International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 05 | May - 2021 ISSN: 2582-3930

Optimization of Air Flow through Propeller and Top Cover of Drone Motor

Akshay T Vyas, Milan H Hansaliya ,Ravi B Thaker,

[1]*Mechanical Department & B H Gardi College,Rajkot*
[2] *Mechanical Department & B H Gardi College,Rajkot*
[3] *Mechanical Department & B H Gardi College,Rajkot*

- **Abstract -** The presented study is focused on Optimization of Air Flow in Drone motor along with propeller with the use of Computational Fluid Dynamics (CFD). From the range of materials, Carbon Fiber (CF) is selected for propeller material with specific diameter and pitch by industry. For the CFD computations and the analysis SIEMENS CCM+ software is used. Also with the help of Open Foam and Matlab programming languages calculation will be carried out. The optimization of design of the Top Face of drone motor is necessary in order to have the desired cooling. As a result of this study, we can conclude that the Air Flow of the drone motor can be reduced by changing the shape of Top Cover and selection of the propeller. To the best of our knowledge, our study is a novel research which focuses on the Air Flow through the design of top face of drone motor. With this motivation, we aim at designing a top face of drone motor with proper selection of propeller.

Key Words: cfd, Siemens ccm+, drone motor

1.INTRODUCTION *(Size 11, Times New roman)*

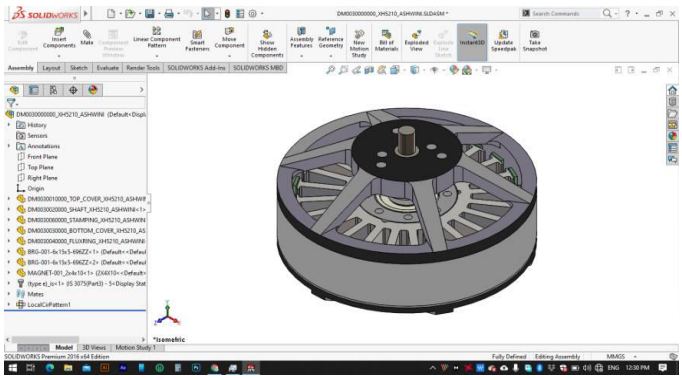
- The motor of the drone is mainly a Brushless DC (BLDC) or Permanent Magnet Synchronous Motor (PMSM). This motors is mounted on the drone's frame arm. On the top of motor the propeller is mounted. Propeller generates downward thrust when rotated by motor.

2. Body of Paper

- Drone Industry is facing a problem of Heating of the motor. In this work, Industry has suggested its drone motor Design XH5210. It is permanent magnet synchronous motor (PMSM).

Table -1: Parameter of drone motor

KV	275
Input Voltage	24 V
Max Current	30 A
Thrust	2650 gm
Power	600 W
Total Motor Weight	230 gm
Efficiency (Motor & Propeller)	4.42 (gm/W)



Industry has given complete assembly of above Design. To optimize this Design, I have designed 3 more Design of top cover of this motor in solid works software. Simulation has been performed on Siemens CCM+ software.

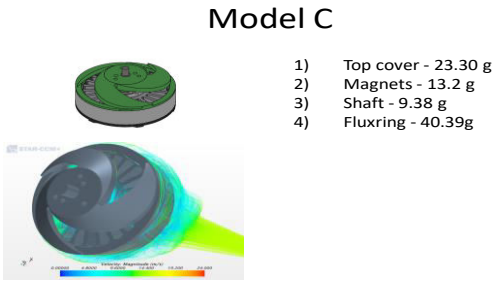
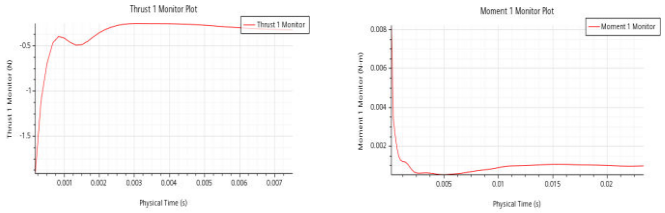


Fig -1: Design of Top Cover and Simulation in Siemens ccm+

Result of above design



Total energy	Momentum Monitor value	Thrust Monitor value	Iterations
	6.28E-4	-0.32	230
301000.0 to 301500.0 j/kg	9.74E-4	-0.37	700

3. CONCLUSIONS

As per above result, Above Design can maximum optimize air flow. In this design for achieving minimum momentum value and minimum thrust value so friction must be less. Design C is 33% more efficient.

ACKNOWLEDGEMENT

Optimization of Air Flow through Top Face of XH5210 drone motor Design. To improve efficiency of this Motor

REFERENCES

1. https://www.dronezon.com/learn-about-drones-quadcopters/drone-components-parts-overview-with-tips/
2. https://www.getfpv.com/motors/what-is-a-drone-motor.html
3. Sato, Mitsuhide, Masami Nirei, Yuichiro Yamanaka, Tatsuki Suzuki, Yinggang Bu, and Tsutomu Mizuno. "Increasing the efficiency of a drone motor by arranging magnetic sheets to windings." *Energy Reports* 6 (2020): 439-446.

4. Christodoulou, Konstantinos, Michail Vozinidis, Asterios Karanatsios, Efstathios Karipidis, Fotios Katsanevakis, and Zinon Vlahostergios. "Aerodynamic Analysis of a Quadcopter Drone Propeller with the Use of Computational Fluid Dynamics." *Chemical Engineering Transactions* 76 (2019): 181-186