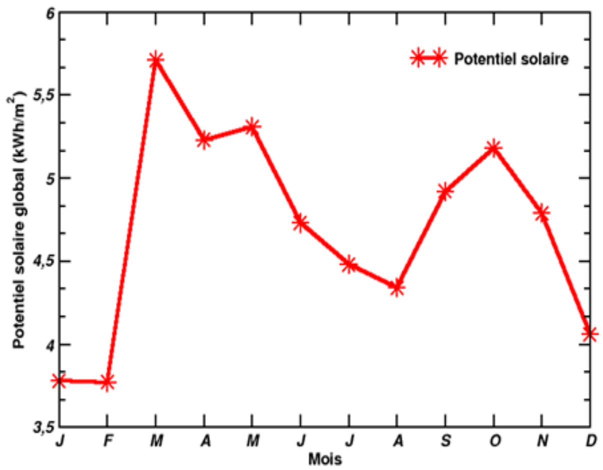

Figure 3. Monthly average of the simulated global solar energy potential in kWh / m2 / d in N'Djamena between 2019 and 2021 [21]

First, there is significant seasonal variability in global solar potential in N'Djamena. The maxima are observed during the dry season, that is to say in spring (from March to May) with values around 5.42 kWh / m2 / d and in autumn (from September to November) with values of 4.97 kWh / m2 / d, certainly linked to strong solar activity. In these periods the remarks made on the storage of hydrocarbons is that there is a strong odor and a very accentuated vaporization which can reach a more or less large radius. Over time, between two weeks and one month, the colors of the hydrocarbons also change. Then, the minima are observed in winter from December to February (probably due to the height of the sun) and in summer from June to August due to cloud cover and the presence of dust. These minimums in winter correspond to values varying between 3.87 kWh / m2 / d and in summer (rainy season) around 4.60 kWh / m2 / d. During these periods we observed the presence of the actual gum as well as the denaturation of the characteristics of the octane number. Gasoline does not exactly respond to the supply of spark ignition engines. The combustion of gasoline during this period is accompanied by a strong black smoke and most of the time leaves black marks on the exhaust pipes of the machines. In short, the hottest month in terms of global solar potential is the month of March in spring with values around 6 kWh / m2 / d and the least favorable month is January with a value of 3.87 kWh / m2 / d . We therefore measured the air quality between these two months, in February. Globally, the annual average of available solar potential is 4.71 kWh / m2 / d for global energy on a horizontal plane in N'Djamena from 2017 to 2018 and simulated from 2019 to 2021. Based on these data, we then made atmospheric distillation according to ASTM D86 and we have carried out standardized tests related to atmospheric pollution and corrosion. Further testing and related analysis could be done following the standards used in Chad for hydrocarbons. For the determination of the air quality, temperature and humidity during the chosen period, we had the following results:

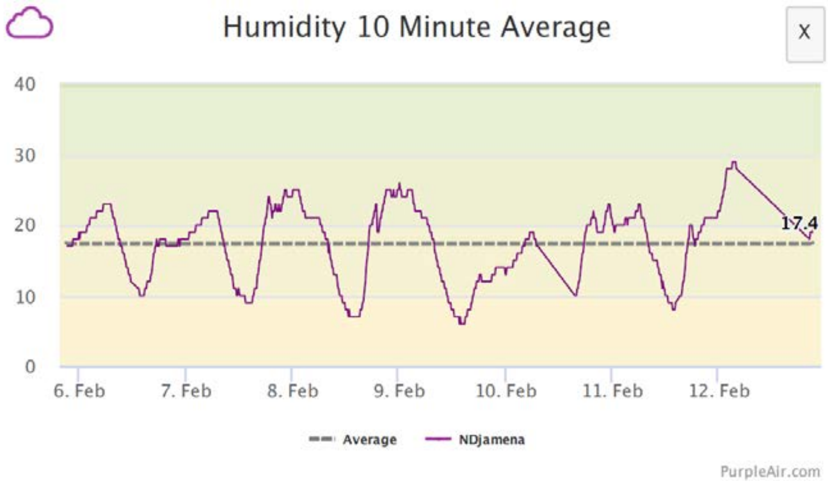

Figure 4. Humidity measurement over a period of one week taken every 10 minutes

The result shown in the figure shows a curve that is not constant with an increase from 15 to 24 during the day and a decrease in deca from 15 to 8 during the night.

