INDIAN SOCIETY FOR TECHNICAL EDUCATION

ISTE Students' National Annual Convention

BABA BANDA SINGH BAHADUR ENGINEERING COLLEGE, FATEHGARH SAHIB PUNJAB

NATIONAL AWARDFOR BEST B.TECH. PROJECT IN MECHANICAL ENGINEERING

2019

Awarded to

MURTHUJA VALI S., NAGA RAJU T.

Dept. of Mechanical Engg.
R.G.M. College of Engineering & Technology,
Nandyal, Kurnool Dt.

for the project titled

Electrical Power Generation using Gasifier

Prof. Pratapsinh K. Desai
President, ISTE

Prof. Vijay D. Vaidya
Executive Secretary, ISTE

ELECTRICAL POWER GENERATION USING GASIFIER

A Project Submitted in partial fulfilment
of the requirement for the award

Bachelor of Technology
in
Mechanical Engineering

By

S. UZMA JABEEN (15091A03J7)
K.V. TEJESWARA REDDY (15091A03K7)
K. VEERA RAGHAVENDRA (15091A03K0)
M. SUDARSHAN REDDY (15091A03H6)
E. SHASHAVALI (15091A03F8)

Under the esteemed guidance of
Mr. B. VEERANDRA, M Tech
Assistant Professor
DEPARTMENT OF MECHANICAL ENGINEERING

ESTD 1995

R.G.M COLLEGE OF ENGINEERING AND TECHNOLOGY
NANDYAL-518501 A.P
(Offering UG &PG courses, Affiliated to J.N.T. University, Anantapur)
(Approved by A.I.C.T.E New Delhi)
Accredited by NBA, NAAC A Grade by UGC)

(2015-2019)

Dr. K. THIRUPATHI REDDY
B.E(Mech), M.Tech, Ph.D, MISTE, AMIE
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
B.E(Mech), M.E(CAD/CAM), M.Tech(CAD/CAM), MIE, MIIE
PRINCIPAL
R.G.M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dist), A.P.

ELECTRICAL POWER GENERATION USING GASIFIER

A Project Submitted in partial fulfillment of the requirements for the award of

Bachelor of Technology

In

Mechanical Engineering

BY

S. UZMA JABEEN	**(15091A03J7)**
K.V. TEJESWARA REDDY	**(15091A03K7)**
K. VEERA RAGHAVENDRA	**(15091A03K0)**
M. SUDARSHAN REDDY	**(15091A03H6)**
E. SHASHAVALI	**(15091A03F8)**

Under the esteemed guidance of

Mr. B. VEERANDRA M.Tech

Assistant Professor

DEPARTMENT OF MECHANICAL ENGINEERING

(ESTD-1995)

R.G.M COLLEGE OF ENGINEERING AND TECHNOLOGY,

NANDYAL-518501, A.P

(Offering UG &PG courses, Affiliated to J.N.T. University, Anantapur)

Approved by A.I.C.T.E., New Delhi, Accredited by NBA, NAAC-A Grade by UGC)

(2015-2019)

Dr K. THIRUPATHI REDDY
B.E(Mech), M.Tech,,Ph.D MISTE,ASME
Professor & Head of M.E and SCHEMES
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

R.G.M COLLEGE OF ENGINEERING AND TECHNOLOGY,
NANDYAL-518501, A.P

(Affiliated TO J.N.T UNIVERSITY, ANANTAPUR, A.P INDIA)
(Approved BY AICTE, Accredited BY N.B.A, NAAC-A Grade by UGC)

(ESTD-1995)

CERTIFICATE

This is to certify that the Project entitled "ELECTRICAL POWER GENERATION USING GASIFIER" that is being submitted by

S. UZMA JABEEN	**(15091A03J7)**
K.V. TEJESWARA REDDY	**(15091A03K7)**
K. VEERA RAGHAVENDRA	**(15091A03K0)**
M. SUDARSHAN REDDY	**(15091A03H6)**
E. SHASHAVALI	**(15091A03F8)**

In partial fulfillment for the award of degree of Bachelor of Technology Mechanical Engineering to the R.G.M College of Engineering and Technology (Autonomous), Nandyal (Affiliated to Jawaharlal Nehru Technological University, Anantapur), is a record of bonafide work carried out by them under our guidance and supervision. The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree.

