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A Study on Effect of Diameter and Speed of Impeller on Air Discharge and Power Consumption of Blower using CFD Analysis

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ABSTRACT: Computational Fluid Dynamics has made it easier to build blowers since it makes it possible to accurately forecast the complex internal flows of impellers. The speed and impeller diameter are most important because it determines the flow and efficiency of the blower. The paper analyses how changes in impeller diameter and rotational speed affect the performance of the blower. The impeller was modelled using solid works software and simulated using CFD to determine the performance of the blower. One particular challenge to CFD is that many variables affect its accuracy; the mesh resolution and spatial/temporal discretization, as instance, might each have a different impact. Simulations were conducted to compare the results of the closed impeller with diameters of 95 mm and 115 mm with speed variation of24000 to 36000 rpm. For each impeller velocity, pressure, and discharge generated are evaluated and better parameters for the best performance of the impeller are suggested. The results demonstrated that changing in impeller's diameter has an impact on the flow, pressure head, and velocity. As the impeller's diameter rises, the blower provides the high flow rate. Additionally, it has been observed that a slight variation in power usage results a change in blower speed. Power consumption is found to increase slightly with maximum variation of 2.5% on increasing speed from 24000 to 36000 rpm. It is also found from results that the impeller diameter at 115mm diameter with the speed of 30000rpm gives approximately the same output with 95 mm diameter and 36000 rpm. Depending on required air flow rate, increasing the diameter or blower speed can be used.CFD results were validated by the good agreement between CFD and experimental results.

Keywords: Blower, Air flow rate, Blower speed, CFD, Impeller, Discharge.

INTRODUCTION

Plant protection activities are most important practices during crop production. The application of fungicides, herbicides, and insecticides is one of the most recurrent and significant tasks in agriculture. For orchard crops, air-assisted, mist blowers and air blast sprayers are now frequently utilised. In recent days, sprayers of various sizes are being imported from overseas which are poorly designed and also, the power consumption and power required to operate the sprayers are very high. The optimised design is a crucial for obtaining improved performance. In the power operated sprayers like mist sprayers cum duster have fans and impellers that supply air at a required high velocity but at less static pressure (Wagh *et al*., 2014). Three crucial components make up a centrifugal blower: the impeller, casing, and air intake duct. Air is pulled axially into the impeller of a centrifugal blower and is propelled radially through the impeller. Blowers have a rotating element (called an impeller) through which air passes and its angular momentum changes, resulting in an increase in pressure, head, and velocity of air (Wilson *et al*., 2006). Axial blowers and centrifugal blowers are two common varieties of blowers or fans. In a centrifugal blower, air is moved by centrifugal force, which causes the impeller blades to actually push the air out of their boundaries and create suction inside the impeller. The blower shaft drives the impeller which adds a velocity component to the air by centrifugally throwing of air away from the impeller vane tips (Zainal *et al*., 2021). The pressure rises and flow rate in centrifugal blowers depend on the peripheral speed (Yahya, 2010). A blower is a type of general machinery that is widely and fully utilized in agricultural fields for spraying operations. Nowadays, the design demands a detailed understanding of internal flow during design and off-design operating conditions. From the various reviews, it is found that Computational Fluid Dynamics (CFD) has successfully contributed to the prediction of flow-through blowers and enhancement of their design (Sreekanth *et al*., (2021). For improvement of impeller efficiency, CFD is used to predict the results of static pressure generated at the impeller's entry (Keyur *et al*., 2013). The impeller's optimum design is essential and significant for the effective operation of a blower (Matlakala *et al*., 2019). The speed and diameter of the impeller determine the air volume or pressure that the blower can generate. The air will move much faster toward the vane tip and absorb more energy as a result of the larger size impellers or speed of rotation (Addison, 1995). If impeller's diameter is decreased from the original design, pressure, air flow, and power consumption will be decreased (Chunxi *et al*., 2011). Therefore, impeller's trimming shouldn't be greater than 75% of the pump's original diameter. The inlet radius had a major impact on the flow rate of the centrifugal blower. Too small or too large of the inlet radius will result in a noticeable loss in flow rate. The total pressure rise and flow rate curves can be obtained as well as detailed information about flow of the fan, which can be helpful for analysis and design (Meakhail and Park 2005).

