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Smart Fuel Supply Pumps and the Possibilities of Reducing Losses in Time and Costs

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Abstract: This research depends on the development of the marketing of gasoline for cars in a simplified way, with an explanation of the stages of development of fossil fuels and the nature of its extraction and consumption, as well as the production processes of this fuel with knowledge of the damages of fossil fuels and ways to reduce these damages, as well as ways to raise the efficiency of gasoline. Low-octane gasoline and alcohol Selling multiple octane fuels from a single outlet, and this has many benefits, which we will explain during our search.

Keywords: High octane fuel, fuel smart pumps, smart fuel marketing, ethanol .

1. Introduction

Marketing is an important vocabulary that is equivalent to or greater than production, because goods without perfect marketing are not equal to their real value and do not reach the largest number of consumers. The Oil Products Distribution Company in the Iraqi Ministry of Oil took upon itself this task, and here we will mention in this chapter a new idea for marketing the gasoline product to consumers in an ideal and innovative way that depends on the amount of alcohol mixed with regular gasoline in order to reach a variable octane number according to the mixing ratios determined by the consumer that can be equipped From one pump, one tank and one station, this will save a lot of expenses to shorten the establishment of multiple stations to sell gasoline according to the octane number, as there are stations in Iraq dedicated to selling high-octane gasoline as well as stations for selling low-octane gasoline, however, it will also reduce pumping and storage operations in warehouses that Contains these products as this mixer pump will perform two functions, the first is to mix gasoline at the consumer's request, which is determined by entering The mixing ratios or by specifying the octane number, and this pump handles this process through an electronic program dedicated to such operations. This processor gives three results.

The first is to determine the price of the mixed product because it is variable based on the mixing ratios and the second instruction will be for the alcohol volume scale and the induction The third will be a gasoline volume gauge, so we will provide a great opportunity for the consumer to determine the mixing ratios according to his needs and the type of engine used in his car

Fossil fuels are on the way to decline due to the increase in human numbers and also due to the development of human consumption, and this will make it difficult to cover the requirements of mankind.

Therefore, we find that there are many researchers trying to reduce human consumption of this fuel

Also, fossil fuels are the main source of energy on our planet, so we find multiple uses

Since our main goal for using fossil fuels is energy, so we had to take some measures that will save us from using this type of fuel.

1- Finding alternatives to this fuel One of the important alternatives is the use of renewable energy

2 Adopt the principle of energy saving to reduce energy consumption

3 Addressing all the damages resulting from the use of fossil fuels or reducing the consequences of emissions

1.1 **Fossil fuel**

Crude oil is a fuel made from the remains of organisms that died millions of years ago and are buried in the ground. And what results from the remains of dead plants and subjecting them to high pressure and high temperature in the earth over millions of years, turns into concentrated forms of organic matter, which consist of carbon and hydrogen in the form of long chains of carbon and contain energy called fossil fuels such as coal, oil, natural gas and fuels Fossils are not a renewable energy source, because the rate of their production and formation is very slow compared to the average consumption, as it takes millions of years to manufacture them. The Earth's efficiency in making and replacing fossil fuels is estimated to be 8.5 x 1014 kJ. While the average consumption is estimated at 3700 x 1014, that is, the Earth makes up only 0.2% per year of fossil fuels used or extracted, so the fossil fuels that took millions of years to form will soon run out due to the proliferation of fossil fuels. The inhabitants of the earth as well as the development of life areas that have become energy entering

into many areas, their prices will rise significantly. This may be one of the reasons why the major industrialized countries are looking for alternative sources of energy, so fossil fuels are considered to be sources of potential energy, which when burned turn into thermal energy.

