

# MINI- FUEL REFINERY STATION FOR RENEWABLE/ CONSERVATION OF ENERGYS

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## Abstract

*Over the years the challenge to reduce waste plastic and polythene material has been an issue to tackle. Hence mini refinery station equipment is designed and built upon the premise to refine crude oil and covert these plastic and polythene waste into different component of fuel. This equipment consists of heat reactor chamber, condenser, vacuum pump, and electrical control panel and distillation unit. The over view of these component, is to convert the waste plastic and polythene material into AGO, dual purpose kerosene and premium spirit etc.*

**Key word:** conversion of waste plastic and mini fuel refinery station

## INTRODUCTION

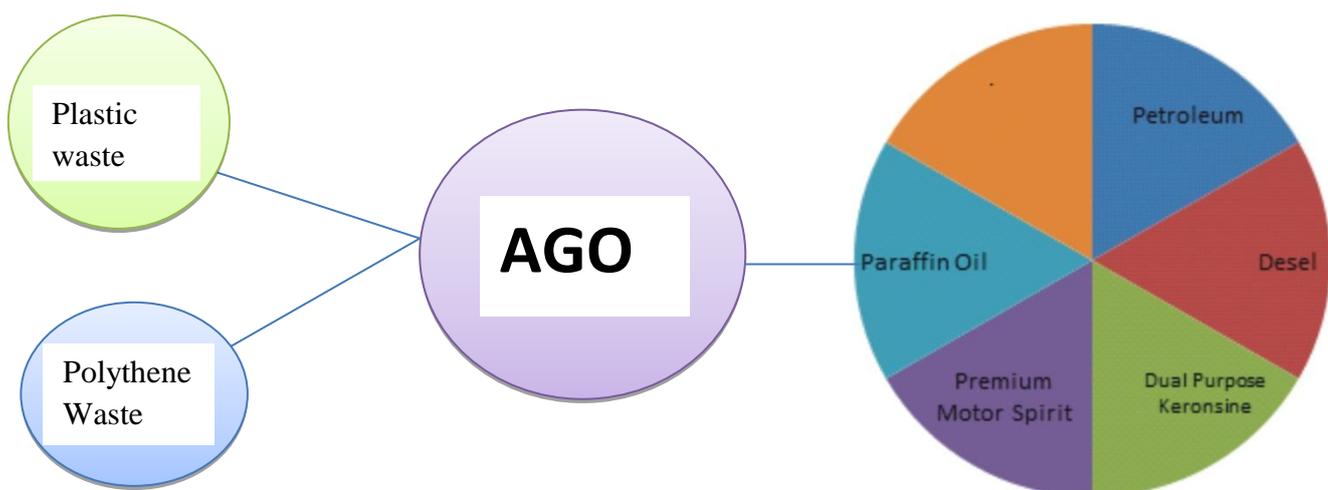
The view to design standard equipment for recycling plastic or polythene waste lined with the present rate of economic growth and environmental challenges, especially in developing countries that is unsustainable without saving fossil energy, like crude oil, natural gas or coal etc.

There are many alternative to fossil energy such as the use of waste plastic and polythene materials, hydropower and wind energy. Development and modernization brought about a huge increase in the production of all kinds of commodities which indirectly generate waste. Plastic or polythene have been one of the most common waste due to its wide range of application, due to its versatility and relatively low cost. Waste polythene or plastic material is one of the most abundant elements in the earth's crust surface such that it is not biodegradable but hence environmental pollution. These materials are found everywhere and consist of a large mixture, such as automobile gasoline oil (AGO), and dual purpose kerosene and premium motor spirit etc.

These products are renewable energy source based on the availability unlike other natural resources such as petroleum, coal and nuclear fuels. Plastic or polythene are product of crude oil using no conversion technology and the necessary food stock for the production of these materials' often waste plastic or polythene which are heated and melted to yield vaporized gas and bubble into water housed in glass vessel, then condense as AGO, as first product received and separated to different products, such as kerosene, spirit and paraffin oil etc.

The mini fuel refinery station equipment designed is to refine crude oil and recycle waste plastic or polythene material to AGO etc. Over the years, the challenge to reduce these waste material within the environment has been a serious issue, but their equipment eliminate and convert these waste materials within the environment and convert these material into useful purpose called fuel.