The second measurement is that of temperature. The sensor to measure the temperature throughout the experiment and gives the appearance of a curve according to the following figure:

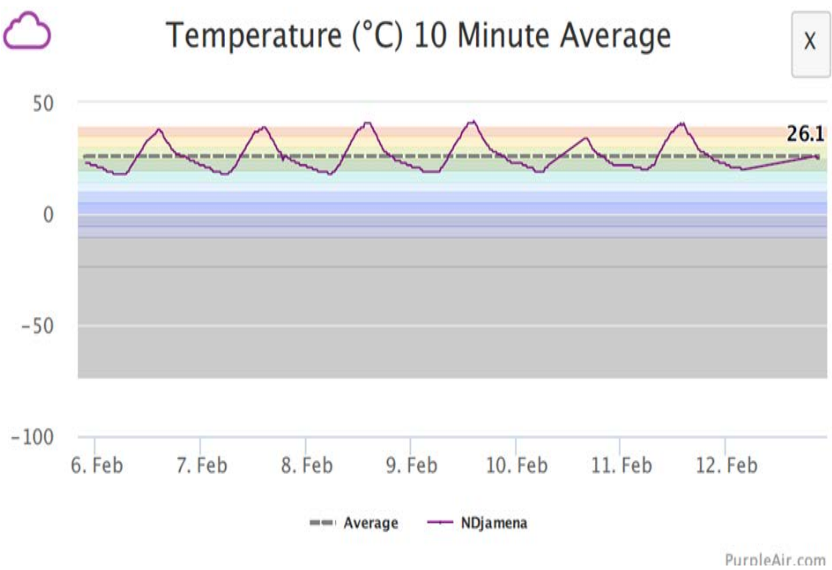

Figure 5. Temperature measurement over a period of one week taken every 10 minutes

The shape of the temperature curve taken during our test is also sinusoidal with peaks around 40 ° C during the day. The experiment made with the sensor in February gives a temperature interval of between 20 and 40 ° C which has already been demonstrated by [21] with an average of between 26.1 to 29 ° C observed during the said period.

The importance sought by the sensor is the presence of particles that may end up in the environment. For this research we made a simulation in the presence of fraudulent essences and normal essences. We noticed that the presence and / or use of gasoline in the laboratory and in areas of high concentration gave the appearance of the increasing curve, thus exceeding the recommended threshold. But with the normal gasolines used in the laboratory and even in the open area to service stations meeting the standards, the air quality was within the normal average range. The si-after figures are obtained through the Purpleair sensor used for air quality in the city of N'Djaména.

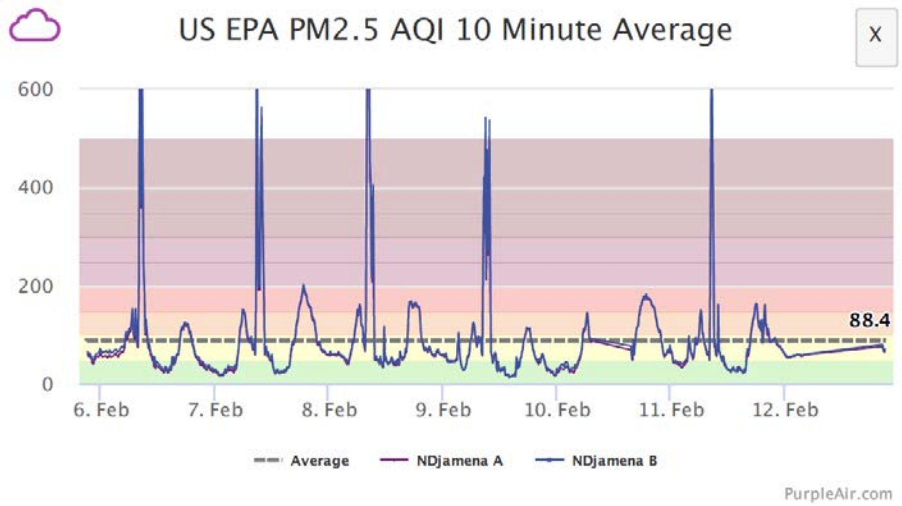

Figure 6. Presence of particles PM2.5 observed every 10 minutes over a period of one week

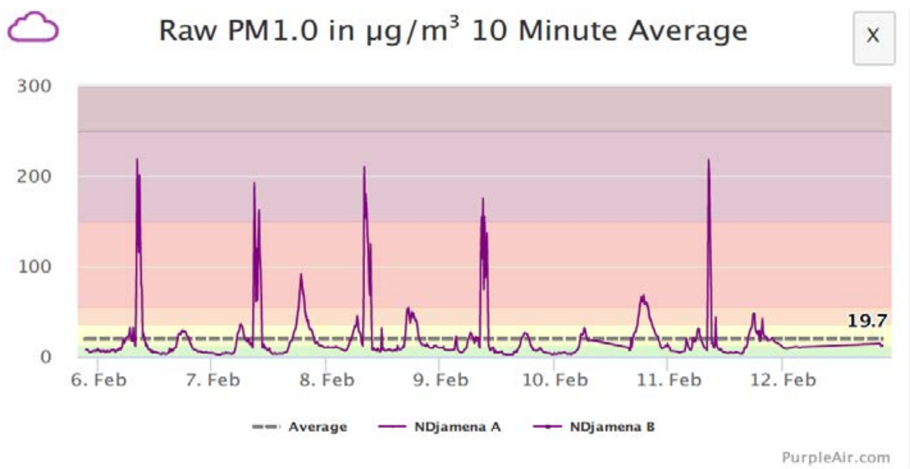

Figure 7. Presence of particles RAW PM 1.0 in µg/m³ observed every 10 minutes over a period of one week

