

A Review of Fuel Adulteration Techniques

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Abstract: -- Air Pollution has become a global issue today for our country. Air Pollution causes mainly due to adulterated fuel due to which it causes tailpipe emission from the vehicles. Due to fuel contamination, the original properties are altered. Consumers are having the complaint that they don't have the appropriate tool to verify the quality of fuel. All the existing systems are very raw and simple. The testing of petrol must be done with the appropriate tool. Fuel must be in pure form for the smooth working of vehicles and automobiles. The very Raw method is used for testing of petrol like filter paper test. In filter paper test, a drop of petrol is taken on filter paper and then if the color of paper remains same then it is pure otherwise it is impure. Some of the systems are introduced are tedious and time-consuming.

Keywords: -Adulteration, Air Pollution, Petrol, Diesel

I. INTRODUCTION

Adulteration simply means contamination caused to the fuel. Adulteration degrades the quality of fuel. Different types of foreign substances are mixed with the fuel. Basically the chemical combination of fuel like petrol is comprised of (C_nH_{2n+1}) i.e. chemical combination of hydrocarbons such as carbon and hydrogen with sulphur. For transportation main fuel required are Petrol, Diesel. Transportation is directly related to growth of the country. If quality of the fuel is decreased then it directly hampers the overall economy of the nation. Due to adulteration problem overall economy of the nation is down. Different types of substances are added into the fuel like raffinate, naphtha, slope but all these are considered as soluble impurities. As the impurities are soluble, they can't be recognized easily which gives problems like tailpipe emission. Harmful pollutants are given out in the atmosphere which causes most prominently health issues.

So that these problems are becoming serious nowadays. This causes different problems like Asthma, Respiratory Diseases, Bronchitis.

II. LITERATURE REVIEW

Due to illegal profits of the suppliers overall nation's economy is down. Physical contamination of fuel basically changes the properties of fuel. Suppliers are getting 10-15% of the profit the overall fuel. Basically, kerosene is subsidized due to which it is mixed with different fuels like petrol and diesel. There are different technical aspects and techniques by which adulteration concentration percentage can be found out.

I] QUALITATIVE ANALYSIS FOR FOOD SAFETY

AND FOOD ADULTERANTS:-

Authors Shruti Awasthi, Kirti Jain, Anwasha Das, Raza Alam suggested that adulteration of food can be easily obtained by comparison of different samples of food. Basically biochemical analysis of food shows the presence of adulterants. Biochemical analysis of different types of food is done like Milk, Butter, Honey, Pulses, Edible oil, Black Paper, Chilly Powder, Coffee Powder. Adulterants used in food are mineral oils, argemone oil in edible oils, Vanaspati ghee, Mashed Potato in ghee. Due to mixing of such adulterants it causes many health issues like Epidemic dropsy, ardiac arrest, glaucoma, Lathyrism, Anemia, abortion, Paralysis, Brain damage, Cancer. Qualitative analysis of adulterants says that if colour of sample under test is changed then it indicates presence of adulteration[1].

II] QUALITATIVE AND QUANTITATIVE ANALYSIS OF MILK ADUTERATION:-

Authors Tanzina Azad Shoeb Ahmed tells us that adulteration of Milk is done by various ways. Basically milk adulteration has become a serious issues in our country. Due to mixing of different foreign ,materials in the milk it causes severe health hazards like stomach pain, Throat Infection. If the quantities of adulterants is more then it may lead to cardiac disorders,cancer. Basically Soluble Impurities are mixed into the milk so they are not easily determined[2].

III] OPACITY AND VISCOSITY BASED FUEL ADULTERATION DETECTION:-

This Paper represents chemical tests through which adulteration concentration percentage can be found out. It tells us that adulteration can be calculated through different Laboratory tests like Density, Kinematic Viscosity. There is reduction in the value of Viscosity where density remain the same even at higher concentrations. Kerosene is subsidized due to which it is used by the suppliers for mixing into the

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fuel for getting illegal profits[3].

IV] SENSOR BASED APPROACH FOR DETECTION OF FUEL ADULTERATION:-

Authors Bharath and Himanth suggested that Sensors can be used for detecting fuel adulteration concentration. Petrol and Diesel are the most commonly used fuels for transportation. Basically low boiling of petrol it is useful for giving spark in the engines. Sensing of increase in hydrocarbon percentage can be done with the help of sensors[4].

