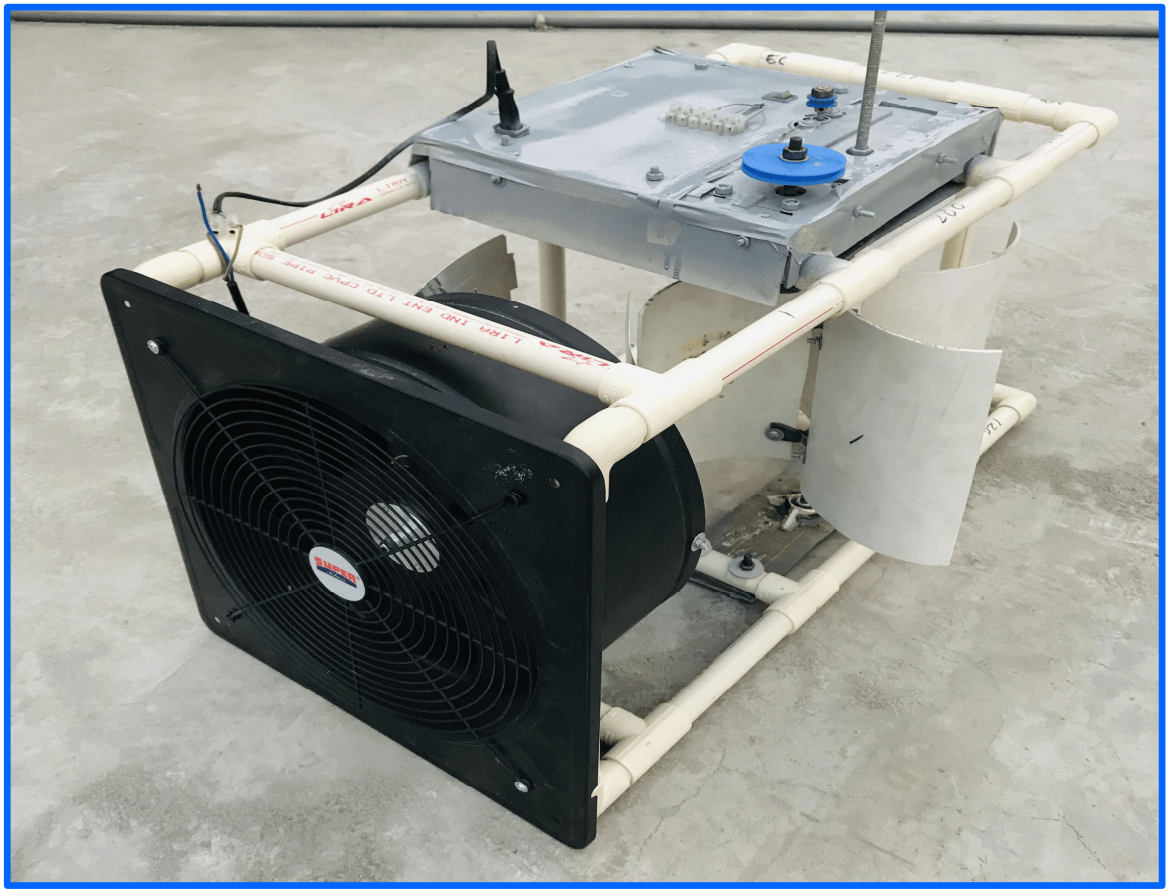
DESIGN AND CONSTRUCTION OF ELECTRICITY GENERATION SYSTEM USING EXHAUST FAN FOR INDUSTRIAL APPLICATION



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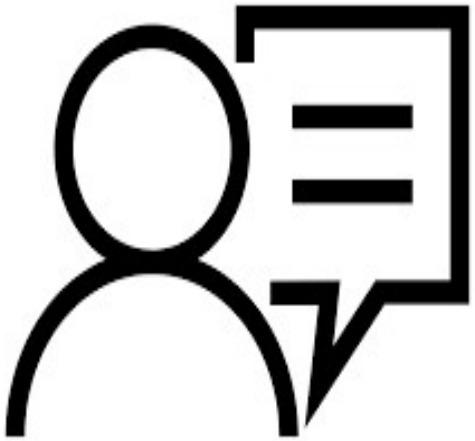
PRESENTATION OUTLINE

1. INTRODUCTION
2. LITERATURE REVIEWS
3. OBJECTIVE
4. COMPONENTS
5. RESULT AND DISCUSSION
6. CONCLUSION



INTRODUCTION

Global energy consumption is rapidly increasing due to population growth, with expectations to double by 2040. Renewable energy (RE) is crucial in reducing dependency on fossil fuels for electricity. A new system uses two vertical axis wind turbines (VAWTs) installed above an exhaust outlet to harness consistent and strong wind energy from industrial exhaust systems. This approach, similar to the Diffuser-Augmented Wind Turbine (DAWT), enhances wind speed by creating a low-pressure zone behind the turbine, drawing in more wind. Recent studies show that diffuser-shrouded turbines outperform conventional ones in power generation.