Accordingly, the results are very useful in choosing the right impeller design based on the considered operating flow conditions. It also involves in evaluating the influence of the diameter and the speed of the impeller on the configuration of the blower. However, no publication has evaluated the influence of blower performance on impeller trimming. As a result, attention must be paid to how speed and impeller trimming affect blower performance. However, some works has proposed empirical formulae for determining the flow rate, and pressure. To determine the performance of centrifugal pumps affinity laws are used. The variation equations of fan performance influenced by the increased impeller diameter are suggested by analysis of these measures. The primary objective of this research is to study the blower's performance using CFD analysis.

MATERIALS AND METHODS

For this study closed type impeller is selected because of its highest efficiency due to its tight clearances against the internal casing but also between impeller blades. In this type of impeller, the air is drawn into the impeller eye (centre) before centrifugal forces direct air through blades, then directed axially and expelled through the outlet. Impellers were designed with two different diameters of 95 mm and115 mm using 3 D modelling (solid works) software was presented in Fig. 1. The designed impellers were tested at varying of different speeds (24000, 30000 and 36000 rpm). For each speed and impeller diameter, the power consumption and air volume flow rate, the pressure developed were computed.

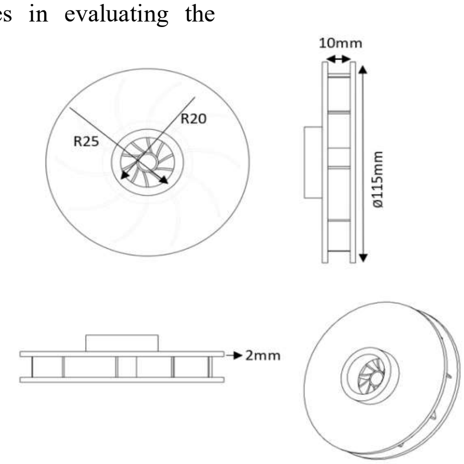

Fig. 1. View of an impeller with 115mm diameter.

Affinity Laws for Centrifugal pump. If the impeller diameter or total head (or pressure) are adjusted, the affinity laws can be used to anticipate how the blower would perform (Jones *et al*., 2011; Matlaka, 2019). The efficiency is used to estimate the affinity laws which describe mathematical relationship between the variables involved in blower performance, such as flow, pump speed, and the total head and power.

Dimensionless pump numbers and affinity laws. The laws reflect the fact that Dimensionless pump characteristics like flow rate Q (m^3 /s), head, H (m), and power, P (W) to the speed, N (rpm) and to the impeller diameter, D (m), of the pump. The calculated values are presented in the Table 2.

The flow capacity is expressed as

$$\frac{Q_1}{Q_2} = \frac{N_1}{N_2} \times \frac{D_1}{D_2}$$

The head capacity is expressed as

$$\frac{H_1}{H_2} = (\frac{N_1}{N_2})^2 \times (\frac{D_1}{D_2})^2$$

The power required is expressed as

$$\frac{P_1}{P_2} = (\frac{N_1}{N_2})^3 \times (\frac{D_1}{D_2})^3$$

These equations can be very useful in the design stage.

Table 2: Calculated values of air flow rate as a function of speed.