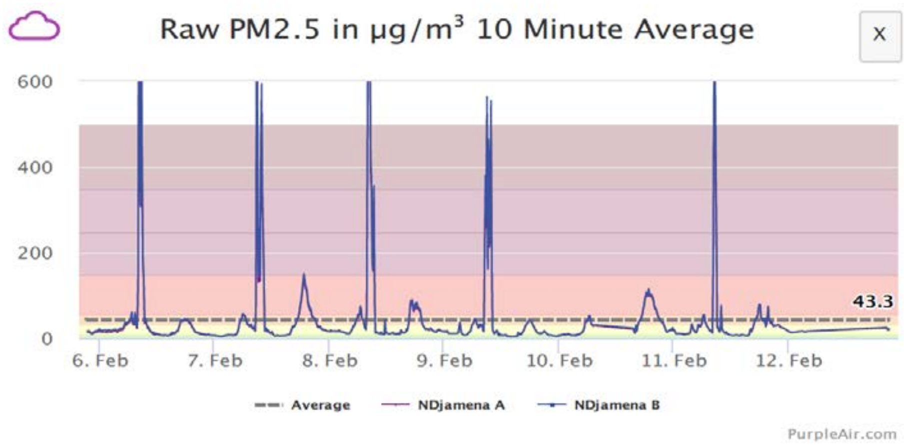

Figure 8. Presence of particles RAW PM 2.5 in µg/m³ observed every 10 minutes over a period of one week

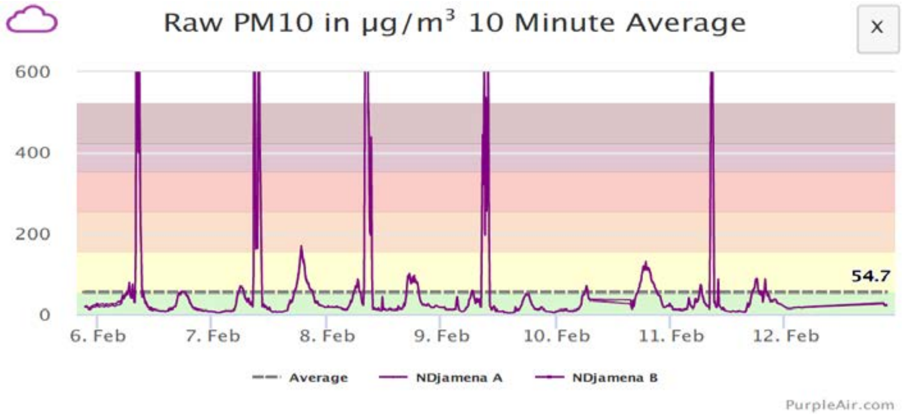

Figure 9. Presence of particles RAW PM 10 in µg/m³ observed every 10 minutes over a period of one week

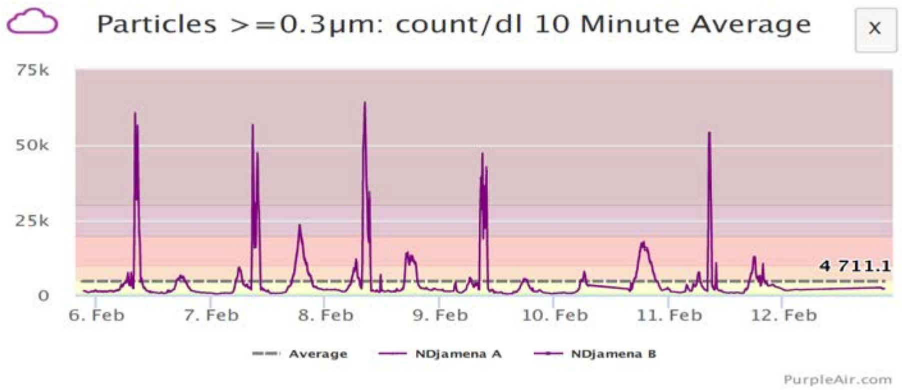

Figure 10. Presence of particles > =0.3 µm observed every 10 minutes over a period of one week

