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ISSN: 2278-6848 | Volume: 14 Issue: 03 | April - June 2023
Paper is available at http://www.jrps.in | Email : info@jrps.in
Refereed & Peer Reviewed

Special Edition
NCASIT 2023, 29th April 2023
Department of Computer Engineering,
St. Vincent Pallotti College of Engineering & Technology, Nagpur,

# Power Generation From Waste Material

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***Abstract***— The examination of power generation utilising a thermo-electric generator and heat source is presented in this project. The majority of the thermal energy used in the sector is released into the atmosphere as waste heat. More power can be produced using this waste heat. The concomitant issues of global warming and the depletion of fossil fuel reserves have made increasing the productivity of any industrial operation a top goal. Creating strategies to use waste heat that is typically squandered is one way to increase efficiency. Thermoelectric generators and heat pipes were determined to be two potential technologies that were helpful for this aim. Consequently, the goal of this research was to create a bench-type, proof-of-concept model of thermoelectric generators that produces power utilising heat pipes and modelled

## I. INTRODUCTION *(HEADING 1)*

In this project, heat energy is converted to electrical energy. A fan will function using this energy, and the energy is stored in a battery. The A.C. ripples neutralizer, unidirectional current controller, and The inverter uses the 12V that is supplied by this battery source to power AC/DC loads.

•The inverter is linked to the battery. Utilising this inverter, 12 V DC is changed into 230 V AC. The loads are turned on using this 230 V AC electricity.

•In this project, the conversion of the heat energy into electrical energy is being done utilising a typical battery charging mechanism. Utilising this energy, the fan will run

methodology

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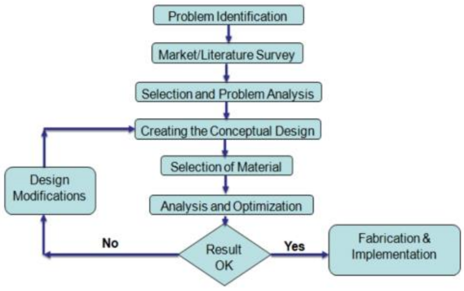


THEORY:One hot side and one cold side make up TEG. A current will flow through the circuit as a result of the hot side's greater temperature driving electrons in the circuit's n-type leg towards the cold side's lower temperature, where they will bridge a metallic connection and enter the p-type leg.

*The dispersion of charge carriers will result in a continuous heat current and, consequently, a constant electrical current if the temperature difference is maintained.The P and N type semiconductor pairs that make up a thermoelectric circuit are referred to as a couple. A thermoelectrical phenomenon was exploited in the circuit to generate electricity.*

*•Temperature changes on both sides of a module when current flows across the intersection of two different types of conductor. Following that, energy production is created.*

## II. RESULT

•The Seebeck effect equation, V=(Th - Tc), can be used to calculate voltage.

Where, V is the voltage generated in volts and Th is the temperature of the hot surface (silencer) in Kelvin.

Bismuth Telluride's Tc-cold surface (atmosphere) temperature is 287 V/K.
Tc = 303 k
The Seebeck equation is applied to a range of temperatures of the hot silencer, and the corresponding voltages that are predicted to be created are determined as follows:
V = α (Th - Tc)
Th= 403 k V= (287 10-6) (403-303) = (287 10-6)(100) = 0.0287 V Case 1
Case 2: Th= 453 kV = (287 106), (453-303) = (287 106),(150), = 0.04305 V These voltages are insignificant in value.Using the booster circuit, this can be amplified. The findings from the experiment are summarised as follows:Table 3 Voltage generated and boosted for different

| Temperature Difference | Voltage withoutBoosting (Volt) | Voltage after Boosting (Volt) |
|---|---|---|
| 80 | 0.02296 | 1.44 |
| 100 | 0.02870 | 2.53 |
| 120 | 0.03444 | 3.21 |
| 140 | 0.04018 | 3.85 |
| 150 | 0.043.5 | 4.43 |
| 160 | 0.04592 | 4.94 |
| 180 | 0.05166 | 5.37 |
| 200 | 0.05740 | 6.10 |

### *A. Maintaining the Integrity of the*

temperatures

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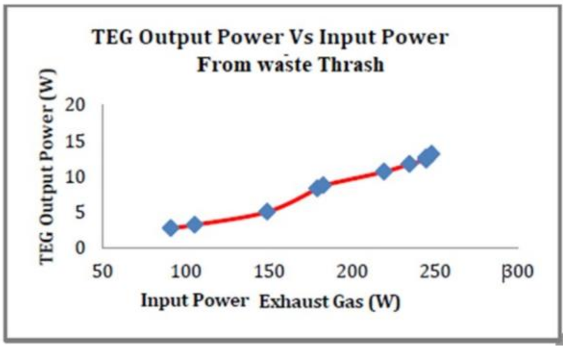
Total Power

T1= Hot side inlet temperature T2= Hot side outlet temperature T3= Cold side inlet temperature T4= Cold side outlet temperature

