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Alternate Power Generation Sources

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Abstract

Alternate power source accentuate to trap and efficiently use methane gas for power generation from waste generated generally by humans. Large amount of domestic wastage, industrial effluent and agricultural farm wash are produced continuously and are creating serious problems to our environment and human health. Our natural resources are depleting at exponential rate and we require checking and reducing our dependency on them. We can efficiently use sewage treatment plants and landfill sites which are abundant source of methane gas. Possible we will not only reduce our dependence on non renewable sources but can also cut down green house gases being released in our environment.

1. Introduction

1.1 Present Scenario

Our world is developing at a faster pace, depleting our natural resources at an exponential rate. Natural resources like coal, gas and oil are non renewable but our mammoth dependency on them is of real concern. Every aspect of our life requires burning our natural resources, be it electricity, our vehicles, our industries every thing still depends majorly on natural resources.

As per IEA 2011 report total electricity generation by 2009 pictures our dependency percentage on depleting resources. As per reports worries have been raised regarding increasing population and increased individual power consumption which is estimated to double by 2030.

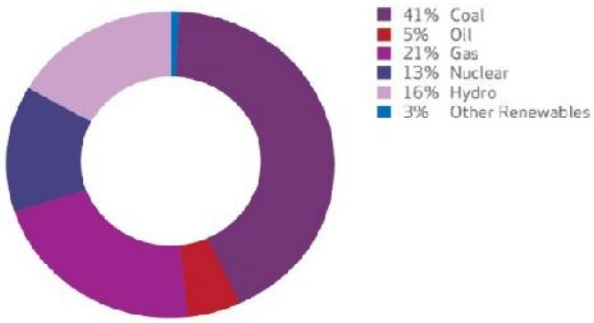

Figure 1: Power generation dependency on various resources.

- 41 % electricity generated comes through coal.
- 5% comprises of oil and petroleum products.
- 21% is the natural gas.
- 13% nuclear energy.
- 16% hydro plants.
- 3% other renewable sources. These renewable include solar, wind, combustible renewable, geothermal and waste.

World Coal Usage for Power Generation

International coal power generation varies from country to country, list of some developed and developing nations is shared below and their coal percentage use for power generation.

Table 1: Coal usage by various countries to generate electricity.

South Africa	93%	Israel	58%
Greece	54%	USA	45%
Australia	78%	Kazakhstan	54%
Czech Republic	51%	India	68%
Germany	41%	Morocco	51%
China	79%		

- What is Methane Gas?

Methane gas is a tetrahedral molecule with four equivalent carbon and hydrogen bond. At room temperature methane is a colorless and odorless gas. It is a combustible gas and mixture of about 5 to 15 percent in air is explosive. Anaerobic bacterial decomposition of plant and animal matter under water produces marsh gas, which is also methane. Combustion of methane is highly exothermic and produces large amount of heat. Gas is fed as fuel to engine which indeed can be connected to generators to produce electricity.

$$CH_4\,(g) + O_2\,(g) \rightarrow CO_2\,(g) + H_2O \qquad (l)$$

- What are Gas Engines?

Gas engines are engines that take pressurized gas as fuel to run. Methane is fed to these engines at high pressure and spark plugs are timed to perform timed combustions. Sometimes duel fuel mixtures are used like gas and diesel, here initially diesel is fed to engine and slowly gas is added to fuel mixture and its composition is increased timely thereby replacing diesel slowly. These engines are connected to generators which produce electricity.

Part 1
Obtain Gas thorough Garbage Landfill Sites

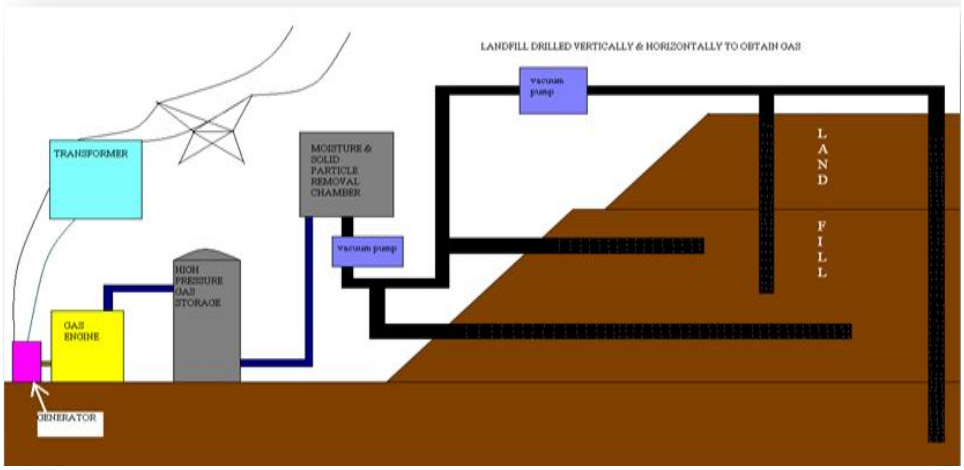

Figure 2: Gas capturing from landfill sites.