01/04/2018

Signature of guide

Mr. B. VEERANDRA
M. Tech
Assistant Professor of M.E.

01.04.18

Signature of HSME

Dr. SYED ALTAF HUSSAIN
M. Tech, Ph.D., MISTE, FIE
Professor & Head of M.E.

Examiner:
Date:

Dr K. THIRUPATHI REDDY
B.E(Mech), M.Tech, Ph.D, MISTE, AMIE
Professor & Head of M.E and SUMENS
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

ACKNOWLEDGEMENT

We express our deep sense of gratitude and honour to our project Guide **Mr.B.VEERANDRA** Assistant Professor in M.E of R.G.M. College of Engineering and Technology, Nandyal, Kurnool District, A.P. for his encouragement and inspired guidance throughout our project work for successful completion of this dissertation.

We are thankful to **Dr. SYED ALTAF HUSSAIN GARU,** Professor in M.E & Head of the Department, R.G.M. College of Engineering and Technology, Nandyal, Kurnool District, A.P. for his encouragement in helping us with timely and invaluable solutions that helped us in the successful completion of our project.

We thank reverenced **DR. T. JAYACHANDRA PRASAD GARU,** Principal, R.G.M. College of Engineering and Technology, for helping us in many regards through his work.

We are also highly grateful to **DR. M. SANTHIRAMUDU GARU,** Chairman, RGM College of Engineering and Technology, Nandyal, Kurnool district, A.P. for their kind permission to do this project work.

PROJECT ASSOCIATES

S. UZMA JABEEN	**(15091A03J7)**
K.V. TEJESWARA REDDY	**(15091A03K7)**
K. VEERA RAGHAVENDRA	**(15091A03K0)**
M. SUDARSHAN REDDY	**(15091A03H6)**
E. SHASHAVALI	**(15091A03F8)**

Dr K. THIRUPATHI REDDY
B.E(Mech), M.Tech., Ph.D MISTE, AMIE
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

INDEX

Dr K. THIRUPATHI REDDY
Professor & Head of M.E and SUMENS
Department of Mechanical Engineering
R.G.M. College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

ABSTRACT

Biomass is a renewable energy source, is biological material derived from living, or recently living organisms such as wood, waste, and alcohol fuels. Biomass is commonly plant matter grown to generate electricity or produce heat. For example, forest residues (such as dead trees, branches and tree stumps), yard clippings and wood chips and garbage may be used as biomass. However, biomass also includes plant or animal matter used for production of fibers or chemicals. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic materials such as fossil fuels which have been transformed by geological processes into substances such as coal or petroleum. Industrial biomass can be grown from numerous types of plants, including miscanthus, switch grass, hemp, corn, poplar, willow, sorghum, sugarcane and a variety of tree species, ranging from eucalyptus to oil palm (palm oil). The particular plant used is usually not important to the end products, but it does affect the processing of the raw material. Although fossil fuels have their origin in ancient biomass, they are not considered biomass by the generally accepted definition because they contain carbon that has been "out" of the carbon cycle for a very long time. Their combustion therefore disturbs the carbon dioxide content in the atmosphere. Plastics from biomass, like some recently developed to dissolve in seawater, are made the same way as petroleum-based plastics.

Dr K. THIRUPATHI REDDY
B.E.(Mech), M.Tech., Ph.D, MISTE, AMIE
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M. College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E.,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

CHAPTER-1

INTRODUCTION

Biomass Chemical composition:-

Biomass is carbon based and is composed of a mixture of organic lecules containing hydrogen, usually including atoms of oxygen, often rogen and also small quantities of other atoms, including alkali, alkaline rth and heavy metals. These metals are often found in functional molecules ch as the porphyries which include chlorophyll which contains magnesium.

