



De La Salle University – Dasmariñas

**Recycling Used Rubber Tire Using Vacuum Gasification to
Produce Electricity: Alternative Power Source
of the Philippines**

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ABSTRACT

Name of Institution: De la Salle University- Dasmariñas

Address: Dasmariñas, Cavite

Title: Recycling of Used Rubber Tire Converted to Electricity Using Vacuum

Gasification as An Alternative Power Source of the Philippines

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Objective of the study

This study aims to:

General:

- To seek process that will maximize the recycling capability of used rubber tires.
- To solve the energy crisis of the Philippines through this innovation.
- To give knowledge and new information about this new technology.
- To know the quantity of kilowatts can be obtained per unit of tire.

Specific:

- To propose a design of new process in recycling used tire to lessen the solid waste and benefit the country.

Scope and Coverage

This study focused only to the design process and principle of recycling used rubber tire converted to electricity and its possible benefits to the country. The



researchers did not tend to undergo experimentation or burning of rubber to the gasifier because it is costly and the researchers have no ability to collect enough samples for gasification process.

The researchers only depend on the data taken from its different resources that may help the researchers explain the principle and its benefits.

Methodology

The method used to this study is descriptive- experimental method wherein the data from different media is the primary source and new to the technology. Descriptive part of the study is the presentation of the principle and benefits of recycling tire using vacuum gasification. The experimental is the added process to the ordinary gasification or pyrolysis process to emit zero carbon dioxide.

The data was gathered by research using different media. The researchers used the Internet as the main source of the topic. Books and research works from different libraries become the basis of designing and improving the gasification process.

The researchers visited Aklatang Emilio Aguinaldo- DLSU-Dasmariñas; Department of Energy Library at Taguig, Manila and; Department of Environment and Natural Resources at Quezon City, for different information for the waste tire management, gasification processes, and energy consumption that can be useful to answer the specific problem given in this study.

No computations were done by the researchers from the reason that they focused more to the principle and design of recycling tire to electricity.



Major Findings

The procedure in recycling used rubber tires to electricity using vacuum gasification is:

Extracting gas and oil to produce electricity

Reduction of size into pieces through the process of shredding, chopping, and grinding. The shredding of a whole tire reduces the tire into strips ranging in size from 2x8 and to 2x2 inches.

Shredded tires to vacuum gasifier and burned. Along with the oxygen and water at high temperatures, about 2500 to 2600 °F tires are burned to produced gas mixture of steam and carbon dioxide and oil.

The steam, in turn, powers the turbines that drive electric generator and produces electricity without pollutants.

The oil recovered will be stored and refined for commercial use and can be also used for powering up electric generators as back up to make electricity in peak demand periods.

Process reaction between Vacuum Gasifier and Turbines

Vacuum gasifier produces steam for turbines to run a generator to produce electricity.

Turbines exhaust gases that will go to condenser to separate gaseous carbon dioxide and water.

Most of the water is reheated and return to steam generator or vacuum gasifier.



The gaseous carbon dioxide can be either sold commercially in form of gas and liquid by cooling it from 2600 °F to 1000 °F.

Any excess carbon dioxide are compressed and cooled to become liquid for disposal by sequestration in the earth or ocean floor to rejuvenate oil wells. Moreover, to emit zero CO₂ in the atmosphere.

In every tire 0.74 kilowatts (Kw) of electricity can be obtained as shown in table 1. if there is 1000 tires used in gasification 737 Kw can possible to obtain that can supplement an energy requirement of a household. This means recycling tires using vacuum gasification can generate electricity that can support the Philippines since the country consumes 1 billion (approximately) of tires and 50 million is added per year.

Conclusion

Recycling of tires using vacuum gasification has its significant benefit that can give a country such as being a rejuvenator of potential oil wells that may help a country solve their economic crisis; to have a cleaner air because this process is a no carbon dioxide emission to the atmosphere; economical wise you can generate heat and power to produce electricity; its waste, the carbon dioxide that is considered waste can be source of industrial gas; since it uses clean energy (steam) with oxygen negates the possibility of producing pollutants such as SO_x and No_x.

Recommendation

It is highly recommended that further studies be taken along the same line regarding a more extensive and detailed verification on the following aspects:

1. Possibility of using fuels that contain less carbon, improve energy efficiency and developing low-cost carbon separation technologies will give use to a cleaner and cheaper energy.
2. Utilization of gas and oil for industrial oil, producer of power and heat, and rejuvenator of potential oil wells of our country.
3. The utilization of its waste products such as carbon black as an ink pigment, recycled steel for small metal parts and ash.
4. Economic viability of an industry on the actual production of electricity and other possible products from used rubber tires.

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