Impeller diameter(mm)	Speed (rpm)	Flow rate (m^3/hr)
115mm	36000	54
	30000	45
	24000	35
95mm	36000	44
	30000	38
	24000	30

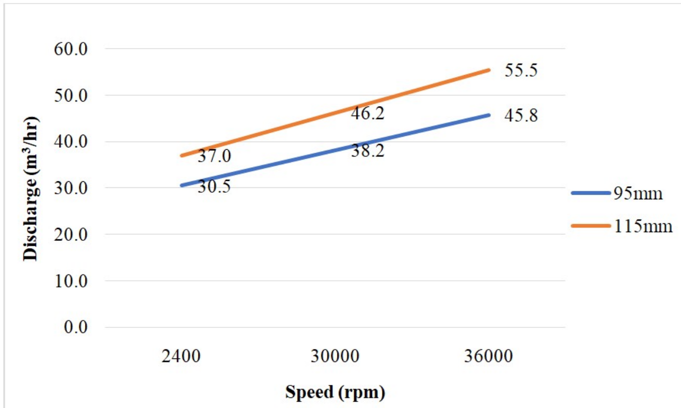

Fig. 2. Flow rate (m^3/hr) as a function of speed and diameter.

The results shows that an impeller with a 115mm diameter gives a higher air flow rate at 36000 rpm as compared to 24000 rpm and 30000 rpm. Furthermore, it shows that the expanded portion of blades in the fan with a larger impeller significantly increases total pressure. Euler's equation, states that the energy of the air produced by the fan is proportional to the fan's diameter (Chunxi *et al*., 2011).

Modelling and meshing of blowers. SOLIDWORKS is used to design the blowers' impeller and 3D modelling (Myaing *et al*., 2014). The design consists of an impeller, suction cover, and casing. These models were designed in solid works. The unstructured grid type is used to mesh the entire centrifugal blower domain. In unstructured grids, triangles in 2D and tetrahedral in 3D are utilized.

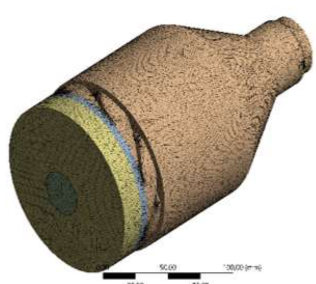

Fig. 3. Model of blower.

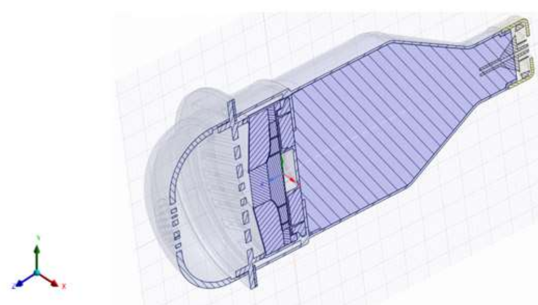

Fig. 4. Meshing with tetrahedral elements.

Unstructured grid systems have the benefit of being highly automated and requiring minimal human effort and time (Pathak *et al*., 2012). An sysfluent is used for meshing. Tetrahedral meshes often offer a more automated method for volume meshing, with the option to add mesh controls to enhance the accuracy in crucial areas and they maintain good quality for complex shapes (Wagh *et al*., 2014; Jayapragasan *et al*., 2014). The mesh element size for the volute casing was kept constant throughout the analysis. Some undesirable curves and surfaces that would have affected the meshing quality have been trimmed, and others were added. The blowers are meshed using tetrahedral elements since they maintain good quality for complex shapes (Ahmad, 2011). After grid generation, the mesh independency tests were carried out.

Simulation of blower. Computational Fluid Dynamics (CFD) approach is the effective method of solving non-linear partial differential equations that governs fluid flow, heat transfer and turbulence of flow (Bhatti *et al*., 2020). The blower performance was simulated using the CFD to examine the impact of impeller diameter. Boundary conditions play an important role in CFD analysis (Kumaran *et al*., 2017). Understanding the energy losses occurring in blower requires a study of the fluid flow pattern within the assembly, which can be obtained through flow analysis by CFD (Manivel *et al.*, 2018).

