echo
FUEL SOLUTIONS
Vision towards Prosperity

"PLASTIC PLASTIC
go away
we want our
earth to play"

Converting Plastic to Petroleum

MENTOR &
INVENTOR DESK

Dr. Punyabrata Chakraborty, an eminent scientist, developed a technology to convert waste plastic into petroleum fuel. This technology has been patented under the Intellectual Property Act, India.

The machine used in this technology is simple and green, and causes no pollution. It is simple, safe, portable and low cost and can be operated by anyone. We can put plastic into the mouth of machine, and collect liquid fuel at one outlet, which can be used to run engines and gaseous fuel at the final outlet which can be used as cooking gas.

This technology can also be used to recover oil from sludge in oil refineries and oil fields. Oily sludge is a hazardous waste and disposal is a major problem. Our technology can be used to convert hazardous oily sludge into non-hazardous category.

DR. PUNYABRATA CHAKRABORTY
Scientist

ECHOFUEL SOLUTIONS

- Formally incorporated in February 2017.

- Echofuel Solutions is set out to be one of the leading entities in the Renewable Energy and Waste to Energy Sector.

- We have immense experience of designing and installing of large scale and small scale plants and working with various public and MNC corporations for past 3 years we also have our offices and subsidiaries in West Bengal, Bihar, Gujrat, Jharkhand.

OUR VISION

- Each Municipality / Panchayat across the globe will use Plastic to Petrol converter

- To start with, West Bengal can be made Waste Plastic Free , Green and Clean State in India.

OUR NEW PRODUCT

INTRODUCTION

PLASTIC COVERTED TO OIL

New process and apparatus invented – Patent No. 370474

Converts:

- Plastic waste to petroleum products.
- Solid waste plastic into gaseous and liquid petroleum products.
- Can be used for many other purpose - like Recovery of oil from Oily sludge in refineries, oil field and convert them from hazardous category to non-hazardous category.

Meaningful use of waste generated in polymer industry

- Process invented while trying to break long chain polymer of ethylene into smaller fragments

- Green and self-sustainable process

Green, Self-Sustained Solution

for management of non-biodegradable solid waste

Waste plastic to petroleum

Problem Analysis

- Several ways have been attempted to overcome polyethylene menace but with little less success
- Commonly used plastic materials are made from gaseous substance like ethylene via polymerisation
- Polymerisation - small molecules joined together to form a big chain
- It is like garland, many individual flowers are tied together one after another with a thread
- From ethylene gas, polyethylene plastic is manufactured

Problem Analysis

- Ethylene gas has 2 carbons whereas polyethylene has > 3000 carbon atoms
- During polymerization, the products first remain in gaseous form, which turns into liquid, and then into solid
- By reversing the process i.e breaking the long chain of polymer into smaller fragments, solid plastic is converted into liquid and gaseous substance
- This solves the environmental issue while also generating useful products
- Lab-study was undertaken to solve the issue –first experiment started at my garage.

Process Emission

- The de-polymerisation process developed is completely environment friendly
- Done in a completely close system / air tight container
- No release of any toxic gases out of the system.
- Gas chromatographic analysis shows the generated gas consists of H2 and lighter HC – both Oleffin and saturates.
- No trace of toxic components like – Dioxine , Furans or any heavy metal like Hg V etc

- The oretically also – no possibility of formation of any toxic gas as the feed is common plastic – PE, PP etc which are pure HC. No aromatics

- Thermocol, PET type material contains aromatic components, so when burnt in open air, there is chance of formation of toxic dioxin, furans and other such toxic gaseous components.

Gaseous Fuel Quality

- Gas chromatography of the eluted gas was carried out
- H2 - 6.49 % vol ; C1-9.54 % vol; C2-12.02 % vol; C2' – 20.59 % vol; C3 – 15.36 % vol; C3' – 19.57 % vol; I C4- 0.08 % vol; N C4 – 5.75 % vol; I butene – 7.71 % vol; I butylenes – 0.35 % vol; C-2-Butene – 0.65 % vol; I C5-0.85 % vol; n C5- 0.87 % vol
- No traces of toxic gases like H2S, di-oxine, Furan or any heavy metal like Hg is absent
- Gas is purified at three stages to remove toxic elements if any

Liquid Fuel

- Liquid fuel boiling range maintained below diesel final boiling point temperature
- Liquid Fuel can be used in diesel engine after minor changes.
- Pour point is lower than diesel, close to 25 deg C – Presence of large amount of saturates.
- Presence of higher amount of saturated hydrocarbon which is good fuel for diesel engine, better Cetane Number
- When blended with Kerosene , quality should improves towards diesel . Cetane number will improve.