2 Biomass sources:-

Biomass energy is derived from five distinct energy sources: garbage, ood, waste, landfill gases, and alcohol fuels. Wood energy is derived both om direct use of harvested wood as a fuel and from wood waste streams. The rgest source of energy from wood is pulping liquor or "black liquor," a waste roduct from processes of the pulp, paper and paperboard industry. Waste nergy is the second-largest source of biomass energy. The main contributors f waste energy are municipal solid waste (MSW), manufacturing waste, and andfill gas. Biomass alcohol fuel, or ethanol, is derived almost exclusively rom corn. Its principal use is as an oxygenate in gasoline. Biomass can be converted to other usable forms of energy like methane gas or transportation fuels like ethanol and biodiesel. Methane gas is the main ingredient of natural gas. Smelly stuff, like rotting garbage, and agricultural and human waste, release methane gas - also called "landfill gas" or "biogas." Crops like corn and sugar cane can be fermented to produce the transportation fuel, ethanol. Biodiesel, another transportation fuel, can be produced from left-over food products like vegetable oils and animal fats. Also, Biomass to liquids (BTLs) and cellulosic ethanol are still under research.

Dr K. THIRUPATHI REDDY
M.E.(Mech), M.Tech.,Ph.D MISTE,AMIE
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL - 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

CHAPTER-2

LITERATURE REVIEW

Biomass power is generated from biomass resources such as forest products, agricultural residues. The power generation involves gasification in which the solid biomass is converted to gaseous fuels (producer gas).By using producer gas it is possible to operate diesel engine on dual fuel mode with marginal changes to the air inlet. This engine is coupled with an alternator for power generation.

Maniatis and Buekens (1982) has developed gasification technology which consists of several unit operations, the most critical of which is gas cleaning and conditioning for utilisation in power production engines. Biomass fuels and residues can be converted to energy via thermo chemical and biological processes. Biomass gasification has attracted the highest interest among the thermo chemical conversion technologies as it offers higher efficiencies in relation to combustion while flash pyrolysis is still in the development stage. For heat applications there is no need to eliminate the tar from the fuel gas and thus any reliable gasifier system can be used successfully. However, although heat applications are relative easy, there are very few examples in the market. Woody biomass has the highest reliability in feeding into a gasifier and most problems related to fluidized bed gasifier is slag formation on heat exchange surfaces.

Chanakya et al (1993) has developed CGPL technology for biomass gasification which includes the possibility to utilise biomass from traditional low-efficient systems for heating and electricity by steam cycles, high-efficient bio-energy production by gas engines and combined gas- and steam turbine cycles. This involves combustion with air and reduction of the product of combustion (water vapor and carbon dioxide) into combustible gases (Carbon Monoxide, Hydrogen, Methane, other Hydrocarbons), and inerts (Carbon

CHAPTER-3

FABRICATION OF GASIFIER

The components that are used in the fabrication of POWER GENERATION USING GASIFIER are as follows,

3.1 Components

- Frame
- Battery
- Inverter
- Turbine
- Pressure gauge
- Blower
- Bulb
- Furnace

