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DESIGN AND FABRICATION OF AIR BLOWER

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Abstract - Air blower is a fun which can move air under pressure. It is a device which increases the velocity of air when it passes through equipped impellers. They include cleaning air blowers, ventilation air blowers among others. Air blowers have long been used for a variety of domestic and industrial purposes. An air blower works by sucking in air from one side using fans and blowing out in the other direction. This helps to direct air through various size nozzles and get desired air blowing results needed for specific purposes. We here use de motor with a circular frame and fan-based arrangement to suck air from one side and push it out the other end with force. We develop circular fan blades to assemble a blower fan that allows for one side airflow with ease. We now use the blade-based fan mechanism to drive the system & achieve one side airflow. The frame is constructed in such a way so as to minimize air leakage and achieve suction from one end as well as redirect this air flow through a nozzle on the other end.

Key Words: Impellers, Sucking, Nozzles, Air flow.

1. INTRODUCTION

An air blower is a device or equipment which increases the velocity of air or gas when it passes through equipped impellers. They are mainly used for flow of air or gas required for cleaning, cooling, ventilating, among others. The air flow generated is used for different purposes like cleaning blowers, vacuum cleaner, air conditioner, etc. Depending on application requirement, air flow and pressure may vary. An air blower works by sucking in air from one side using fans and blowing it out in the other direction. This helps to direct air through various size nozzles and get desired air blowing results needed for specific purposes. 1862, Guido Bell from England invented centrifugal blower. The impeller, casing were concentric circular; the casing was made from bricks, while wooden impeller was backward straight blade. 1880, for mine ventilation, some engineers designed centrifugal blower fun with volute casing and backward curved blade. Existing air blowers are categorized into two: axial and centrifugal. Axial air blowers, blow air axially with low pressure and has high noise level. For these reasons, axial air blowers are not commonly used. Centrifugal air blowers generally use centrifugal force to propel air forward. Inside a centrifugal air blower is a wheel with small blades on the circumference and a casing to direct the flow of air into the center of the wheel and out toward the edge. Centrifugal air blowers are capable of generating relatively high pressures. They are suitable for high pressure applications as compared with axial blowers. The design of the blades will affect how the air is propelled and how efficient the air blower is. Blade designs in air blowers are classified as forward curved, backward-inclined, backward-curved, and radial and airfoil. Forward-curved blowers are drive devices with blades that are curved in the direction of rotation: The blower accelerates air to a high velocity Centrifugal air blowers used in different applications can fail in many ways. To fix failures it is important to know what causes them. The problems involved with centrifugal air blowers include, blower is too noisy, when fan performance is wrong, and fan is vibrating and when the fan fails finally there is corrosion of the air blower.

1.1 PROBLEM STATEMENT

The need of air blowers today has increased due to the need to remove dust from computers and in offices, hair drying in saloons, air conditioning, cooling among others; however most air blowers used in most places. Using physics concepts and creativity, this research project has come up with an air blower using locally available materials which may be cheaper compared to the imported air blowers and it can also be used as a teaching aid.

2. LITERATURE SURVEY

[1] Numerical Design and Parametric Optimization of Centrifugal Fans with Air foil Blade Impellers:

There are six types of centrifugal fan impellers AF, BI, BC, FC, RT, RB among which the AF i.e. impellers with airfoil blades are considered as highly efficient. The following paper presents the design methodology for the centrifugal fan system with impellers having airfoil blades. The numerical design procedure is developed for it and the CFD optimization has been carried out for volute casing to improve the results which have got from the numerical procedure only. A case is studied from technical bulletin1 for this purpose and the results are correlated with those obtained from the numerical procedure developed. The concept of MRF (moving reference frame) is applied in the CFD analysis of the centrifugal fan as a rotating region around the impeller, keeping the components of the impeller stationary. The volute casing was optimized by decreasing the volute clearances by 10-14% and increasing the cut off height by 5% keeping it at 35% of impeller diameter. Thus the design methodology which includes the assistance of CFD optimization has been developed successfully.