HOW TO PLASTIC

GOOD

- Helpful invention of science
- Popularity - light-weight, durable, flexible, strong, inexpensive, hygienic
- Widely used

HOW TO PLASTIC

BAD

- Discarded/ waste polyethylene materials is the single largest environmental hazard
- Non bio-degradable in nature – remains as such for more than a 100 years
- Islands of plastic in the oceans, the size of a city, where no marine life can survive

HOW DO WE CHANGE THIS

- Stop using this useful material?
- Or convert it to something useful?
- Current approach:
  - Restricting production, banning usage (use of < 75 micron plastic banned)
  - This is temporary relief - will reduce volume slightly
  - Total production of only polyethylene plastic is > 100 million ton per annum

INFRASTRUCTURE

- Land/ working shed / office / lab
- Accessories/ spares
- Electricity- domestic supply is sufficient

PLASTICS IN ENVIROMENT

- 3.6 lakh million tonnes of waste plastics are produced every year in the India alone, only 50% of which are recycled. In the current recycling process usually the plastics end up at city landfills or incinerator. As with any technological trend, the engineering profession plays an important role in the disposal of plastic waste. Discarded plastic products and packaging materials make up a growing portion of municipal solid waste.

- The Global Environment Protectional Agency [GEPA] estimates that by the year 2004 the amount of plastic thrown away will be 65% greater than that in the 1990's The recycling of the plastic is only about one percent of waste plastic in the stream of waste in developing countries as compared to a rate of recycling of aluminum which is about 40% and 20% for paper, where as recycling rate in India is very high up to 20% of waste plastic.

- In a short span of five years plastics have captured 40% of total 6.79 billion USD packaging market in India. This situation may grow further in the coming years with more and more US and European companies entering the market. It would be very interesting to note the type of litter we generate and the approximate time it takes to degenerate.

Process Cost

R.O.I of the project :

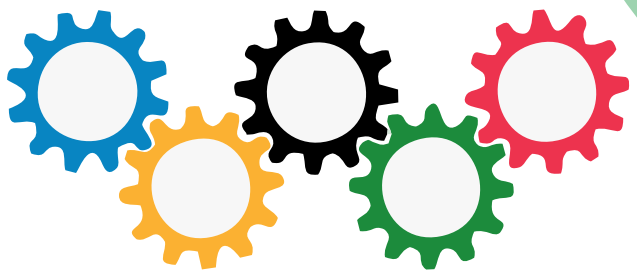
- Process conversion is 75% -85 % depending on feed quality
- Machine Cost – 5,00,000/- (approx)
- 40 kg waste plastic will give ~ 30 kg final products (considering 75% conversion rate)
- 25 kg liquid oil + 05 kg gas
- Production cost for 1 kg product should not be more than Rs. 20 /-(Including Raw materials, Electricity, Man Power etc)
- Average sale price @ 70/- kg
- Average Sale Price for 30 kg product = 30 x 70 = 2,100 /-
- Production cost = 30x 20 = 6,00/-
- Net Profit = Rs. 2,100 – 6,00 = 1,500/-
- R.O.I. – 5,00,000/1,500 = 335 Days.

Process Cost

- Machine is one time investment – cost approx 05 lacs ,for a machine which can produce minimum 30 litres Oil & Gas/Day.

- For capacity increase ,cost will NOT increase proportionately.

- Considering Rs. 1,500 profit /day; Break even point only 335 days + tremendous Environmental Benefits.



Legal Aspects

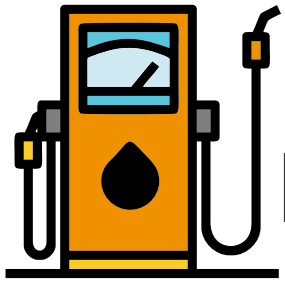
- As the production quantity is very small per machine, explosive license for storage of the product won't be required.
- Products can be locally consumed without long storage.
- Pollution/ environmental clearance can be obtained easily as there is no process emission.
- Residue - whatever will remain at the reactor bottom is mainly ash, dirt particles which comes along with feed – no heavy metal

Infrastructure – Utilities Requirement

- Land/ working shed / office / lab
- Accessories/ spares
- Electricity- 3 phase electricity supply required.
- Machinery delivery period- 60 days.
- Full payment before dispatch.

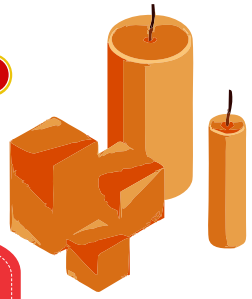
FROM THE PLASTIC WASTE

FINAL OUTPUT PRODUCTS :



- DIESEL

- LP GAS



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"Less PLASTICS Feels FANTASTIC"

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