3.1.1 FRAME

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

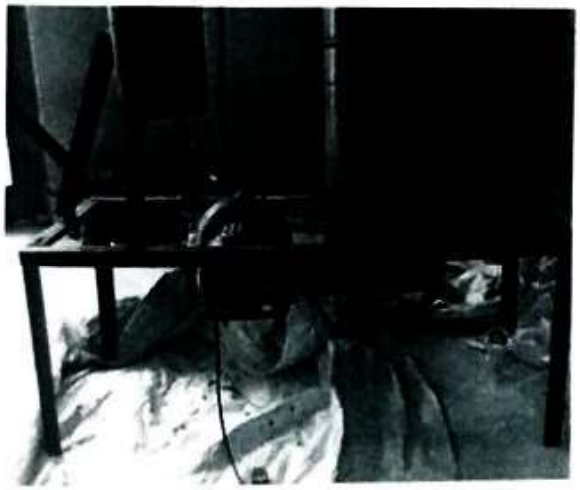

Fig: 3.1 Frame

2D DIAGRAM OF GASIFIER

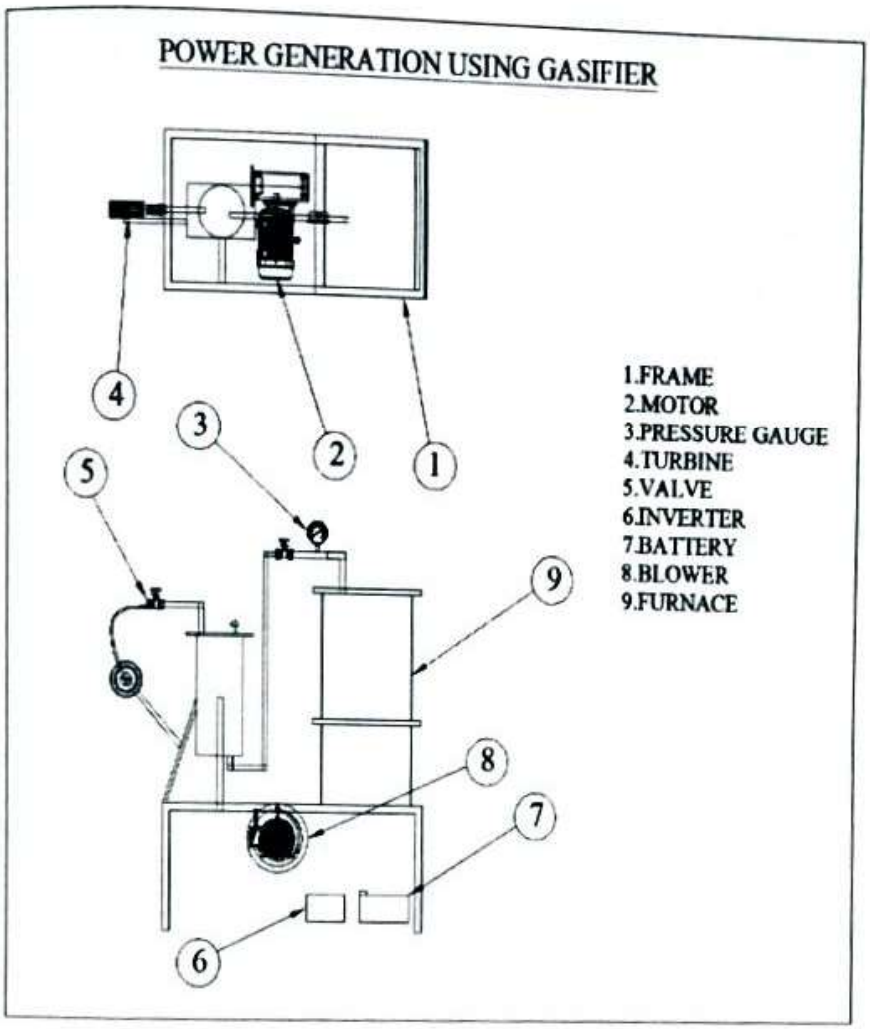

Fig: 3.17 2D Diagram of Diagram

Dr K. THIRUPATHI REDDY
Professor & Head of M.E and SCHEMES
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

Fig : 3.18 Gasifier

Dr K. THIRUPATHI REDDY
B.E.(Mech), M.Tech.,Ph.D. MISTE,ASME
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M.College of Engg. & Tech., (Autonomous)
NANDYAL 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.