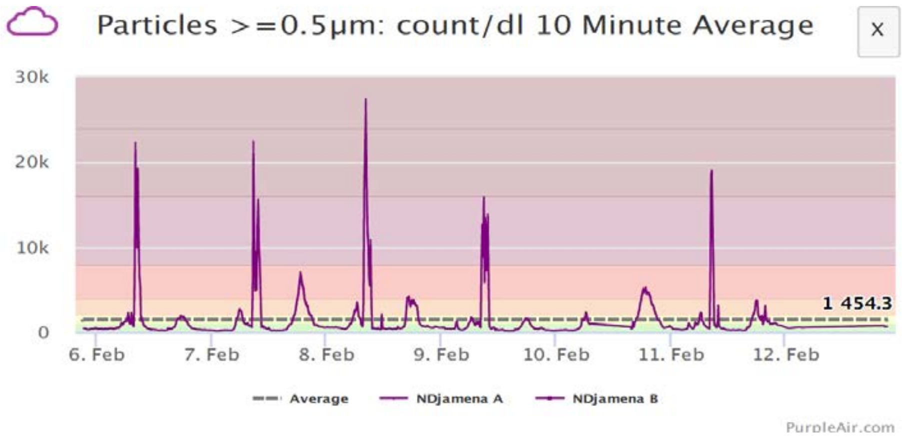

Figure 11. Presence of particles > =0.5 µm observed every 10 minutes over a period of one week

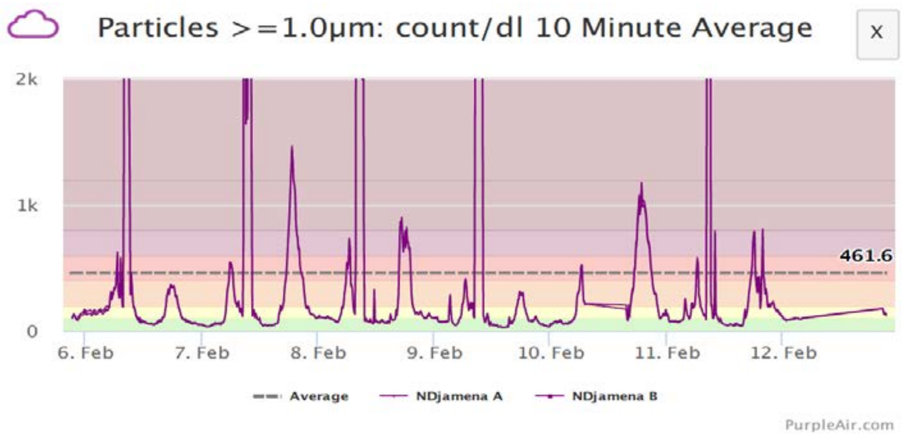

Figure 12. Presence of particles > =1.0 µm observed every 10 minutes over a period of one week

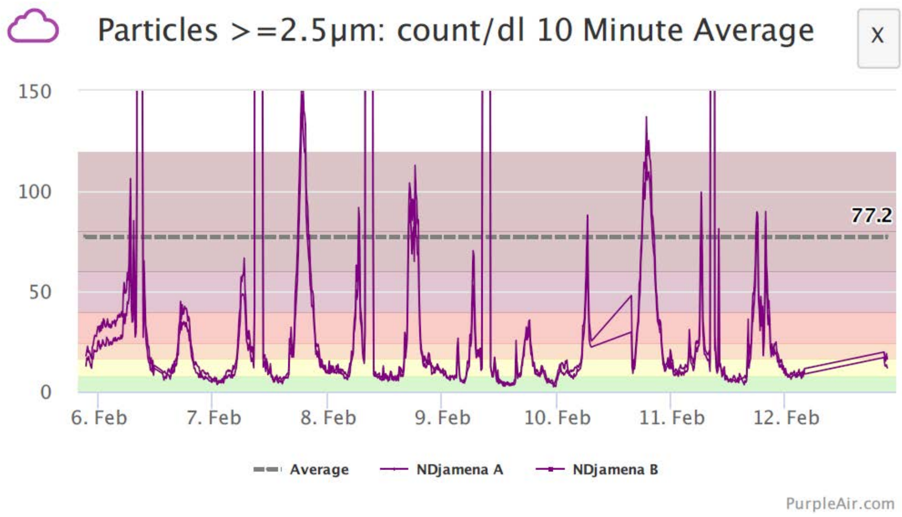

Figure 13. Presence of particles > =2.5 µm observed every 10 minutes over a period of one week

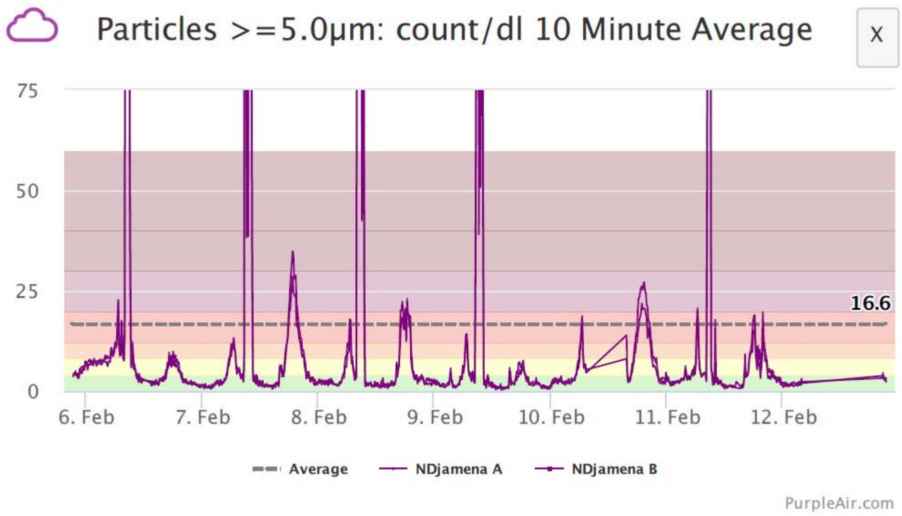

Figure 14. Presence of particles > =5.0 µm observed every 10 minutes over a period of one week