V] CONSEQUENCES IN INDIA REGARDING FUEL ADULTERATION:-

This review tells us that, different automotive fuel emissions like NO, PM, CO and unburned hydrocarbons are the main sources of fuel adulteration. In the countries like South Asia Petrol and Diesel are having much more tax than kerosene due to which these fuels are mixed with the Fuels like Petrol and Diesel. There are many consequences in India like Internal Combustion of Engines, Tailpipe Emission, Safety Problems, Failure of Various Components[5].

VI] SIMULATION BASED FUEL ADULTERATION DETECTION APPROACH :-

There are different techniques of fuel adulteration out of which Ranjan Dey has given a best solution for finding adulteration concentrations. A Computer aided design is used so as to have the simulation of the data samples. Digital Data Decisions are given in which signal conditioning concept is used. The system calculates the values for AT & SC cut quartz crystal frequency responses which are helpful for displaying adulteration concentration percentage[6].

VII] ADULTERATION DETECTION USING ARM CONTROLLER:-

In this paper various parameters are analysed. S.D. Kale had proposed a hardware based technique for determination of adulteration concentration. Small detection device is used to for the density test. Adulteration detection is done by determining comparing test results with standard reference using ARM controller which gives output on LCD. Various types of sensors are given as an input to the system controller through signal conditioning by which the output is displayed on LCD[7].

VIII] NONPOROUS SILICON MICRO CAVITY BASED FUEL ADULTERATION:-

Sensors plays an important role in finding out the percentage of fuel adulteration. Fiber Optic Sensors are used determining adulterated concentrations of Petrol and diesel by Kerosene. The micro cavity, fabricated using electrochemical anodization process. The most commonly used adulterant kerosene was sensed by the micro cavity as an optical sensor for fuel adulteration was done. The sensor is reusable[8].

III. COMPARISON OF MATERIALS AND METHODS DISCUSSED

Basically, there are different techniques for finding Adulteration concentrations. There are different types of Approach used such as hardware based and some are laboratory based. The main adulterant used is Kerosene because it is subsidised.

Types of Fuel Adulteration:-

- Mixing of Kerosene with gasoline
- Mixing of Kerosene with petrol
- Mixing of Kerosene into Diesel
- Mixing of Soluble Impurities into Petrol and Diesel
- Mixing of Lubricants into Petrol and Diesel

In some of the methods ARM Microcontroller i.e. Advanced RISC Machines which provide platform for finding out the percentage of Adulteration concentration. Adulteration is not limited to fuel but it brings out tremendous changes in food when different adulterants are mixed into it. Some laboratory tests through different sample comparison can be easily done. Fiber Optic Sensors are useful finding Hydrocarbon Percentage followed by the chemical process. Adulteration is basically impurities observed in the fuel. All the sensors are reusable. The another approach given is Simulation based approach in which Computer aided design is used for detection of Hydrocarbon percentage. AT and SC Curves are used through which data decisions are given.

PREPARATION OF CUSTOM PROPORTIONS MIXTURE OF FUEL AND ADULTERANT:-

In laboratory based techniques two adulterants used and custom proportions of the liquids are made. Diesel is mixed in volume by different proportions:

(190:10, 180:20, 170:30, 160:40, 150:50)

Sample quantities are compared with mixing of different proportions of liquid i.e. adulterants and Concentration of Hydrocarbons and its percentage can be easily calculated.

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IV. CONCLUSION

Fuel Adulteration basically causes tremendous health hazards which are harmful and dangerous for the Society. Fuel adulteration causes disorders like Respiratory Disorders, Bronchitis, Cardiac Block, and Asthma. Adulteration is not limited of up to fuel but it is done in food as well as milk. Physical Contamination through adulterants degrades the quality of food, milk, Fuel too. Due to Adulteration, the properties of fuel are changed it doesn't meet the requirements causing problems like Air Pollution and Health Disorders. It is done by the suppliers so as to gain illegal profits. Different types of techniques proposed are useful for finding out adulteration concentration in fuel as well as food. Some of the methods are tedious and time consuming. The techniques like Laboratory tests give better results so as to get accurate results. In laboratory based approach different samples are compared and different tests are conducted like Kinematic Viscosity, Density through which adulteration concentration in Fuel can be easily calculated.

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