

# SRAGEN

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**ABSTRACT**-Today world is facing the power crises due to more demand and less generation of electrical energy, so in that case in spite of the different schemes by the government to provide the electricity to the people of the remote areas there is very still and slows process. Imagine if we can able to generate the electrical energy in a small locality or at a small house itself than it will be a bit easier for us to access the electricity without taking help of the government. Project “SRAGEN” is a solution to that problem as in the project “SRAGEN” i.e. Steam recovery and generation of electrical energy, we have made a small working model of the steam power plant in which we have used a pressure cooker as a boiler to generate steam by the water which falls on a closed type turbine which attached to a machine to generate the electrical energy. The efficiency of the steam power plant will be improved by the steam recovery process.

This model will help the remote area people to do their little electrical work without the help of the government.

**Keywords-:** Electricity, SRAGEN, Steam generation.

## 1. INTRODUCTION

India is among the top leading producers of the electricity from steam energy. The steam has enormous power to generate the electricity so it is used by different power plants like Thermal, Geothermal, and Nuclear etc. All these power plants use different fuels such as coal and uranium but at last their ultimate aim is to produce the steam by heating up the water which falls on the turbine to generate the electricity. Another advantage of using steam to generate the electricity is that the steam fed on the turbine can be again converted into the water through different equipment like the Condenser to use it back for generating the electricity. So after analysing the qualities of the steam we have also developed a mini power plant that generates the electrical energy through steam.

## 2. CONSTRUCTIONAL DETAILS OF THE PLANT



**Fig. 2.1 Steam Boiler**

Every steam power plant require a boiler. A boiler is a closed container in which the liquid is heated to produce the steam. The pressure vessel of boiler is mainly built up of the steel or the alloys of the steal [1]. In this project we have taken use of a pressure cooker to generate the steam. The pressure cooker specifications are as follows:

- **Capacity-:**10 Litres
- **Material-:**Aluminium
- **Company-:**Minolta
- **Protection-:**Safety valve, Pressure releasing valve

**Turbine** is the most important part of any steam power plant. A steam turbine is a device that extracts the thermal energy from the pressurised steam and uses it to do mechanical work on a rotating output shaft [2]. In this project we have made the turbine blades with the help of the oil cans which are made up of the iron, we have cut down the outer surface of the can into proper dimension and mounted the blades on the shaft. The entire arrangement is put in a closed case which is made up of cast iron. So in this way our turbine is a closed type of turbine in which the steam losses are less as compared to the open type turbine where most of the steam energy is wasted as there is no provision of reusing the generated steam which falls on the turbine blades. The details of the turbine are as follows:

- **Material:-**Cast iron
- **Diameter:-**8cm
- **Length of blades:-**3.7cm
- **Width of blades:-**2.4cm
- **Diameter of shaft:-**3cm
- **Type:-**Closed type



**Fig. 2.2 Steam Turbine**

### 2.1 Generator

Generator is an electrical device that has capability to convert the mechanical energy into the electrical form for use in the external circuit. These are of various types like direct current generators, alternating current generators, turbo generators etc.

- **Operating Voltage:-**12V
- **Rated Speed:-**1000 RPM
- **Diameter:-**16mm
- **Generator Length:-**50mm
- **Shaft Diameter:-**3mm
- **Weight:-**28gm

### 2.2 Fuel Source

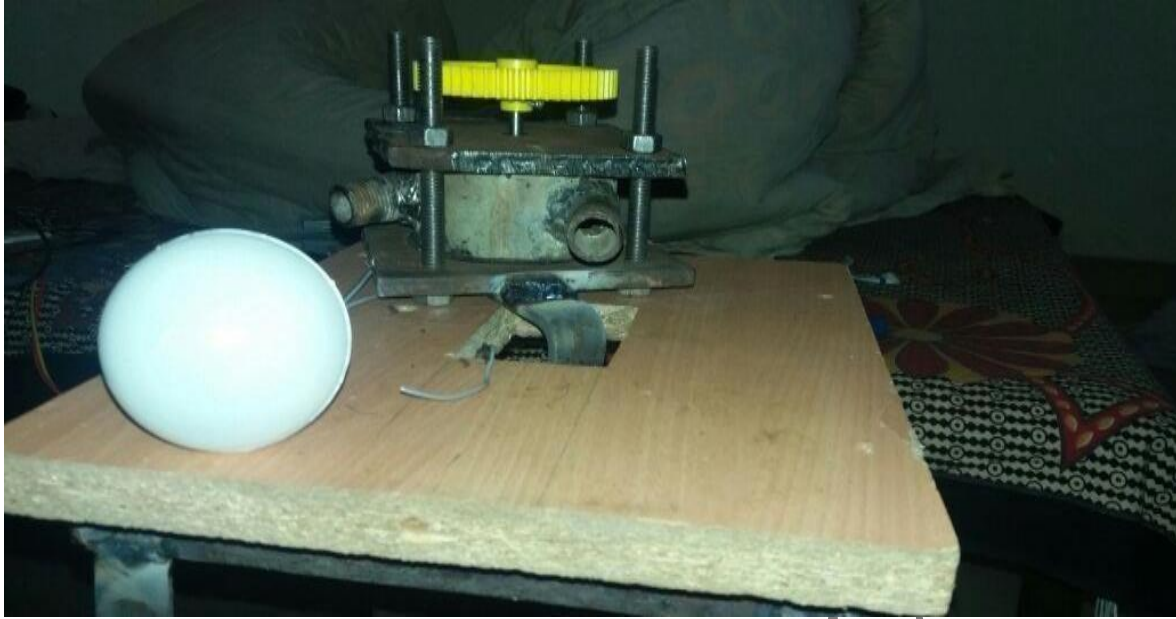
Every plant need a fuel source for the production of the steam. There is various type of fuel sources used now days like coal, uranium, earth's heat energy etc. The fuel sources used by the team in this paper is Liquid petroleum gas (LPG) [7], looking at conveniences at the college level. The specifications of the fuel used are as follows-

