

# Renewable Energy –Biomass, Solar Energy and Heat Pumps

Siddharth Yadav

Student

School of Mechanical Engineering, MIT-WPU, Pune, India

**Abstract**— Renewable energy can be termed as the energy that has been collected and processed for utilization from renewable sources, the sources which are freely available in nature. Examples of natural available resources include solar energy, wind energy, tidal energy, geothermal heat, etc. Renewable energy can also be called as green energy that is directly extracted from the natural sources available without consumption of artificial sources where such sources of energy can be continuously replenished. Also, with the utilization of energy from renewable source, there is no harmful effect on the atmosphere, and emissions are also reduced. The developments in renewable energy is replacing the usual fossil fuels in the power plants, which provides the benefit of lower carbon footprint and environmental pollutions.

**Keywords:** Renewable Energy, Solar, Industrial Applications, Heat Transfer

## I. INTRODUCTION

As to date, the sustainable sources of energy have over the period created a broad daylight in strategy consideration especially for its ability to reduce the carbon emissions and footprint. Most of the intrigue have focused on the utilizing renewable sources such as biofuels for power generation. Few considerations have been aimed in the potential for renewables that is the biomass and solar thermal technologies, to provide warming and cooling in private space that is HVAC applications. But use of renewables has not been a point of interest under the mechanical field over the years. This report focuses on the capability of sustainable energy hotspots for process heating in the modern part and replacement by biomass feedstock in mechanical procedures.

Renewable sources of energy can be broadly utilized in various industrial applications. The four major alternatives principally focused in this paper are:

- Biomass for process heat.
- Biomass for Petrochemical Feedstocks.
- Solar thermal systems for process heat
- Heat pumps for process heat.

## II. LITERATURE REVIEW

Renewable sources of energy are the energy sources that occur naturally in the nature. Along with this renewable energy is also called as clean energy, because unlike non-renewable energy it does not consume fossil fuels, coal, etc. For the generation of energy from such non-renewable sources leads to pollution of the atmosphere and also causes damage to the ozone layer. Hence, based on the above comparison, renewable energy is named as CLEAN ENERGY.

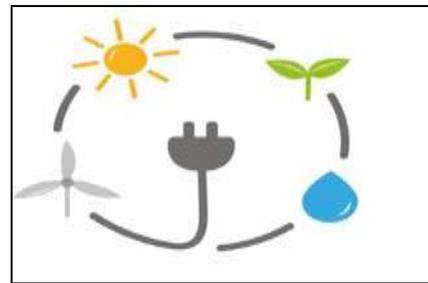


Fig. 1: Energy Cycle

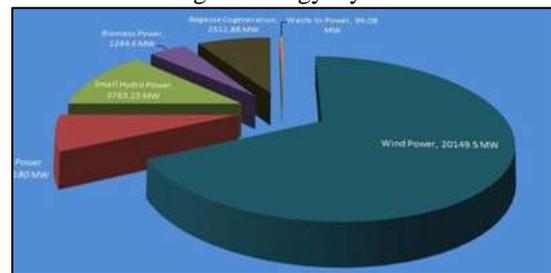


Fig. 2: Renewable Energy in India

Figure 2 depicts the dispersal of renewable energy in India, As provided in the pie chart, major consumption of energy is of the wind power followed up by power, small hydropower, biomass power, bagasse cogeneration, and waste to power.

Due to the development in technologies, the world is excelling rapidly and utilization of renewable energy in all the fields is the talk-of-the-town everywhere, because the non-renewable sources are depleting continuously and based on that one cannot carry out their work. As a result the energy from renewable sources has set a trend where there is minimal pollution due to the energy consumption.

## III. OBJECTIVES

- 1) The main focus of renewable energy is to avoid the atmosphere from being polluted.
- 2) Also, to take over the use of fossil fuels which comprise of long Hydrocarbon chains.
- 3) Since it is sustainable, one should try to make use such a energy sources.