STUDY OBJECTIVE







To study about “Design & Construction of Electricity Generation System Using Exhaust fan for Industrial Application".

To design and develop a prototype of an electricity generation system using exhaust fans, optimized for industrial applications.

To conduct detailed testing and analysis of the prototype to assess its efficiency, reliability, and suitability for industrial use

BLOCK DIAGRAM

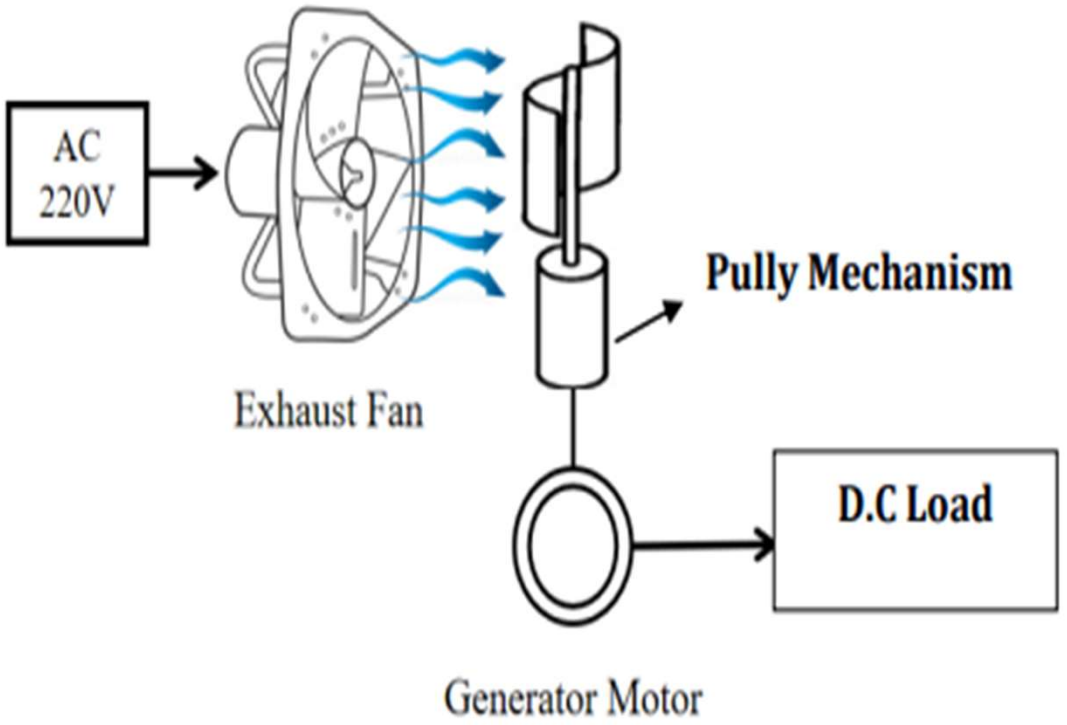


Figure: Block Diagram of Proposed System

CIRCUIT DIAGRAM

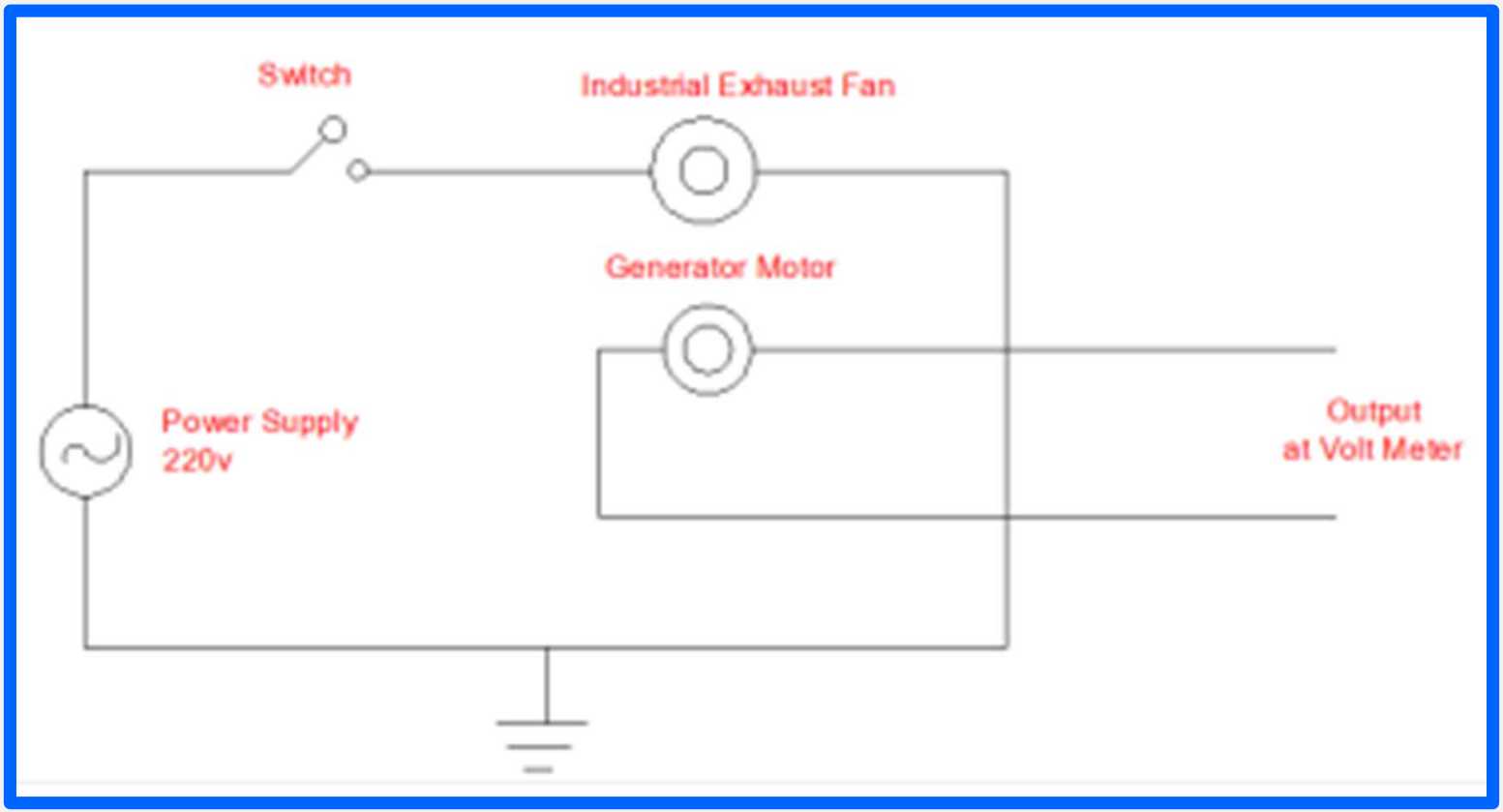


Figure: Circuit Diagram of proposed System.

COMPONENTS

- Exhaust Fan
- Generator Motor
- Wind Turbine
- Glue Gun
- Cable Tie
- Hot Gun
- Pulley
- Round Belt
- Soldering Iron
- Digital Tachometer
- Multimeter
- AutoCAD 2007



HARDWARE REQUIREMENT



EXHAUST FAN

Model: FS-30
Size: 12" (300 mm diameter) Voltage: 220V
Power: 85W
Frequency: 50/60 Hz
Speed: 2800 rpm



GENERATOR MOTOR

Model No : DN-6612