Statistical analysis. The Pearson correlation often referred to as Pearson's r, is a popular statistic for assessing the degree to which two variables are correlated. The correlation coefficient (r) is a dimensionless numerical variable with a range of -1 to +1 (Kim *et al.*, 2015). As a result, the correlation significance is determined by coefficient value. A correlation value of 0 shows that two variables do not have a linear relationship. If the coefficient is 1 or extremely close to 1, the two variables are related in a positive linear manner (Schober *et al.*, 2018).

$$r=\frac{\sum_{i=1}^{n}(xi-x)(yi-\bar{y})}{\sqrt{\Sigma(xi-\bar{x})^2\Sigma(yi-\bar{y})^2}}$$

where r is the correlation coefficient and x_i and y_i are the values of the individual variables. x and cy mean values of the time series data. The relationship between rotational speed and discharge is determined using the Pearson correlation coefficient.

RESULTS AND DISCUSSION

Computational Fluid Dynamics (CFD).A 3D model has been created using experimental information that has been collected regarding dimensions of the impeller, casing, blade profile and guide vane etc. For the purpose of pre-processing the simulation, geometry model of the blower assembly is imported into ANSYS workbench. To create flow simulations, CFD is employed.

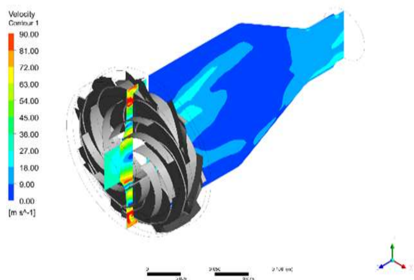

Fig. 5. Velocity contour.

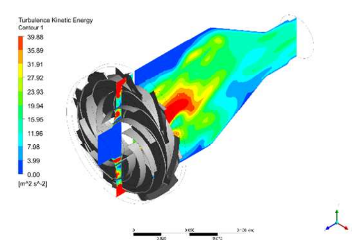

Fig. 6. Kinetic energy contour.

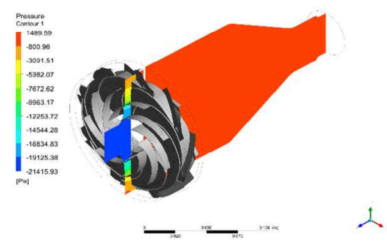

Fig. 7. Pressure contour.

The impeller region is operating in a rotating frame of reference and the casing region operates in a stationary frame of reference. Based on the simulation, the results of airflow through different volute geometries were investigated. The simulation of a 115mm diameter impeller with 36000 rpm was presented in Fig. 5 to 7. The velocity contours reveal that when the flow coefficient rises, the velocity at outflow also rises as shown in Figure 5. This is because the opening area is similar for all cases, so as the mass flow rate is increased the velocities will also increase. A high-velocity contour is observed near the impeller region. Similar outcomes are also reported (Choi *et al*., 2003). This is because of the rotation of the impeller. High-velocity contours become less pronounced due to distance away from the impeller. The velocity is seen to be reduced from the impeller to exit due to the conversion of velocity into the pressure. The turbulent kinetic energy (Fig. 6) is a result of an analysis and it shows that kinetic energy can be minimized through sophisticated design, which also results in a decrease of noise emission (Breier, 2005). Figure 7 shows the contours of pressure. It is observed that the static pressure rises as it is moved from suction to exit. This result of pressure rise is due to the conversion of velocity into pressure that takes place in the casing. This is the process of pressure recovery occurred in the casing. CFD was carried out using Ansys software and the results were presented in Tables 3 and 4.

Table 3: Impeller diameter and speed as a function of Discharge and Nozzle Pressure.