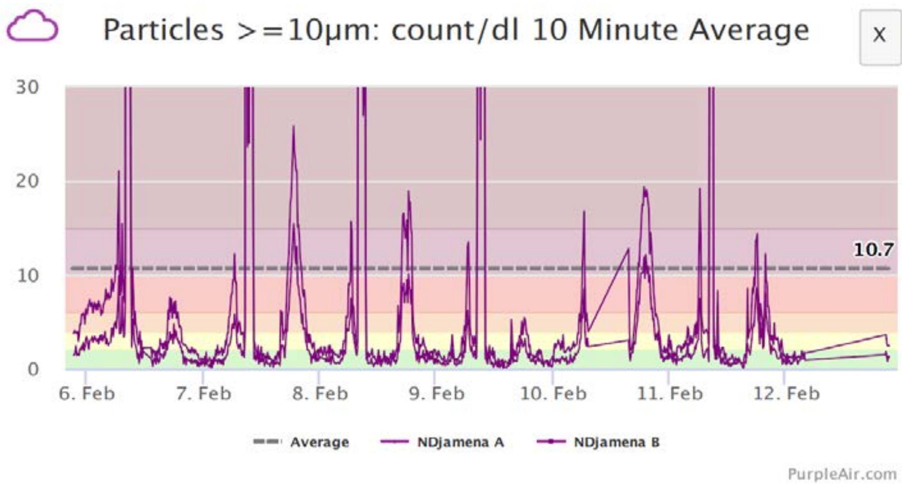

Figure 15. Presence of particles > =10 µm observed every 10 minutes over a period of one week

The grouped figures give us an overview of the presence of various particles that are significantly harmful to human health. Among the masses of particles, the sensor was able to identify PM 2.5; Raw PM1.0 in µg/m³ ; Raw PM10 in µg/m³ ; Particles >=0.3µm: count/dl ; Particles >=0.5µm: count/dl ; Particles >=1.0µm: count/dl ; Particles >=2.5µm: count/d ; Particles >=5.0µm: count/dl ; Particles >=10µm: count/dl

Exposure to all these particles above a certain threshold is dangerous for human health. The sensor data gives us the following characteristics 0-50: Air quality is considered satisfactory, and air pollution poses little or no risk.

1. 51-100: Air quality is acceptable; however, if they are exposed for 24 hours there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
2. 101-150: Members of sensitive groups may experience health effects if they are exposed for 24 hours. The general public is not likely to be affected.
3. 151-200: Everyone may begin to experience health effects if they are exposed for 24 hours; members of sensitive groups may experience more serious health effects.
4. 201-300: Health alert: everyone may experience more serious health effects if they are exposed for 24 hours.
5. 301-400: Health warnings of emergency conditions if they are exposed for 24 hours. The entire population is more likely to be affected
6. >401: Health warnings of emergency conditions if they are exposed for 24 hours. The entire population is more likely to be affected

PM2.5 is the mass of particles whose diameter is less than 2.5 µm and which is approximately 1 / 10th the size of a human hair. It is one of the main pollutants that the US EPA measures because of its potential for adverse health effects. For each figure in the diagram we notice that the observed peak is a function of the daily heat. This confirms our results according to the influence of solar radiation on the very quality of the hydrocarbons but also according to the consumption, handling and storage and distribution of its questionable gasolines in the city of N'Djaména. The presence of every element that the sensor was able to identify is more or less worrying since no structure in the state talks about it. The factor of all its particles in the human health of the population of N'Djaména is however not subject to an adequate study to allow the lifting of measures and the incentive to use hydrocarbons not only healthy but with respect for standards. In force of the State.

3.1. ASTM D86 Distillation Result

In the normal context of the characteristics of a clean and environmentally friendly gasoline, ASTM distillation presents an apparatus comprising a distillation flask that can contain 100 or 200cm³ of product which is heated and distilled. The vapors formed are condensed in a copper tube bathed in a mixture of water and crushed ice, generally the refrigerant, then collected in a graduated cylinder. The operator notes the temperature of the appearance of the first drop of condensate at the outlet of the tube; this is the initial point of distillation. Then the temperature is measured regularly when 5, 10, 20 ... 90 and 95% of the product is distilled and collected in the test tube. Finally, in distillation, it suffices to follow the temperature, which passes through a maximum, then decreases as a result of the thermal alteration of the last traces of liquids in the flask. The maximum temperature is the final distillation point, corresponding to a distillate recipe represented by d%. After cooling the flask, the amount of residual liquid is measured, ie a residue of r%. The volume balance of the operation shows a loss item p% such as: d + r + p = 100% [22] Finally, these results are plotted on a diagram having as coordinates the percentage distilled and the temperature. The losses are placed at the beginning, so that all the abscissa of the distilled percentage must be increased by the p-value of losses. We thus find after the end point, the value of the residue r. All the points obtained are then combined by a curve called the A.S.T.M distillation curve as shown in the figure below.