Garbage landfill sites are appropriate source to obtain large amount of methane gas. Methane gas being combustible in nature is appropriate for purpose to burn as fuel. In this, landfill sites are to be filled with enormous garbage then rolled over with more solid waste. After these landfill sites are full to their capacity, they are covered with natural occurring clay, sand and vegetation. Landfill sites are drilled approximately till end or to convenient depths. Anaerobic reactions occur under absence of oxygen beneath multiple huge layers of waste produce methane gas. Gas is extracted by creating vacuum on the surface above; the gas comes out with high amount of moisture and solid particles. It is really important to remove moisture and solid particles from gas fuel because it can damage engine within.

Extracted gas flows through network of pipes and made to pass through chamber which removes moisture and solid particles from it. Gas in now stored in high pressure vessels before being fed to engine which run on gas power. These engines are connected to generators which generate electricity, which can be transferred through power lines to power distribution stations.

Part 2

Obtain Gas through Sewage Treatment Plants

Here idea is to make sewage interceptor tanks being connected parallel to sewage treatment plant. Water to be treated should be made to pass through very deep closed tanks before being sent for treatment, allow it to stay there for few days. It is important to have greater depths for tanks because it will create high pressure and more gas will be released. This oxygen less environment would generate higher amount of methane which could be collected thorough pipes by vacuum extraction process.

Extracted gas is now made to pass through moisture and solid particles removal chamber. This process removes excess moisture and solid particles which could damage engine internally. Engines specially designed to run on gas are connected to generators to produce electricity. By this method we can produce substantial amount of electric power which could serve a lot of purposes.

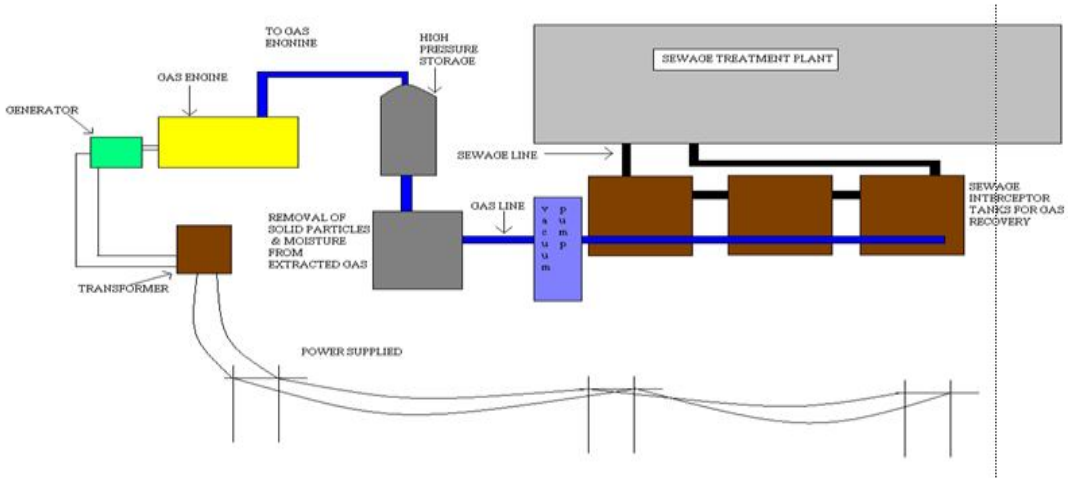

Figure 3: Gas capturing from sewage treatment plants.

Merits

- Continuous process, thus producing electric power round the clock.
- Clean source of power generation, thus earning carbon credits.
- Efficient use to generate power through wastage.
- Will help to meet increasing power demands and dependency on regular sources.
- High scope in developing country like India where 1.25 billion people reside.

Demerits

- Initially cost intensive project, with longer period of recovery on investment.
- Work environment cannot be expected to be hygienic.
- Gas engines and various required machinery are expensive and they require regular maintenance.

2. Conclusion

Today we can obtain energy sources even from the last stage of wastage generated. It totally depends on our technology to find new and clean methods to generate electricity. The above two methods determined both are highly profitable, rich and clean sources for power alternatives. It totally depends on us to exploit these methods efficiently to get the best out the waste.

References

[1] www.worldcoal.org
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