- **Capacity-**2 Litres
- **Type:-**Liquefied petroleum gas
- **Calorific value:-**46.1 MJ/Kg

### 2.3 Load

Electricity generated by the plant need to be transferred to the proper application which is commonly known as load end. It can be industrial end, house hold or any other commercial place. The load used in this project is a

light emitting diode bulb. The reason behind using the LED bulb is its energy efficient nature it has low power consumption and produce high lumens.



**Fig. 2.3 Load**

#### 2.4 Condenser

Condenser is a device used to condense back the steam after operation on the turbine [3]. In this way the steam is not wasted and recovered in the form of water and can be recycled back to the boiler for the further production of the steam. The condenser used in this project is a thermos cool box with having ice it will condense back the steam into water is collected in a mug and put back into the boiler.



**Fig. 2.4 Condenser**

### 3. WORKING OF THE SRAGEN

The LPG used as a fuel is fed to the boiler containing water. Water in the boiler starts to boil it takes nearly 15 minutes to build the pressure in the boiler, the safety valve attached prevents the boiler from excessive pressure which might lead to bursting of the boiler. After 15 minutes of the time the steam generated in the boiler is fed to the closed type steam turbine through a copper pipe and a pressure releasing valve is also attached for appropriate pressure to the turbine. The steam generated is then fed to the turbine. As the pressurized steam falls on the turbine at an appropriate angle the turbine blades begin to move in the clockwise direction. A gearing mechanism is attached to the shaft of the turbine which helps to increase the speed of the

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generator attached to the gear system [8]. The generator rotates with the increased speed and consequently the electricity is produced. The produced is then fed to the load end. And also an electrolytic capacitor of 1000 micro farad, 63 volt is attached in parallel to improve the voltage profile [4]. To attach the generator with the turbine we have taken use of the chilli powder it acts as an adhesive while erarite is used to prevent leakage from the cooker [9].

## 4. CALCULATION

### 4.1 For the Speed of the Motor

T1=54 (number of tooth present in the bigger gear)  
T2=27 (number of tooth present in the smaller gear)  
N1=1000 rpm (speed of the turbine shaft)  
N2=? (Speed of the generator)  
Applying the formula

### 4.2 Equation Used $N1 \cdot T1 = N2 \cdot T2$

1000\*54=N2\*27  
N2=2000rpm  
Mass flow rate =0.120 kg/hr  
Calorific Value= 46.1 MJ/kg

#### 4.2.1 Advantages

- A better option for the places where electricity is not available.
- Compact in size
- Fuel like woods and compressed natural gas can be used which are friendlier to the environment.

#### 4.2.2 Disadvantages

- Fuel currently used is not eco-friendly
- Can give better efficiency by the addition of battery.

## CONCLUSION

The project "SRAGEN" has been made in the perspective to make the electricity easily available to all or "Access to all". There are many areas in the country, such as hilly areas or the islands where it is not possible to set up an electrical installation. So keeping this in mind this project can be a cause of the revolution in the field of the generation of the electricity by installation of the home made arrangement of the power plant which has almost no cost of production or one time investment and can be a huge success if we focus on some of the parameters such as selection of the gearing system, type of the generator to be used and of course the most important thing is the design of the turbine blades. All these things will increase the output power and thereby increase in the overall efficiency of the plant.

The another concern of the plant as we are producing it by water so the output is steam only so it does not give any ill effects to the environment so we can definitely say that this project is "Environment Friendly".

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