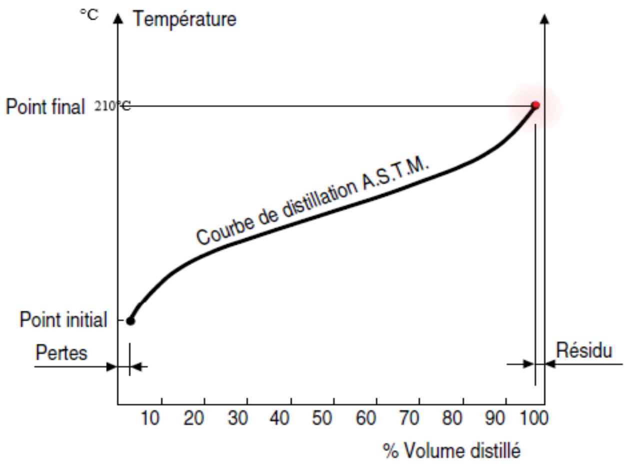

Figure 16. Distillation curve for normal ASTM distillation

This figure gives us an increasing shape of the ASTM distillation curve with an initial point which starts from 70 to 80°C and which increases according to the different cut point or intermediate point of 10; 20; 30; 40; 50:60:70; 80; 90; up to the final distillation point of around 210°C. The results obtained during the different sampling of species in the boroughs are different. On average, each distilled gasoline has a different response due to storage time, exposure to sunlight and mixtures and / or the addition of an additive. We also observed the change in color of the distillates obtained. The following figure gives an overview of the average taken from the different samples.

Figure 17. photographie des distillats après distillation ASTM.

In this photograph we notice the difference in color of the distillates obtained from the ASTM distillation of gasoline sold on the street. The quantity and quality of the distillates are also different. The second experiment carried out is that of pollution and corrosion by sulfur: The sulfur compounds present in petroleum products are the main culprits of air pollution and corrosion problems caused by petroleum products, especially street gasoline in our specific case. The results show that the combustion of sulfur contained in fuels and combustibles leads to the formation of gaseous sulfur oxide SO2. Studies have shown that the generation of SO2 by this combustion process generates around 60 million tonnes of SO2 per year worldwide. This SO2 mainly contributes to urban pollution and acid rain. Those present in fuels contribute to the release of sulfur oxide and increase the production of particles by the engines and thus constitute a brake on the elimination of nitrogen oxides in the exhausts. Sulfur is then transformed during combustion into SO2 and SO3 and then becomes a very corrosive acid which is sulfuric acid [23-30]. In our work, as copper is particularly sensitive to the presence of corrosive compounds, we used a copper strip corrosion test. The copper strip immersed for 3 hours at 50 ° C in a sample of gasoline. Depending on the quality of the sample, each result was different. We were therefore able to observe that the essences exhibiting a more volatile characteristic presented a different color from the heavier essences.

Table 2. Mixture of hydrocarbons of organic or synthetic origin, optionally organic oxygenates, intended for supplying spark ignition engines

SUPER FUEL SPECIFICATIONS								
Definition	Mixture of hydrocarbons of organic or synthetic origin, optionally organic oxygenates, intended for supplying spark ignition engines							
specifications	**Units**	**Specified values**		**Test methods**				**Observations**
		MINI	**MAXI**	**AFNOR**	**ASTM**	**NF EN**	**NF EN ISO**	
Aspect								clear / limpid
Total sulfur	% masse		**0,05**	T60 142	D 2785/5453		20846	
olefins	% vol		**55**		D1319		22854	
Aromatics	% vol		**35**		D1319		22854	
odour								commercial
Volumic mass	Kg/m3		**AN**	T60 101	D 1298/4052		12185	
vapor pressure reid	kpa		**74**	M07 007	D 323	13016-1		
initial point	°C		AN	M07 002	D 86		3405	
10% VOL	°C		**70**	M07 002	D 86		3405	
50% vol	°C		**125**	M07 002	D 86		3405	
90%vol	°C		**190**	M07 002	D 86		3405	
End point	°C		**210**	M07 002	D 86		3405	
Residue	% vol		**2,0**	M07 002	D 86		3405	
Losses	% vol		**AN**	M07 002	D 86		3405	
Copper corrosion (3 h at 50 ° c)			**1B**	M07 015	D 130		2160	
Acidity or basicity of water soluble			Neutre		D 1093			
Current erasers	mg/100ml		**4,0**	M07 004	D 381		6246	
Lead content	g/l		**0,013**	M07 043	D 2599 / 3237	237		Note nº 2
Research octane index		**90**		M07 026	D 2699		5164	
Induction period	min	**240**		M07 012	D 525		7536	
Benzene content	% vol		**5**		D 3606		22854	
Manganese content	% masse		**0,018**		D 3831	16135		
Oxygen content	% masse		2,7		D 4815		22854	Note Nº 3
Content other oxygenated compounds	% vol		15				22854	
Ether content of 5 atoms of C or +	% vol		22				22854	
Note Nº 2	mandatory for additives containing lead.							
Note Nº 3	mandatory for additives containing manganese, alcohol and esther.							