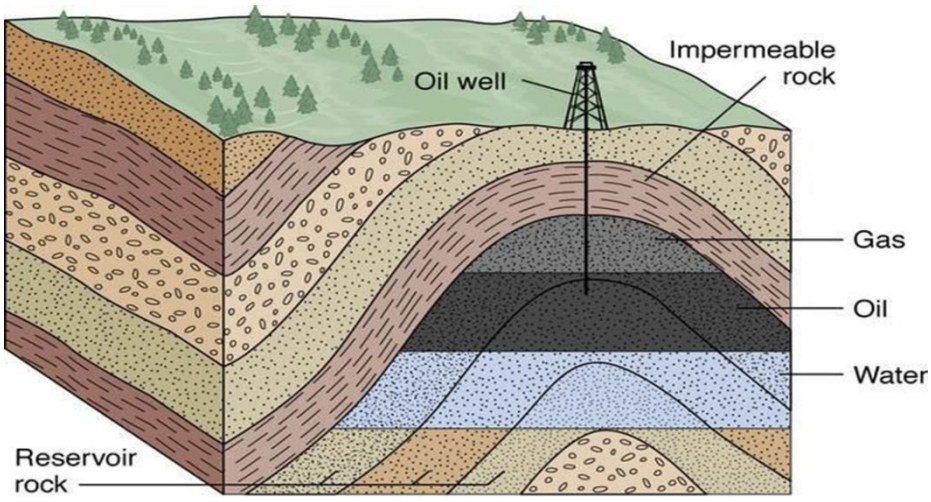

Fig.(1) :The above figure shows the layers of the Earth and the places where oil and gas are formed

1.2 biofuel

It is called vegetable fuel or agricultural fuel, and it is one of the sources of bio-energy and not renewable due to its dependence on specific sources and made from live plants or freshly harvested plant parts (grains, seeds, cellulose fibers in live mass) which are characterized as crops with high content of sugars and starches. For example, in Brazil it is made from sugar cane, but in the USA it is made from corn. Biofuels are derived directly or indirectly from the products of energy absorption in plants, which these plants convert solar energy into potential energy from photosynthesis and stored in the form of sugars or starches. Produced from green plants, thanks to photosynthesis, as the energy produced from this process reaches approximately 850,000 x 1014 kilojoules annually, and therefore it is a source of biological or renewable energy if we consider that its main source is sunlight.

Reasons for using biofuels:

Reducing the use of polluting fossil fuels (dirty fuels) and penetration.

2-Supporting national energy security. By relying on a variety of energy sources that can be obtained outside of traditional sources of fossil fuels

3- Improving rural development and increasing agricultural income by increasing the quantities of agricultural products and improving the added value of the product through diversifying the use and consumption in double quantities with great economic returns while increasing the green cover of the abandoned lands and the surplus of the agricultural need.

4- Reducing greenhouse gas emissions (greenhouse gases) and raising the levels of green spaces while raising the percentage of oxygen resulting from photo-metabolic processes, while increasing the investment in the agricultural field to be used as a biofuel product.

5- Enhancing the industrial field and providing great job opportunities in the fields of agriculture, manufacturing and marketing, while opening the way for investment companies to invest in this field.

