DESIGN AND FABRICATION OF "TESLA TURBINE"

Shubham Muratkar, Sumit Kamble, Nikhilsingh Dhandoriya, Shubham Sukhadeve, Shyam Bhende.

[1] Shubham Muratkar, Mechanical engg., DMIETR, Wardha, Maharashtra, India.
[2] Sumit Kamble, Mechanical engg., DMIETR, Wardha, Maharashtra, India
[3] Nikhilsingh Dhandoriya, Mechanical engg. DMIETR, Wardha, Maharashtra, India.
[4] Shubham Sukhdeve, Mechanical engg., DMIETR, Wardha, Maharashtra, India.
[5] Shyam Bhende, Mechanical engg., DMIETR, Wardha, Maharashtra, India.

Guided By,
Prof. Tushar Karhale, Mechanical engg., DMIETR, Wardha, Maharashtra, India.

ABSTRACT

In 1913, Nikola Tesla invented the bladeless turbine. Which is known by the name of Tesla Turbine. Tesla turbine is a unique turbine having disc instead of blades. In other turbine there are the blades mounted on the turbine shaft on which the force of fluid sprayed on it, impact of fluid on blade results in rotation of turbine. In tesla turbine the series of parallel disc mounted on shaft. Discs are so design that when the compressed air or fluid enters into the casing. Due to the boundary layer effect, the disc will get rotate. This turbine is harmless to the environment. This turbine does not have any blades, hence the problem of failure of blade is eliminated. This paper contemplates to review design modification, working principle of Tesla Turbine.

Keyword: - Boundary layer, nonconventional, Bladeless turbine, Disc turbine, Tesla turbine.

1. INTRODUCTION

Tesla turbine is the innovation of Nikola Tesla a century ago. This turbine is not only the turbine but it can be used as a pump, engine also. Tesla turbine is also known as boundary layer turbine because this turbine operates on the principle of boundary layer. The actual definition of turbine shaft having blades like fan blade mounted on it rotated by the jet or force of water on blades. But in the tesla turbine series of parallel disc mounted on shaft and situated within a sealed chamber known as casing. When compressed air allows to enter in the casing and pass between the disc, the velocity of air rotate the disc, which is results rotation of shaft. In this way the mechanical energy is generated and it can be used in a variety of ways. This turbine is simple in design and construction also it is economical efficient and green, so it does not provide any harmful effect to the environment.

1.1 CONSTRUCTION:-

- It contents turbine discs with holes in center for air flow to exhaust.
- A 12V compressor for supplying air pressure.
- A medium tank for storing compress air in it.
- Casing and discs clearance is 0.5cm.
- A rear cover and five exhaust port.
- A front cover with five exhaust port.
- A flexible coupling which neutralize the initial torque impact.
- Two bearings which is fixed at the two end of casing.
- It contains a shaft which is used for transmitting the power.
- There are three discs mounted on shaft.
- A dynamometer is used to convert the mechanical energy in to electrical energy.
- A DC voltmeter is used to indicate the voltage.

1.2 WORKING:-

A tesla turbine is a bladeless turbine that operates on the prandtl layer effect or boundary layer effect. A boundary layer effect said that "the layer of reduce velocity in fluids such as air and water that is immediately adjacent to the surface of solid in which the fluid is flowing". As the air enters the turbine housing, due to the shape of housing it create vortex. The position of front and rear cover so arranged that the air has no choice to exit by another way. The air passes the discs, and exuast at the center of the turbine due to the velocity of air discs get rotate.

2. DESIGN SPECIFICATION:

Sr. no.	Name of part	Quantity	Specification
1.	Shaft	1	Diameter

			=16mm
2.	Disc	3	Diameter*thickness =150mm*5mm
3.	Casing	1	Diameter*width =163*75
4.	Dynamometer	1	
6.	Voltmeter	1	0 – 60 volt DC
7.	Compressor	1	DC compressor
8.	Tank	1	Length 35cm, daimeter 15cm.

CALCULATIONS:-

MINIMAL INPUT CONDITIONS

In our case the **minimum pressure and flow conditions are**:

Pressure (min) = 2 bar

Flow min = 1.2 cfm = 0.034 m^3/min

Power (min) ((kW) = Pressure (bar) X Flow (m^3/min) X 1.70
= 2 x 0.034 x 1.70 =0.115 Kw = 115 watt.

Hence minimum power output from engine for given input conditions = 115watt

MAXIMUM INPUT CONDITIONS

In our case the **maximum pressure and flow conditions are**:

Pressure (min) = 5bar

Flow min = 1.8 cfm = 0.050 m^3/min

Power (min) ((kW) = Pressure (bar) X Flow (m^3/min) X 1.70
= 5x 0.05 x 1.70 =0.425 Kw = 425 watt.

Hence minimum power output from engine for given input conditions = 425 watt

TORQUE ANAYSIS:-

Torque at spindle is given by;

$$Ts = \frac{975\,N}{n}$$

Where;

Ts = Torque at spindle (N.m)

N = POWER (Kw)

n = Speed (rpm)

Maximum power output = 425 watt at 8000 rpm

$$\Rightarrow \quad Ts = \frac{975 \times 0.425}{8000}$$

$$Ts = 0.0517 \text{ kg .m}$$

$\Rightarrow$Ts = 0.508 N.m

Considering 100 % overload;

$T_{design} = 2\ Ts$

= 1.016 N-m

=1.016 N.m

$\Rightarrow$Tdesign = 1.016 N.m

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