CHAPTER-4

EXPERIMENTAL DETAILS

4.1 WORKING PRINCIPLE

The wood chips are kept inside the furnace and upper container contains the wood powder, the wood powder getsw heated up inside the tight container, from the container methane gas travels through the copper tube this gas is lighted and heats the water boiler and generated steam hits the turbine to generate electricity.

The disposal of solid waste and buried waste materials produce gases which are associated to the landfill. It is very a common exercise in most countries. The landfill method was often an established method in eliminated or unutilized from which rock or mineral is extracted. An appropriately design and well managed landfill could be salubrious and relatively an economical method of distribute of waste material. The design of characteristics' a modern and landfill include method to contain leachier such as plastic undercoat material. Accumulated waste are normally compacted to increases the gas production. Many landfill methods have been used for landfill gas system and installed to extract the landfill gas. These are four types of solid waste and fill methods.

(1) Municipal solid waste landfill.

(2) Bio-reactors/ Nuclear waste landfill.

(3) demolitionDebris landfill.

(4) Industrial hazardous waste landfill.

The municipal solid waste has been measure from driveway and disposal at landfill method and different composition with percentage show below.

CHAPTER- 5

RESULTS AND CONCLUSIONS

5.1 RESULT

In Gasifier the Generated gas composition more content is methane CH_4, with a steam velocity 1m/s and Power Produced is 12V.

5.2 CONCLUSION

A reliable, affordable and clean energy supply is of major importance for remote and rural area. Off-grid electrification can provide a more reliable supply and has a great potential to supply power to remote and rural areas. In this context, use of lignite as a fuel (as opposed to traditional use of biomass fuel) in downdraft gasifier coupled with engine-generator is considered a very promising clean energy option for remote electrification.

APPLICATIONS

1. Gasifiers offer a flexible option for thermal applications
2. Gasifiers are widely used for power Generation
3. Gasifiers are used as Transport Fuels

5.3 Scope for future work

The present study involved the effect of particle size of lignite on performance of downdraft gasifier. As a future work, the performance of the producer gas engine coupled with present gasification system could be studies. It would be also of interest to analyze the exhaust gas of producer gas engine.

One of the main parameters in gasification process is the carbon conversion efficiency. The carbon conversion efficiency may be calculated by measuring all gas constituents containing carbon. In the present study only CO, CO2 and CH4 was measured. Theproducer gas also contains a small amount of higher order hydrocarbons that would be desirable to measure. It would also be of

REFERENCES

1. Chimenos, J.M.; Segarra, M.; Fernández, M.A.; Espiell, F Characterization of the Bottom Ash in Municipal Solid Waste Incinerator; J. Hazard. Mat. A 1999, 64, 211-222.
2. Changkook Ryu, Potential of Municipal Solid Waste for Renewable Energy Production and Reduction of Greenhouse Gas Emissions in South Korea 2010
3. http://en.wikipedia.org/wiki/Municipal_solid_wasteEastern Research Group, Inc., List of Municipal Solid Waste Landfills, Prepared for the U.S.Environmental Protection Agency, Office of Solid Waste, Municipal and Industrial Solid WasteDivision, Washington, DC, September 1992.
4. Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines, Office of Air Quality Planning and Standards, EPA-450/3-90
5. Nikoo M. B. and Nader M., Simulation of biomass gasification in fluidized bed reactor using.

Dr K. THIRUPATHI REDDY
B.E.(Mech), M.Tech.,Ph.D MISTE,AMIE
Professor & Head of M.E and SIEMENS
Department of Mechanical Engineering
R.G.M College of Engg. & Tech., (Autonomous)
NANDYAL - 518 501, Kurnool (Dist), A.P

Dr. T. JAYACHANDRA PRASAD
M.E,Ph.D.,FIE,FIETE,MNAFEN,MISTE,MIEEE
PRINCIPAL
R G M College of Engg. & Tech.,
(Autonomous)
NANDYAL-518 501, Kurnool (Dt), A.P.