Table 3. Mixture of hydrocarbons of doubtful origin intended for supplying spark ignition engines

Specifications Petrol marketed unlawfully					
Définition	Mixture of hydrocarbons of doubtful origin intended for supplying spark ignition engines				
specifications	**Units**	**Specified values**		**Test methods**	**Observations**
		MINI	**MAXI**	**ASTM**	
Appearance					Pink / dark
Total sulfur	% masse		**0,2**	D 2785/5453	A normal
Odour					Very Strong almost nauseating
initial point	°C	60	150	D 86	
10% VOL	°C	62	**70**	D 86	
50% vol	°C	80	**100**	D 86	
90%vol	°C	130	**190**	D 86	
End point	°C	200	**239**	D 86	
Residue	% vol	4	**7**	D 86	
Losses	% vol	3	**7**	D 86	
Copper corrosion (3 h at 50 ° c)			**1B**	D 130	yellow color turning dark green and black
Current erasers	mg/100ml		**6,5**	D 381	Abnormal presence of the current gum
Research octane index		**≈80**		D 2699	< to that of super fuelt
Induction period	min	**240**		D 525	
Oxygen content	% masse		2,9	D 4815	Note Nº 3
Content of other compounds	% vol				Presence of trace and water-soluble elements in the distilled residue
Note Nº 2	mandatory for additives containing lead.				
Note Nº 3	mandatory for additives containing manganese, alcohol and esther.				

The Table 2 gives us an overview on the specification of the gasoline of the refinery in Chad. These data are well established and meet the standards in force used for standardized testing of hydrocarbons in Chad.

As mentioned above, we performed a series of analysis and specification at Afric-Lab and the results of our analyzes are listed in Table 3.

Several observations emerge from this Table 2: we had two types of gasoline sold illegally. The first type is an extremely light gasoline therefore very volatile. When it is hermetically sealed in polypropylene bottles and exposed to the sun, it inflates the bottle by deforming it. The second type of gasoline is quite heavy gasoline, it is a mixture of gasoline collected everywhere and added to the type of gasoline that comes from Cameroon and Nigeria often. This type of gasoline shows positive results in determining the presence of a corrosive element. While popular with drivers because it does not evaporate quickly, it has a characteristic that does not meet any standard. Another finding is on the color and smell of the essences stored and / or sold; We also noted the presence of water and other unidentified trace elements in most of the gasoline samples processed. We can therefore say in Table 2 that the results are out of specification under normal analysis conditions. These results demonstrate that the nature of the gasoline exposed to solar radiation is denatured and presents major risks on machines, their combustions will generate substances which will degrade the component of the environment and will affect street vendors as well as all those who use it. stock in an anarchic manner. The results of bibliographic consultations have shown that the combustion of petroleum products releases harmful emissions into the air (carbon monoxide [CO], fine particles [pm10], nitrogen oxides [NOx], etc.) as well as various greenhouse gases (carbon dioxide [CO2], methane [CH4], etc.). These emissions can have an impact in particular on the air and the ground [23]:

Air pollution

In addition to carbon dioxide (CO2), the main pollutants resulting from the combustion of energies are also carbon monoxide (CO), an odorless gas resulting mainly from the incomplete combustion of fossil fuels. Inhaled CO binds easily and quickly to hemoglobin (pigment in red blood cells, carrier of oxygen to cells), there is a reduction in the supply of oxygen throughout the body, leading to asphyxiation organs. Volatile organic compounds (VOCs), including hydrocarbons, some of these substances are irritating to the lungs, carcinogens, mutagens and / or toxic to reproduction. In combination with nitrogen oxides (NOx), VOCs contribute to the formation of ground-level ozone (ground-level ozone). During our surveys, people living with barrels used for storing hydrocarbons sometimes presented disease peculiarities: Coughs and headaches were very common among those questioned. The presence of fine particles (PM10): the most harmful fine dust are particles with a diameter of less than 10 thousandths of a millimeter. They penetrate deep into the lungs and even the smallest can reach the bloodstream and vital organs. Diesel engines emit large amounts of fine particles if they are not equipped with a particulate filter. We have noticed in some patients the presence of traces or drop of blood in their spit. For sulfur dioxide (SO2): this gas, naturally present in small quantities in oil, is responsible for much of the acid rain and air pollution affecting urban and industrial areas. More recently, it has also been recognized that SO2 emissions contribute to the formation of secondary inorganic aerosols containing fine particles harmful to human health. In humans, exposure to high concentration of SO2 can cause respiratory problems, respiratory tract disease, and worsening of pulmonary and cardiovascular disease [24]. Our hospitals are not equipped with the necessary elements for the follow-up and / or the care of people contracting these types of illness mentioned above. We have, however, noticed in people selling gasoline on the fly a strong characteristic of breathing problems and aggravated by severe coughing sometimes leading to bleeding back into their spit. Nitrogen oxides (NOx): emissions of these toxic gases, which cause acute respiratory illnesses and chronic bronchitis. NOx also contributes to the formation of ground-level ozone.