Output shaft : 5.1 MM (it is the flower shaft) Outlet length : 16.5 MM. (From the panel)
Voltage : DC 220V-240V
Speed : 12000 RPM



VERTICAL AXIS WIND TURBINES

Rotating Speed Max : 90 RPM
Wind Speed Max : 10,000 m3 /h Diameter (VAWT) : 360 mm
Blade Height : 200 mm Blade Thickness : 3 mm Blade
Material : CPVC

HARDWARE REQUIREMENT



GLUE GUN

Title: Hot Melt Glue Gun 20W
Frequency: 50/60Hz
Power: 20W



CABLE TIE

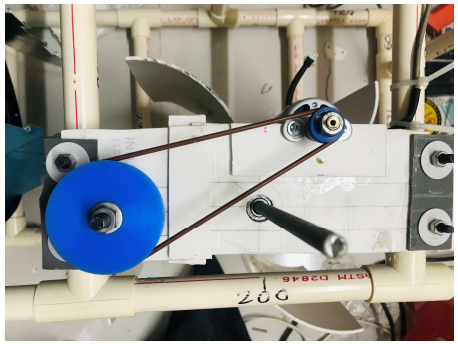
Material: Nylon 66
Operating Temp: -40 to +85°C
Flammability: UL 94 V2



HOT GUN

Working temperature :60 – 550 °C
Airflow :350 – 550 l/min
Heat-up time:1 s
Control, airflow :3

HARDWARE REQUIREMENT



MOTOR PULLEY

Tensile Strength: ~15–25 MPa
Elongation at Break: 150–300%
Low Friction:
Coefficient of friction ~0.04 (very low, making it slippery and anti-stick).



ROUND BELT

Material Data: (General for a 3.5 mm Round Belt)
Material: Typically, polyurethane (PU) or rubber.
Diameter: 3.5 mm (0.0035 meters).