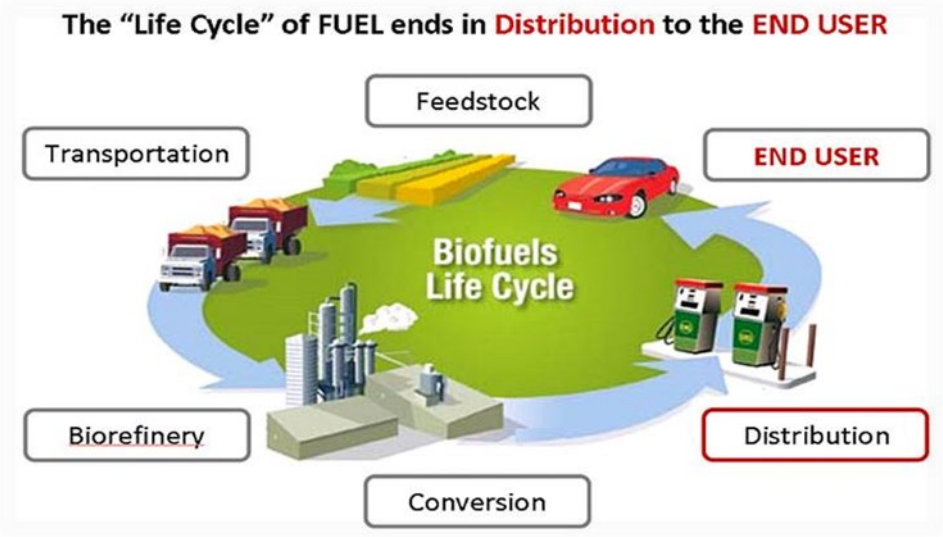

Fig.(2): The above figure shows the stages of biofuel formation and consumption

1.3 Does biofuels reduce global warming?

Biofuel works to reduce global warming in two parallel fields. The first depends on increasing the rates of oxygen production resulting from the photosynthesis of plants that are grown to obtain the raw materials for the production of biofuels, as well as Green plants can fully utilize the gas produced from biofuel combustion emissions (CO2) from biofuel combustion, thanks to photosynthesis (the process of carbon fixation), and this is known as the closed carbon cycle (the complete carbon cycle), but it has been observed that green plants recycle A small part of the coal gas produced by burning petroleum fuels, which leads to a significant increase in the concentration of coal gas over the years, and exacerbates the greenhouse effect because the combustion resulting from fossil fuels results from gases unsaturated with oxygen, including carbon monoxide.

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2 **The need to mix fuel with alcohol**

The increase in the number of cars inside Iraq, as well as the lack of infrastructure for oil refineries that produce substandard gasoline, as well as fluctuations in global crude oil prices, which are related to Iraq's import of high-octane gasoline for this purpose. By mixing it with regular gasoline produced in Iraqi refineries, he invited us to think about finding promising alternatives. In the field of developing fuels used in cars, the best way to raise the octane number of gasoline produced inside Iraqi refineries was to mix it with ethanol after we produce ethanol from raw materials available in Iraq at cheap and economical prices, which is the produced dates. From the palm tree that contains high levels of sugar, the most important of which is ethanol production fermentation processes using renewable energy applications to reduce the energy spent during the stages of ethanol production, which is an economic problem in terms of energy consumed and energy resulting from cultivation and preparation processes, as we will eliminate energy waste in Ethanol production and cultivation of raw materials sources, and therefore its production is economically feasible and efficient, and does not bear the costs of fossil fuels in production processes, in addition to the global trend of biofuel production, where emissions are few, that is, less than the use of ordinary fuels that cause environmental pollution, as well as change The climate due to harmful emissions as well as global warming, which led to a rise in the levels of extreme temperatures in addition to the possibility of selling ethanol from the fuel supply pump with several degrees of octane number that when mixing is according to the percentages that we determine and according to practical experience and this will reduce transportation and storage costs for each product According to the octane number

2.1 **Mix fuel and ethanol**

That is why I chose the program to study in raising fuel efficiency to a degree without high costs, as we now have the cost of this increase is an economic cost with high specifications. That is why I mixed pure alcohol, ethanol, and methanol with the gasoline product produced from Iraqi refineries, and this process took place in the laboratories of the Ministry of Oil in Najaf Governorate. The use of many mixtures between regular gasoline and ethanol according to the table(1) below, which will show the amount of gasoline with the amount of alcohol mixed with gasoline with the result of this mixture, which is the octane number for each mixed product

No. of mix	Gasoline ratio	Alcohol ratio	Octan no.
1	70%	30%	95.5
2	75%	25%	95.4
3	80%	20%	94
4	85%	15%	93
5	88%	12%	92.1
6	86.9%	13.1%	92.7
7	90.6%	9.4%	91.1

Table(1): This table shows the practical experiments that were conducted for mixing alcohol and ethanol, according to the proportions shown in the table

We note in this mixing that the percentage of alcohol has decreased significantly, i.e. by less than 10% of the mixture, and this did not have a significant effect in reducing the octane rating, as we noticed that the octane number has maintained its value above 90, so we find that the best ratios for mixing are mixing according to Mixture No. 7 because it increases the octane number with the least addition of alcohol in this process, so this mixture will be economically profitable because it consumes little alcohol

On this basis, we can market gasoline for cars according to mixing ratios and at different prices, but we will face a problem, which is that the fuel is determined on the basis of the octane number, and given that there are many options, we cannot provide many pumps, places and tanks for this choice, so we had to find a smart solution that can provide these options At one time and one place which is the smart fuel pump

This pump will provide many options in selling gasoline, as it will not be limited to specifying only two types, namely high-octane gasoline and low-octane gasoline. There will be many options between low and high, commensurate with the

consumer's ability to benefit from these options available in One place and one time Note this technology is not used so far in all countries of the world