Impeller diameter	Speed (RPM)	Discharge (m^3/hr)	Nozzle Pressure (pa)
95 mm	24000	1.33	1022.22
		14.70	844.44
		29.40	622.22
		44.10	524.44
		58.80	275.56
		73.50	44.44
	30000	1.67	1597.22
		18.38	1319.44
		36.75	972.22
		55.13	1819.44
		73.50	430.56
		91.88	69.44
	3600	2	2300
		22.05	1900
		44.10	1400
		66.15	1180
		88.20	620
		110.25	100
	24000	1.10	697.58

115mm		12.14	576.27
		24.29	424.62
		36.43	357.89
		48.57	188.04
		60.72	30.33
	30000	1.38	1089.98
		15.18	900.41
		30.36	663.46
		45.54	559.20
		60.72	293.82
		75.90	47.39
	36000	1.65	1569.57
		18.22	1296.60
		36.43	955.39
		54.65	805.26
		72.86	423.10
		91.08	68.24

The results indicate that increases in blower speed and impeller diameter (115 mm) result in a substantial increase in flow rate. The increase in blower speed from 24000 rpm to 36000 rpm, the flow rate increases by more than 21 %, while increasing the diameter of impeller from 95m to 115 mm increases flow velocity by 15% increase for speed of 36000rpm. This indicates that by increasing the impeller diameter and speed to an optimum level the performance of the blower will be increased as stated (Chunxi, *et al*., 2011). The results indicated that the air velocity at blower outlet varies from 8.06 to 12.09 m/s at the speed of 24000 rpm to 36000 rpm for an impeller of 95 mm diameter whereas for 115 mm diameter, there was an increase in air velocity from 9.75 to 14.63 m/s at the speed of 24000 rpm to 36000 rpm respectively.

Table 4: Calculation Results of the Impeller parameters using CFD.

Impeller diameter, mm	Speed (rpm)	Q(m^3/hr)	Pressure (pa)	Power (W)	V (m/sec)
95	24000	1.1	697.58	36.75	0.24
		12.14	576.27	49.78	2.69
		24.29	424.62	64.64	5.37
		36.43	357.89	76	8.06
		48.57	188.04	91.53	10.74
		60.72	30.33	116.09	13.43
	30000	1.38	1089.98	71.77	0.3
		15.18	900.41	97.22	3.36
		30.36	663.46	126.25	6.71
		45.54	559.2	148.44	10.07
		60.72	293.82	178.78	13.43
		75.9	47.39	226.73	16.79
	36000	1.65	1569.57	124.02	0.37
		18.22	1296.6	167.99	4.03
		36.43	955.39	218.17	8.06
		54.65	805.26	256.5	12.09
		72.86	423.1	308.93	16.11
		91.08	68.24	391.8	20.14
115	24000	1.33	1022.22	65.19	0.29
		14.70	844.44	88.30	3.25
		29.40	622.22	114.67	6.50
		44.10	524.44	134.81	9.75
		58.80	275.56	162.37	13.00
		73.50	44.44	205.93	16.26
	30000	1.67	1597.22	127.31	0.37
		18.38	1319.44	172.45	4.06
		36.75	972.22	223.96	8.13
		55.13	1819.44	263.31	12.19
		73.50	430.56	317.13	16.26
		91.88	69.44	402.20	20.32
	36000	2	2300	220	0.44
		22.05	1900	298	4.88
		44.10	1400	387	9.75
		66.15	1180	455	14.63
		88.20	620	548	19.51
		110.25	100	695	24.38

From Table 4, it is found that the mean discharge of 30.5 m^3/hr, 38.18 m^3/hr,45.81 m^3/hr, mean nozzle pressure of 380 Pa, 592 Pa,853 pa for a blower speed of 24000 to 36000rpm with respect to 95 mm diameter impeller. The mean discharge of 36.9 m^3/hr, 46.2 m^3/hr, 55.45 m^3/hr, mean nozzle pressure of 555 Pa, 1034 Pa, 1250 Pa for a blower speed from 24000 to 36000 rpm with respect to 115 mm diameter impeller. It also indicates that the impeller diameter at 115mm with speed of 30000 rpm gives approximately the same air output of 46.2 m^3/hr and with 95 mm diameter and 36000 rpm gives 45.81 m^3/hr. This suggest that if decrease in diameter of impeller there should be an increase in speed to get better output. The pressure rise at nozzle and air discharge parameters of two impellers at three different speeds are presented in Fig. 8.