The equipment design as subject is built upon the premises that students already has a fairly background of fundamental subjects such as strength of materials, material science, design of machine elements (N.k. Mehta 1992) could use it for better result. This equipment designed in scientific Equipment Development Institute Enugu (SEDI-E) is a new dimension to revive the economics of the country on board.



**Fig 1 Schematic production of the fuel**

Today, it is impossible to image a branch of production activities of man where heat would be of no use. Space technology, metallurgy, machine, food industry, transportation, power engineering, agriculture, chemical technology, food industry – this is only a very short list of the branches of national economy

where scientific Engineering and technical problem associates with heat would be generated in the highest quantity and useful effect. This means of essential to encourage, minimize the evolution of heat and reduce its various effects (V. Afamosyev 1995)

The tools and components of this equipment were done by hand. It is the process of heating both metal and glass to a desired temperature in order to acquire sufficient plasticity, followed by operation like cutting, bending, blowing and sealing etc [R.S .Khurmi 2013]. The principle to achieve AGO from waste plastic or polythene required heat energy for energy, hence mini fuel refinery station help to actualized this objective.

## **MATERIAL AND METHOD**

The material and method used for this design is borosilicate glass tubing, mild steel, electrical temperature control panel and vacuum pump. The condensation chamber is made of borosilicate glass tubing dimensioned as 300mm x 75mm with effective length of 250mm, receiver tank, 200mm x 100mm, sheet of mild steel 1660mm x300mm, reactor heat exchanger chamber 300mm x220mm x580mm, reactor heat exchanger vessel 560mm x1220mm, temperature control panel ranged from 0 degree to 1000°C, vacuum pump of 0.5 horse power, fractionating column 300mm, 1 liter of flask and 200mm spiral condenser

In the cause of accomplished the designed some other perishable material were used such as Oxygen and CH<sub>4</sub> to fabricate the glass components while few were foreign material purchased within.

## **METHOD**

The plastic and polythene waste collected within the surrounding were crush to pellet and 10kg of it were heated in reactor chamber with temperature of 350°C. At the beginning, the vaporization temperature of the material were first monitor and found that at 230°C less gas vaporized, hence 350°C were considered as constant temperature needed for effective heating and discharge.

## **RESULT**

The quantity of AGO collected depend on the capacity of reactor chamber and material. When a volume of 10kg of plastic waste was heated at a constant temperature of 350degree, 13 liter of AGO were collected and this was repeated with the view to check for variation and same was achieved.

The product "AGO" was reheated and separated and a volume of 3liters premium motor spirit, 2 liter of petrol, 3 liter of dual purpose of kerosene , 2 liter of diesel and 1 gram of paraffin were obtain from 13liter of AGO with the help of these equipment showed in figure 2.

From the experimental result, it was observe that the efficiency of the equipment's to discharge vaporizing pellet to AGO largely depend on the constant temperature and pressure build within the system. Too, the first product to be archived or received if same reactors chamber is used for separation of AGO products.



**Fig 2 a. MINI-FUEL REFINERY EQUIPMENT**

## **DISCUSSION**

The mini refinery station equipment consists of heat reactor, condensation chamber, receiver tank, gas separator chamber, vacuum pump and electrical control panel. These component parts, some are made from borosilicate glass tubing, stainless steel and mild steel.

Their efficiency of this equipment depends on constant temperature and pressure generated and its first product required to be discharge from the reactor vessel. As it is in enthalpy. The change in entropy of a reaction is seen as from the entropy of the product and the reactant. At the reaction temperature in the reactor chamber is shows that the entropy changed of gas, or a state of substance is practically depended of the temperature (D.W. Hepking or L. Couturier 1988), hence the equipment is design to regulate and maintain the temperature for effective discharge.

## **CONCLUSION**

To this end, the fundamental principles of refining waste plastic and polythene material to AGO has been established in a simple and systematical manner and elaborate through the use of mini refinery equipment station design. We need this equipment because vision to create job which is environmentally, economically and socially sustainable raises a new global and inter connected challenges

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