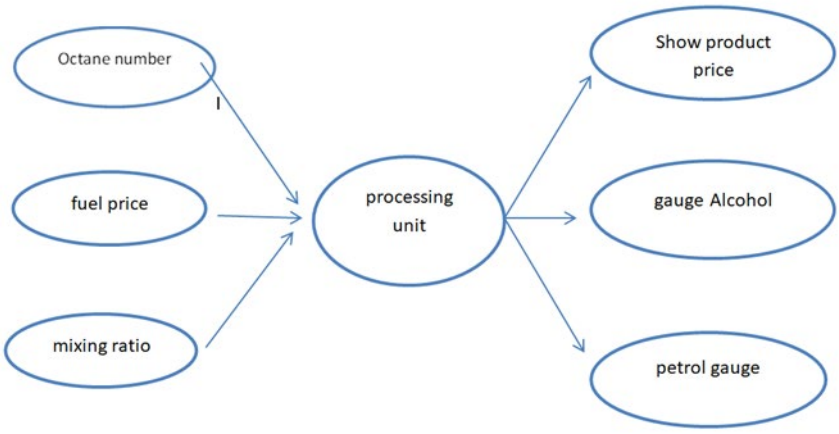

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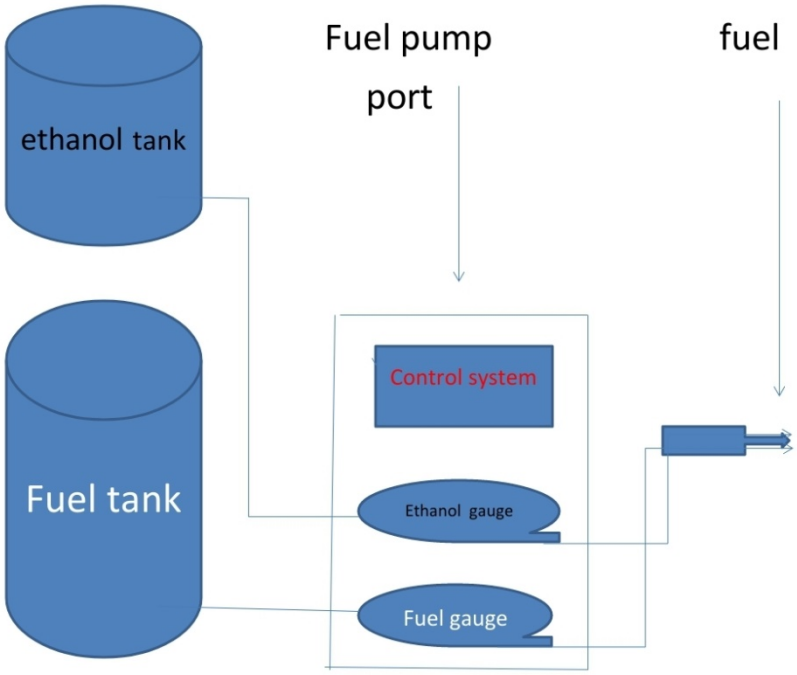
Fig.(3): This figure shows the electronic signal circuit of the smart pumps from the input side to the processor to the output side



Fig(4): This figure shows a diagram of connecting pipes between the tanks and the smart pump and the process of connecting it to the fuel and alcohol supply with the fuel port

Through Figure (3), we find that we can control three inputs through which the consumer can determine the form of the inputs. The consumer can specify the octane number, the price of the product per liter, or the amount of alcohol mixed with the fuel. This vocabulary is entered through a special panel installed on the pump. The board transmits data to the programmed processing unit through special algorithms installed according to the quantities and prices we enter
The third part of this scheme is based on the output, three signals are output from the processing unit. The first goes to the display board for the purpose of determining the final price per liter after the mixing quantity.
Or the second signal goes to the alcohol meter to determine the mixed quantity
The third indicator is to measure the amount of fuel to be mixed with the mixture

The mechanism of operation of this pump is based on the presence of two gauges in each pump, the first for alcohol and the second for fuel. These gauges are connected to the fuel and alcohol tanks. On this basis, the fuel loading lever is equipped with

two lines of tubes, the first goes out from the alcohol meter and the second goes out from the fuel gauge. Mixed quantities between each fuel and another.
We find in Figure (4) the basic scheme of the operations of connecting pipes with fuel tanks with a smart pump and how it works in a simplified manner. It shows the shortcomings in the amount of pipe networks compared to regular stations, where we can supply fuel with many options for different octane numbers.