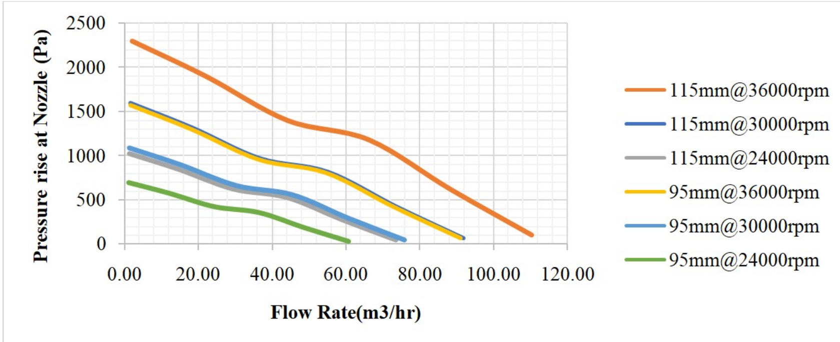

Fig. 8. Performance Curves for Nozzle Pressure and Air flow rate.

Effect of power and discharge. Power output is analysed to understand the changes in the system performance according to various operating conditions. Regarding power consumption as shown in Fig. 9, results indicate that the mean power consumption of 72.46 W,142 W,245 W for blower with 24000 rpm, 30000 rpm,36000 rpm of 95 mm diameter impeller, The mean power consumption of 128 watts, 251 watts, 433 watts for blower with 24000 rpm,30000 rpm,36000 rpm of 115 mm diameter impeller. Similar result of power consumption rises gradually as the impeller diameter rises as reported (Mwinuka, 2016). This increase might be due to an increase in inertia load, diameter, speed and change in air flow dynamics. The design or redesign of manufactured blowers may benefit greatly from these findings.

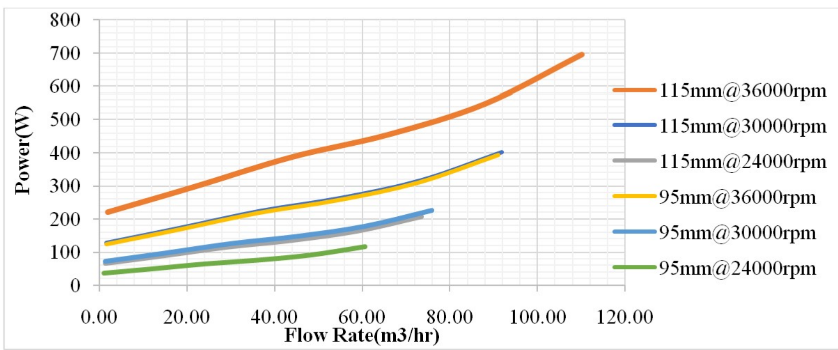

Fig. 9. Performance Curves for Power and Air flow rate.

The effect of speed and diameter of impeller on blower efficiency is shown in Fig 10. The result suggests that as blower speed increased, operating at 36,000 rpm as compared to 24000 rpm of 115mm diameter blower efficiency declined by 27%. This might be caused by lateral gap volumetric and impeller frictional losses. The blower may have been less efficient as a result of running at faster speed. As the blower speed increased, the efficiency is decreased. Similar results were observed by Dhande *et al*. (2016). This could be as a result of decrease in static pressure at the casing caused by an increase in air discharge.

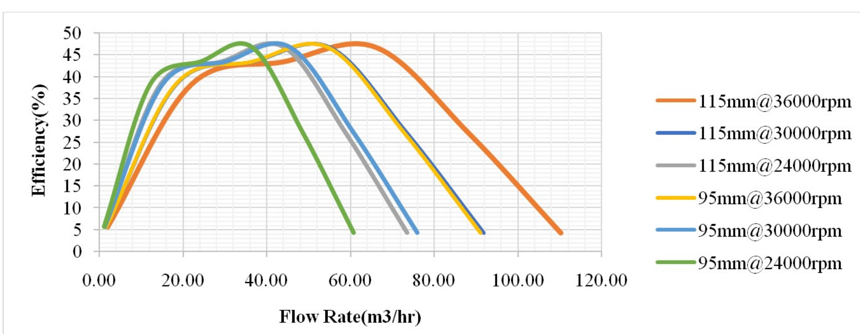

Fig. 10. Performance Curves for Flow rate and Efficiency.