## IV. BIOMASS

### A. Biomass for Process Heat

Biomass warming is a developed, experimented innovation and has been utilized to a great extent for a long time. Use of biomass is one of the kind economically acute and sensible approaches to giving room atmosphere heating, boiling water converting to steam from a low carbon source. Additionally, using biomass hotspots for heating gives more economically savvy carbon expenditure funds than for the other utilizations. It generally offers the highest carbon reserve pool per unit mass of biomass and the most significant investment funds of carbon that can be uplifted by use of a unit of land to originate biomass.

### B. Why Biomass?

Heating using the biomass is a mature, tested technology and has been implemented successfully over the years. Use of biomass is one of the most financially viable and practical way of providing space heating. Also, utilizing various sources of biomass for heating provides higher cost-effective saving of carbon fuels than for other uses.

### C. Feedstock Used

Virgin wood, industrial, agricultural residues and certain wood residues are the most commonly used biomass sources as heating fuels.

### D. Biomass for Petrochemical Feedstock

The above feedstocks are used in various petrochemical industries to produce the seven basic building blocks i.e. propylene, synthesis gas, benzene, ethylene, xylenes, toluene, and butadiene. The utilization of petrochemical feedstocks around the world is quite high. The largest number in terms of consumption of petrochemical feedstocks according to the 2019 data is North America followed by Northeast Asia, Baltic States, Middle East, West Europe, Southeast Asia and then the rest of the world. Carbon is an important constituent in the petrochemical sector for the manufacturing of materials where it forms around 75% of the total compound. Olefins mainly propylene, ethylene, and butadiene are a part of this category and are developed by the steam cracking of different petrochemical feedstocks such as ethane, naphtha, LPG (Liquid petroleum gas), and gas oil. Naphtha is considered as the main feedstock for the development of aromatics such as toluene, benzene, and xylenes through reformation process.

## V. SOLAR

The solar systems have brought many changes with the development and advancement in technology for example the vehicles are powered on the panels installed on them, houses are fitted with solar panels on the terrace for the electricity production from solar energy. Use of solar energy in our everyday life reduces the cost as it is financially viable and carbon emissions are also under control by the utilization of solar energy. The chemical industry also has high potential for use of solar energy but is generally on a very huge scale. Reduction of costs in the CSP Technologies, together with the growth in the chemical production sector in Africa and the Middle East, the main barriers and the drawbacks faced in this sector are the need of large area for installation of solar panels.

## VI. HEAT PUMP

Heat pumps can absorb the heat from the surroundings or waste heat streams and supply the same to industrial regions without requiring of burning any type of fuel. Use of heat pumps reduces emissions and the amount of fuel required is also neglected here. Certain applications where the energy used for pumping of fluids is in the form of electricity produced from renewable sources such solar energy, wind energy, etc, heat pumps are a fully renewable energy form of technology. as the power is obtained from carbon fuels only part of the energy output can be considered as renewable.

## VII. RESULTS AND DISCUSSION

Production of Electricity can be divided into the two forms of major sources - renewable energy sources and non-renewable energy sources. The consumption of energy from the non-renewable energy sources are not reusable i.e. after the use of fuels like combustion of petrol, its cannot be once again used to produce energy. Similar system can be observed with coal and other non-renewable energy sources. Renewable energy is the energy that is naturally available in nature and can also be replenished after their consumption, hence there is no shortage of the availability in the nature.

There are various sources of renewable energy from where the energy is produced multiple times through same process, against the non-renewable energy sources. We cannot rely on the non-renewable energy sources as they will be consumed up completely one day if they are still been used in huge quantities as of today. As a result, it is suggested that the using the renewable energy sources should be increased over the upcoming days in every industry and sectors, because they are emission free and also comparatively cheaper over long duration.

## VIII. CONCLUSION

It has been proven over the years that various coal fields have experienced a radical growth in demand for production of electricity. This results in consumption of non-renewable sources at a rapid rate which cannot be matched by their production rate. As a result, we are seeing a rapid hike in electricity and fuel bills. The biomass feedstock is one of a tested alternative in the chemical sector. Apart from that, various new schemes are promoted by the government to increase the overall awareness among citizens with an aim to push towards relying on the renewable sources such as solar energy. Another upcoming industry based renewable sources of industry is the Carbon Capture and Sequestration which at least helps the industries to be Carbon neutral.

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