Conclusion

The discrepancy in the income levels of car owners made us reconsider the prices and types of fuel, and because of the stability of the price of gasoline in the global markets, we had to raise two levels, the quality of poor quality gasoline to better and different levels in order to be accessible to everyone and this happens when mixing low-cost gasoline with alcohol, whose prices are high About fuel prices, which makes us find all the requirements that exist according to the possibility of the buyer, and this matter called us to provide these options in one place without the need to expand the establishment of many stations for each type of gasoline because this construction process requires high costs, for example, gasoline with a number of Octane (80,90,95) from one pump and from one tank, and this indicates reducing construction losses and providing opportunities to choose the product in one place. Also, such projects will help communities to develop agriculture and take care of it even if production exceeds the quantities required to meet the food need Due to the availability of new consumption other than consumption as foodstuffs

References

1- Lark, Tyler J., et al. "Environmental outcomes of the US renewable fuel standard." Proceedings of the National Academy of Sciences 119.9 (2022): e2101084119.

2- Daga, Andrew, et al. "Electric fuel pumps for wireless power transfer: Enabling rapid growth in the electric vehicle market." IEEE Power Electronics Magazine 4.2 (2017): 24-35.

3- Rutz, Dominik, and Rainer Janssen. "Biofuel technology handbook." WIP Renewable energies 95 (2007).

4- Haitham Abdullah Salman, and the Arab Center for Research and Policy Studies. The Economics of Renewable Energy in Germany, Egypt, and Iraq. Arab Center for Research and Policy Studies, 2016.

5- Karim Obeis Hassan Al-Azzawi. Iraq: The unilateral economy and development problems. (2011).

6- Tietze, Ulrich, and Christoph Schenk. Advanced electronic circuits. Springer Science & Business Media, 2012.

7- Dagsvik, John K., et al. "Potential demand for alternative fuel vehicles." Transportation Research Part B: Methodological 36.4 (2002): 361-384.

8- Ghadikolaei, Meisam Ahmadi, et al. "Why is the world not yet ready to use alternative fuel vehicles?." Heliyon 7.7 (2021): e07527.

9- Brito, Thiago Luis Felipe, et al. "Transitions between technological generations of alternative fuel vehicles in Brazil." Energy Policy 134 (2019): 110915.

10- Saleh, Adel Mahmood, and Miqdam Tariq Chaichan. "The effect of alcohol addition on the performance and emission of single cylinder spark ignition engine." proceeding to Najaf Technical collage international scientific conference, Najaf, Iraq. 2010.

11- Muthanna Latif Abdullah, Abdul Hussain Harijeh, and Muhannad Latif Abdullah. "Reducing Compression Ignition Engine Exhaust Pollutants Using Diesel-Ethanol Blend". Journal of Engineering and Sustainable Development (JEASD) 22.4 (2018).

12- Noureddine Salih Khader Ahmad, and Abd al-Rahman Habbo Muhammad al-Hob. "Theoretical study to evaluate the performance of an internal combustion engine operating under the mug system and using a mixture of gasoline with oxygen-containing fuel." Journal of Engineering and Sustainable Development (JEASD) 23.4 (2019).

13- Omar Hamid Majid. The biofuel industry and its reflection on the development of the agricultural sector in developing countries. Journal of Economics and Administrative Sciences 22.90 (2016): 360-360.

14- Al-Roomi, Ali R., and Mohamed E. El-Hawary. "Diagnosing Fuel Pumps, Power Transducers, CTs, and PTs via Fuel-Power Function and 2oo3 Voting." 2020 IEEE Canadian Conference on Electrical and Computer Engineering (CCECE). IEEE, 2020.

15- Sun, Mingyang, et al. "Benefits of smart control of hybrid heat pumps: An analysis of field trial data." Applied energy 247 (2019): 525-536.