[2] Performance analysis and optimized design of backward-curvedairfoil centrifugal blowers:

Backward-curved airfoil centrifugal blowers were numerically simulated and compared with experimentally measured data. Simulation settings and boundary conditions are stated, and

the measurements follow ANSI/AMCA Standard 210-07/ANSI/ASHRAE Standard 51-07, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating (AMCA/ASHRAE 2007). Comparing simulation results with measured data, it was found that the deviation of the static pressure curve at each specified flow rate was within 4.8% and the deviation of the efficiency curve was within 15.1%. After the simulation scheme was proven valid, the effects of blade angle, blade number, tongue length, and scroll contour were discussed. Several parameter changes are suggested based on these simulations. An optimized design is presented with a 7.9% improvement in static pressure and a 1.5% improvement in efficiency. Overall, the whole process simulates backward-curved airfoil centrifugal blowers effectively and is a powerful design tool for blower development and improvement.

3. COMPONENTS & MATERIALS REQUIRED:

1 Solar Panel

2 Battery

3 Propellers

4 Connecting Pipe

5 Actual Part of off-Set

6 End Cap

7 Reducer

8 Electric Motor (DC Motor) 12V

9 Cello tapes

10 PVC Pipes

11 Nozzles

12 Shafts

13 Suction frames

14 Circuit Boards

15 Mpr121 Breakout V12 Capacitive Touch Sensor

16 P-20AU Module Compatible Board

4. WORKING PRINCIPLE:

Blowers increase the pressure of the absorbed gas by a series of vortex motions formed by the centrifugal movement of the impeller. When the impeller is rotating, the channels in the impeller push the air forward by the centrifugal movement and a helical movement occurs.

4.1 FUNCTION OF AIR BLOWER:

The air blowers are used in industries where there is a requirement for larger volumes of airflow with high pressure. They are highly useful in industrial processes like conveying material in dust collector systems, combustion air for burners, drying and cooling, general ventilation, and circulation of air. Also used for household purposes like cleaning.

4.2 ASSEMBLY OF AIR BLOWER:

A solar panel is used to recharge the Lithium Ion Battery which is used for in working of air blower. A circuit board is connected the above used components. The solar power stores in the battery. Battery is connected to sensors and the connecting wires are connected to the DC motor (12v). The impeller blades designed by the PVC pipes with 45^0 which is fit into the reducer cap. The motor is connected to impellers blades and the impellers based fan mechanism rotates and sucks air into the casing and by applying more pressure the air escapes from one side of the pipe.

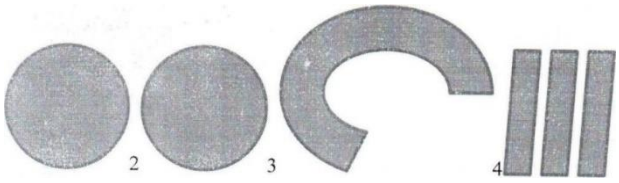
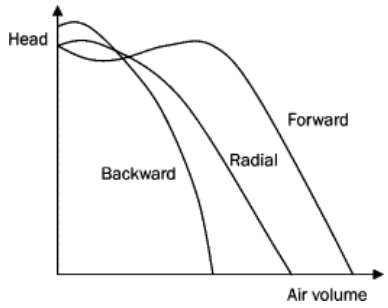


Fig-1 Assembly of Parts

5. PERFORMANCE TEST:

Generally air blowers have three types of blade: forward blade, backward and radial blade. The characteristic curve of three kinds of centrifugal air blowers is as the figure



Graph-1 Performance Test

Centrifugal blower consists of an impeller which has blade fixed between the inner and outer diameters.It can be mounted either directly on shaft extension of the prime mover or separately on a shaft supported between two additional bearing These pressure fluctuation:.; occur at flow rates when the slope of total system head curve is steeply negative. According to our previous study on the detailed unsteady pressure measurements, this pressure oscillation is supposed to be the mild surge caused by the positive slope of the head curves at the second to the last stages. The slope of the total system head curve was kept negative due to the steeply negative slope of the head curve at the first stage. Thus, the wholecompression system seemed to be stable.

5.1 TESTING THE FUNCTIONING OF THE ROTATING SHAFT:

This was done by connecting motor to the battery, when the motor is connected to the battery, we expect the shaft to star rotating and for that matter, the impellers will exert potential and kinetic energy on theincoming air.