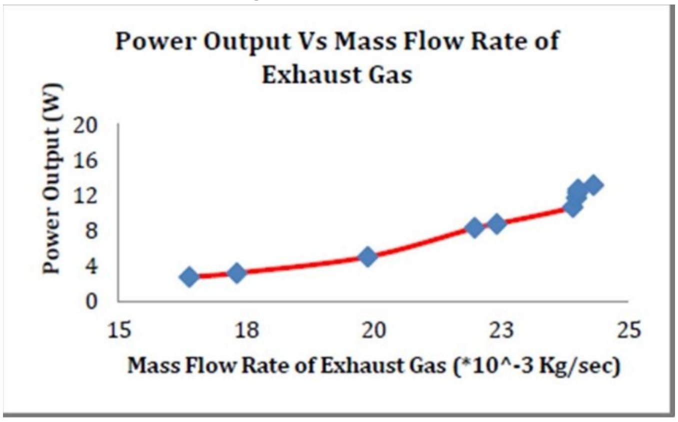
Tin= Exhaust gas temperature at TEG system inlet Tex= Exhaust gas temperature at TEG system exit.

TEG output power Vs Input power if exhaust heat gas




TEG Output Power Vs Input Power The graph shows that at the engine speed of 3736 rpm, input power of exhaust gas is 248.03 W & the TEG output power is 10 W, hence the overall efficiency obtained is 5.28%.

Power output Vs Mass flow rate of exhaust heat gas

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IV CONCLUSION

To generate electrical work, waste heat recovery requires catching and utilising the waste heat from waste rubbish. If these technologies were implemented by the production waste rubbish, it would also be easier to see how the engine's performance and emissions had improved.

If the thermoelectric system concept is applied in practise, a significant amount of electricity might be produced and used to power industrial loads directly. Additionally, this system consumes a significant quantity of waste heat for pollution on a continuous basis. Additionally, such waste materials contribute in some way to reducing environmental contamination.
The power generation by the TEG linked to the exhaust engine grows, as demonstrated above.

| **Symbol** | **Name of Symbol** |
|---|---|
| $T_1 = Th$ | Temperature of Hot Side (k) |
| $T_2 = Tc$ | Temperature of Cold Side (k) |
| T | Average Temperature (K) |
| $E_{AB}$ | Electromotive Force (V) |
| U | Current Density (A/m$^3$) |
| Z | Figure of Merit (uV/K) |
| P | Seeback Coefficient (V/K) |
| S | Compatibility Factor (1/V) |
| H | Efficiency (%) |

| **Abbreviation** | **Name of Abbreviation** |
|---|---|
| TEG | Thermoelectric Generator |
| HEV | Hybrid Electric Vehicles |
| IC | Internal Combustion |
| TE | Thermoelectric |
| BTR | Best Temperature Range |
| SiGe | Silicon Germanium |
| $Bi_2Te_3$ | Bismuth Telluride |
| $CoSb_3$ | Combalt Triantimonide |
| PbTe | Lead Telluride |
| DNA | Deoxyribo Acid |
| PCR | Polymerase Chain Reaction |
| $NO_X$ | Oxide of Nitrogen (X=1,2,3) |
| WHR | Waste Heat Recovery |
| EGP | Exhaust Gas Pipe |
| EGR | Exhaust Gas Recirculator |
| BMW | Bavarian Motor Works |
| GMC | General Motor Company |
| GM | General Motor |
| AETEG | Automotive Exhaust Thermoelectric Generator |
| ATEG | Automotive Thermoelectric Generator |

TABLE I. TABLE TYPE STYLES

| **Table** | **Table Column Head** |
|---|---|

| **Head** | ***Table column subhead*** | ***Subhead*** | ***Subhead*** |
|---|---|---|---|
| copy | More table copy[a] | | |

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## VI ACKNOWLEDGMENT

WE WOULD LIKE TO EXPRESS OUR SINCERE GRATITUDE AND ADMIRATION TO DR. P M TARWATKAR, DEPARTMENT OF ELECTRICAL ENGINEERING, FOR HER UNWAVERING SUPPORT, INSPIRATION, EXCITEMENT, AND LEADERSHIP. HE GAVE US THE SUPPORT, DIRECTION, AND ASSURANCE WE NEEDED TO FINISH THIS PROJECT.

WE APPRECIATE THE LEADERSHIP OF PRINCIPAL DR. S.V. GOLE.

WE ALSO LIKE TO THANK DR. N. K. DHOTE, THE HEAD OF THE ELECTRICAL ENGINEERING DEPARTMENT, FOR GIVING THE RESOURCES WE NEEDED TO FINISH OUR RESEARCH.

WE ARE GRATEFUL TO PROF. NILESH MENDHE, THE ORGANISER OF OUR PROJECT, FOR HIS LEADERSHIP DURING THE ACADEMIC YEAR. WE ALSO THANK THE DEPARTMENT OF ELECTRICAL ENGINEERING'S TEACHING STAFF FOR PROVIDING PROJECT GUIDANCE AND CONTRIBUTING THEIR INSIGHTFUL THOUGHTS.

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