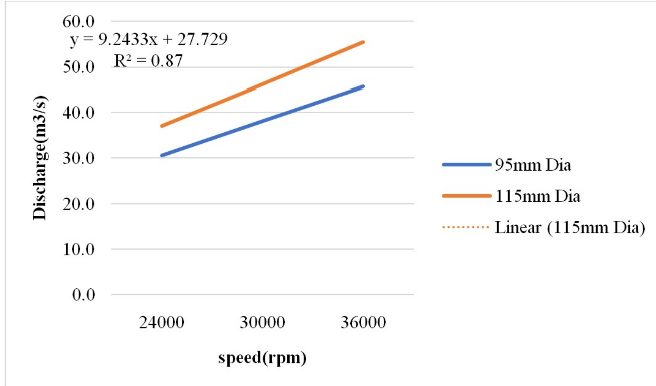

Fig. 11. Rotational speed of impeller – Air discharge relationship.

The linear relationship between discharge and rotational speed has been found using a scatter diagram as shown in Fig. 11. The correlation coefficient (R^2) is determined to be 0.87, suggesting a positive strong link among discharge and speed. The results were considered to be more optimistic when they were compared with similar research.

CONCLUSION

In this study, the major parameters like impeller diameter, and rotational speed were considered and analysed. The results are improved by using CFD and experimental methodology, the following conclusion was made.

Airflow rate is a function of diameter and speed of the impeller. The analytical performance works were carried out to get the optimum combination of blower parameters. On increasing speed from 24000 to 36000 rpm, power consumption is observed to increase significantly with a maximum variance of 2.5%. A 95mm impeller raised pressure at the nozzle by 1297 Pa at 36000 rpm compared to a 115mm impeller 2300 Pa at the same speed. This design generates a velocity of around 90 m/s at 36000 rpm, which is similar to the velocity produced by a mist blower petrol engine. If a significant change in flow rate is needed and space is a constraint, rotational speed and impeller diameter can be changed. Therefore, in order to achieve a greater flow rate and head, a 115mm diameter impeller has been selected, but power consumption for a 115mm, 36000 rpm impeller is high. This greater power consumption could be reduced by decreasing the weight of the impeller. This can be achieved by selecting lighter material for constructing an impeller. According to the results of experiments, when the impeller operates with a larger diameter, the flow rate, total pressure rise, and shaft power consumption has also increased, but the efficiency has reduced. This research is quite beneficial for choosing the blower's dimensions to attain the best performance and may be accepted as the experimentally validated design.

FUTURE SCOPE

The research results of the CFD analysis are as accurate as those of the experimental values and also aids in saving fabrication and material cost. These results help in carry out further development of agricultural blower to improve the horizontal reach, spray deposition and efficiency.

Conflict of Interest. None.

REFERENCES

Addison, H. (1995). Centrifugal and other Rotordynamic Pumps, 2nd ed., Chapman & Hall, London, UK.

Ahmad, S. B. (2012). Modal Analysis of Rotary Piston Blower.

Bhatti, M. M., Marin, M., Zeeshan, A., & Abdelsalam, S. I. (2020). Recent trends in computational fluid dynamics. *Frontiers in Physics*, (8): 593111.

Breier, A. (2005). Computational Fluid Dynamics-A Tool for Optimized Fan and Blower Design. In *INTELEC 05-Twenty-Seventh International Telecommunications Conference* (pp. 627-630).

Choi, J. S., McLaughlin, D. K., & Thompson, D. E. (2003). Experiments on the unsteady flow field and noise generation in a centrifugal pump impeller. *Journal of sound and vibration*, *263*(3): 493-514.