SOLDERING IRON

Voltage: 220V AC
Frequency: 50Hz
Power: 40W
Tip Temperature: ~300°C to 400°C

HARDWARE REQUIREMENT



DIGITAL TACHOMETER

Fluke 930 Tachometer
Range:
30 to 99,999 RPM



MULTI METER

The Hioki 3288 Clamp-On AC-DC
Capacity :
AC Current: Measures up to 1000 A
DC Current: Measures up to 1000 A

RESULT

Isometric View



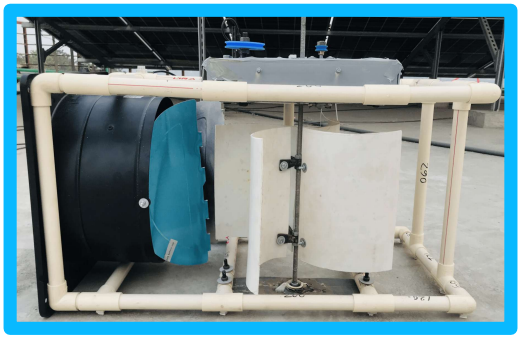
RESULTS



Top View



Left Side View



Right Side View



Front View

Fig 1.2

RESULTS FOR ELECTRICITY CONSUMPTION OF EXHAUST FAN

Calculating Electricity Consumption of exhaust fan:

The fan's power rating is 85W. Electricity consumption per hour is calculated as follows:

Electricity Consumption:

= (Power (W) ÷ 1000) × Time (hours)
= (85/1000) ×1
= 0.085 kWh

Given data:

Model: FS-30
Size: 12" (300 mm diameter)
Voltage: 220V
Power: 85W
Frequency: 50/60 Hz
Speed: 2800 rpm

- Consumption an hour 0.085 kWh
- 0.085 kWh is the energy consumed an hour, or approximately 0.085 units

RESULTS FOR DELIVERY AIR FLOW OF EXHAUST FAN

Calculate Theoretical Airflow:

Assuming 70% blade efficiency (common for standard exhaust fans), the theoretical airflow can be estimated. At 2800 RPM:

$$\text{Airflow } (m^3/\text{min}) = \text{Fan Area } (m^2) \times \text{Fan Speed (RPM)} \times \text{Efficiency}$$
$$= 0.0707 \times 2800 \times 0.7$$
$$= 138.5\ m^3/\text{min}$$

Converting to cubic meters per hour:

$$\text{Airflow } (m^3/h) = 138.5 \times 60$$
$$= 8310\ m^3/h$$

The theoretical air flow is *8310 m³/h*.

To convert cubic meters per minute (m³/min) to cubic feet per minute (CFM):

So:

$$\text{Airflow (CFM)} = 138.5 \times 35.31 \qquad [1m^3/\text{min} = 35.31\text{CFM}]$$
$$= 4891\ \text{CFM}$$

RESULTS FOR OUTPUT VOLTAGE FROM DYNAMO

Known Parameters:

1. Voltage Range: 220–240V DC
2. Speed: 12000 RPM (at max voltage)
3. Current Speed: 287.832 RPM (given)
4. Motor Diameter: 42 mm
5. Motor Torque: Strong enough to resist hand lock at lower speeds (torque is good)

Estimate Output Voltage at 287.823 RPM

If 220 V is Generated at 12000 RPM, then at 287.823 RPM, the Voltage will be:

$$V = \frac{220}{12000} \times 287.823$$
$$= 5.28\,V$$

THE TABLE OF RESULT AND EFFICIENCY

Component Name	Input	Output	Efficiency
Exhaust Fan	85W, AC 220V, 0.39A	4891 CFM Air	=(2.64w/85w)X100 =3.10%
Wind Turbine	4891 CFM Air	33.3 RPM	
Pulley Mechanism	33.3 RPM	287.832 RPM	
Dynamo	287.832 RPM	DC 5.28V, 0.5A, 2.64W	



CONCLUSION AND FUTURE WORK

ADVANTAGE

Less skill technicians is sufficient to operate.

Simple construction

APPLICATION

- This project has applications in many fields due its necessity. We have selected a few of them and they are given below:
- It can be use in industrially.
- It can be use in cold storage.

FUTURE SCOPE

- In future, we are thinking about IoT monitoring system.
- In future, we are thinking about increase its accuracy.
- In future development this project can be develop by more protective and measuring sensor.
- In the future we will use emergency alarming system.



CONCLUSION

The wind from exhaust fans can effectively generate electricity, sometimes even faster than natural wind. To optimize this energy output, it's important to use directors or connectors that channel the exhaust wind directly to wind turbines. These tools should help maintain the wind's speed, as consistent velocity is key for efficient energy production. By preventing dispersion, we can significantly boost the effectiveness of this renewable energy approach.