5.2 TESTING THE INLET OF THE BLOWER:

This was done using leaves of paper, they will be held near the inlet and since they are light, as blowing is in process, the leaves of paper will be attracted to the blower indicating that air is enteringthrough that very inlet.

5.3 TESTING THE OUTLET DUCT:

On testing the out let duct, here the velocity of air at the outlet was measured against the voltage supplied to the blower. The measuring of the air velocity was done using with the application called Zephyr Free Wind Meter, and it measures speed of wind in meters per second (m'). The voltage was measured with help of DC power supplier which supplies voltage varying from 0-12volts.

6. RESULTS:

In this chapter, we shall see all that happened in process of designing of this forward centrifugal air blower, and also will convey the outcome of project.

What have been found out in the testing for the materials locally available construction and designing of this forward curved centrifugal air blower.

MATERIALS:

Different types of materials were tested of these included metals, plastics, glass, pieces of papers, etc. It has been found out that metals and plastics can work better.

Plastics can be used on construction of the outer shape because they are easily shaped and themetals used for marking the fun since they can easily be curved.

DESIGN AND CONSTRUCTION:

A simple air blower has been successfully constructed using locally available materials as theywere mentioned above and it can function very well.

Table-1 Performance of Air Blower

PERFORMANCE OF AIR BLOWER	
Voltage (v)	Air speed at the outlet (ms')
2	0.4
4	3.0
6	5.3
8	5.8
10	6.2
12	6.3

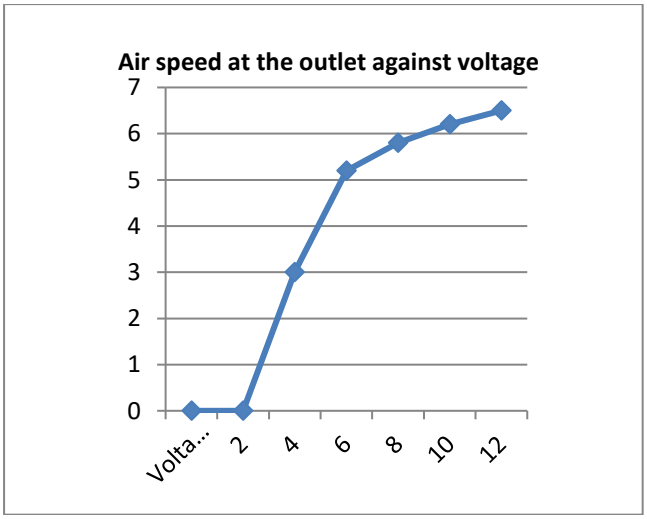


Chart-1 Performance of Air Blower

6. DISCUSSIONS:

From the testing of the performance of which was done on the velocity of air at the outlet of the blower, we are able to observe that.

From the graph we see that, at start when voltage was low as 2v, the speed of air was also very low as 0.2ms'. As voltage was increased from 2v to 4v to 6v up to 8v, the speed of air gradually increased, thus voltage was proportional to the speed of air.

As voltage was increased from 8v to 10v up to 12v, the rate of change in speed of air reduced. Thismeans that, at a certain point, the speed of air at the outlet will remain constant with increasing voltage.

7. CONCLUSION:

Materials: Here, I conclude saying that; plastics in conjunction with metals can make very good forward curved air blowers.

Performance: Under performance, we can see that the air speed at the outlet increased with increase involtage. There for the voltage can always be increased depending on the speed of air required for a given task. Also, it was observed that at a certain point, the speed of air remains constant with increase in voltage, this may be as result of the de motor, which has a certain number of revelations per second.Therefore, a de motor of increased revolutions can be used for more effectiveness of the blower.

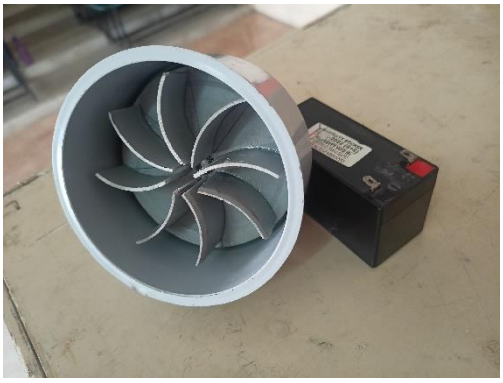


Fig-2 Final Output of Air Blower

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