Chunxi, L.; Song L.W.; and Yakui, J. (2011). The performance of a centrifugal fan with enlarged impeller. Energy Conservation and Management, 52(8): 2902-2910.

Dhande, K. G., Mathur, R. A. V. I., & Sharma, A. J. A. Y. (2016). Performance evaluation of a centrifugal blower of air assisted sprayer for orchard pesticide applications. *International Journal of Agricultural Science and Research*, *6*(4): 119-130.

Jayapragasan, C. N., Kumar, M. S. P. D., & Reddy, D. K. J. (2014). Redesign and Validation of an Industrial Blower.

Jones, W. V. (2011). Motor selection for centrifugal pump applications made easy. In *IEEE/IAS Pulp & Paper Industry Technical Paper Conference* (pp. 140-150). IEEE.

Keyur, K.P.; and Prajesh, M.P. (2013). Performance improvement of centrifugal fan by using CFD. *International Journal of Advanced Engineering Research and Studies, 2*(2):01-04.

Kim, Y., Kim, T. H., and Ergün, T. (2015). The instability of the Pearson correlation coefficient in the presence of coincidental outliers. *Finance Research Letters*, *13*: 243-257.

Kumaran M.R.A.M. (2017). CFD Analysis of Centrifugal Pump with Various Blade Outlet Angle Hangling Viscous Fluids. *Biological Forum – An International Journal*, *6*: 1798-1802.

Manivel, R., Vijayanandh, R., Babin, T., & Sriram, G. (2018). Pneumafil casing blower through moving reference frame (MRF)–A CFD simulation. In *AIP conference proceedings* (Vol. 1953, No. 1, p. 140063). AIP Publishing LLC.

Matlakala, M. E., Kallon, D. V. V., Mogapi, K. E., Mabelane, I. M., & Makgopa, D. M. (2019). Influence of Impeller Diameter on the Performance of Centrifugal pumps. In *IOP Conference Series: Materials Science and Engineering* (Vol. 655, No. 1, p. 012009). IOP Publishing.

Meakhail, T., & Park, S. O. (2005). A study of impeller-diffuser-volute interaction in a centrifugal fan. *J. Turbomach.*, *127*(1): 84-90.

Mwinuka, T. (2016). Experimental Determination of the Effect of Number of Impeller Blades on the Air Flow Rate and Power Consumption of Centrifugal Blowers. *American Academic Scientific Research Journal for Engineering, Technology, and Sciences*, *17*(1): 81-88.

Myaing, K., & Win, H. H. (2014). Design and analysis of impeller for centrifugal blower using solid works. *International Journal of Scientific Engineering and Technology Research*, *3*(10):2138-2142.

Pathak, Y. R., Baloni, B. D., & Channiwala, D. S. (2012). Numerical simulation of centrifugal blower using CFX. *International Journal of Electronics, Communication & Soft Computing Science and Engineering*, 242-247.

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: appropriate use and interpretation. *Anesthesia & Analgesia*, *126*(5): 1763-1768.

Sreekanth, M., Sivakumar, R., Sai Santosh Pavan Kumar, M., Karunamurthy, K., Shyam Kumar, M. B., & Harish, R. (2021). Regenerative flow pumps, blowers and compressors–A review. *Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy*, *235*(8): 1992-2013

Wagh, S., & Panchagade, D. (2014). Analyzing effect of impeller width on mass flow rate of Centrifugal Blower using CFD. *International Journal of Engineering and Advanced Technology*, *3*(5): 236-238.

Wilson, K. C., Addie, G. R., Sellgren, A., & Clift, R. (2006). *Centrifugal Pumps* . Springer US. (pp :190-226)

Yahya, S. M. (2010). *Turbines compressors and fans*. Tata McGraw-Hill Education.

Zainal, M. H. F., & Mahmudin, R. (2021). Simulation Study of Various Blade's Numbers and Performance's Effect Inside Impeller for Centrifugal Pump System. *Progress in Engineering Application and Technology*, *2*(2): 844-853.

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