Ground pollution

The presence of heavy metals in the combustion of petroleum products leads to the emission of heavy metals (lead, cadmium, mercury, etc.), which are highly toxic to humans and animals. These accumulate in the food chain. Lead interferes with blood formation and the development of children, cadmium is toxic to microorganisms, mercury is toxic to humans, plants and microorganisms [25]. To this end, petroleum products sold on the sly come mainly from countries such as Nigeria and some in Cameroon, but also a combination of the two which causes an even greater risk of contamination, proven in several studies. The work of Kloff, Sandra and Clive Wicks states that the level of pollution caused by the combustion of fuels is often higher in cities [26]. In the reports consulted, the main air pollutants associated with combustion or releases are nitrogen oxides, sulfur oxides, particulates, polycyclic aromatic hydrocarbons, and volatile organic compounds that are released into the air. Once in the air, these components react to produce secondary pollutants such as ozone [27]. Air pollution from fuel combustion is associated with increased mortality in humans, respiratory and cardiovascular disease, and cancer. [28] The majority of these toxic effects in the environment are associated with the soluble aromatic fraction such as benzene, toluene, ethylbenzene, xylenes, and naphthalenes. Apart from the impacts of spills, these substances pose a greater risk to humans than to wildlife [29]. People who work in the operation, distribution and transportation of petroleum products are the most exposed to volatile organic compounds that evaporate from petroleum and petroleum products in the case of our present study. Certain products or components are known or suspected to be carcinogenic (eg gasoline, mineral oils, benzene, benzo (a) pyrene, 1,3-butadiene). Others can have adverse effects on the nervous system (eg, benzene, n-hexane, toluene, and xylene) [30,31] Fuel storage and transportation pose a risk of fire and explosion. Air pollution from fuel combustion is associated with increased mortality in humans, respiratory and cardiovascular disease, and cancer [32]. In the work of [33] we can verify that hydrocarbons are among the most widespread polluting substances and the most dangerous for the environment. And several researchers talk about pollutants and the contamination of soils and sediments by hydrocarbons, which still remains a major problem [34-38].

4. Conclusion

The development of industrial activities has associated with the growth of the world population, since the middle of the 19th century, increasingly significant discharges which have a strong impact on the environment. The consequences for human health, ecosystems and the depletion of natural resources must now be taken into account to ensure the sustainability of future societies [12]. In 2005, Charles-Philippe Lienemann carried out work on the Analysis of trace metals in petroleum products, a state of the art which summarizes the issue of trace metals in the petroleum industry. It presents the three major techniques for determining trace metals in petroleum products: atomic absorption spectrometry with an electrothermal furnace (GFAAS), inductively coupled plasma atomic emission spectrometry (ICP-OES) and spectrometry of mass by inductively coupled plasma (ICP-MS). These various applications affect all petroleum products, from biofuel through ethanol, to the most traditional gasolines and diesel, up to heavier products such as bitumens. One of the goals of this work was to offer in the coming years a solution to the speciation of metals in petroleum products [39]. Evaluating and characterizing the physicochemical properties of petroleum products is crucial to understanding the behavior of these products in the environment in the event of a spill or evaporation due to misuse. Whether it is an introduction during refining on petroleum products or dosing on finished products, the goal is to find a hydrocarbon that meets the standard and specification in force. Thus several researchers have worked on the introduction and / or the dosage during the reaction or directly on the finished products for better use, among them there is the work of [40] which also uses an ICP-HRMS Inductively Coupled Plasma-High Resolution Mass Spectrometry, Inductively Coupled Plasma High Resolution Mass Spectrometry. To determine the S in gasolines and diesel oils by isotopic dilution. This information can inform the prediction and modeling of the fate and behavior of species under different environmental conditions. For our part, the samples of species were subjected to an alteration, that is to say a simulation of evaporation, in the Afric-Lab laboratory in order to obtain samples presenting different states of alteration (light, moderate alteration, advanced and very advanced). Subsequently, analyzes were carried out according to the standards used in Chad or internal laboratory methods. The means of action to lower the level of toxic products consist in intervening in the formulation of fuels. The so-called reformulated gasolines are designed with a view to protecting the environment in all its aspects: reduction of losses by evaporation, and of conventional pollutants in the exhaust.

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