DESIGN AND PERFORMANCE ANALYSIS OF PROPELLER BLADE

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ABSTRACT:

The propeller are used many fluid flow and mass flow forward thrust screw. Mostly multi blade are used in compressor, cooling fan and blower design etc… Many propeller blade are weightless but structural damaged and better performance. Three bladed propeller are model will be 80% performance with in the 0 degree angle at Various rpm thrust . Therefore small change parameter into the blade design to increase thrust performance . A Performance characteristics of a three bladed propeller are carried out in this project to using **solid work** software. When propeller blade has been model. Further analysis carried out using **ANSYS Fluent** at various rpm. The validation of experiment & software results are compared.

KEYWORDS: **Aluminium,solid work**, **ANSYS (fluent).**

INTRODUCTION:

As a lightweight metal, aluminum has long been the metal of choice for creating airplane propellers. They created aluminium propeller is first aircraft engine. In the creation of lightweight metals – led to the evolution of aircraft from wood-and-fabric to full metal. Then new designs and integrating them with new aluminum alloys led to large changes in overall aircraft efficiency and performance. Today, aluminum propellers are often strengthened through the use of advanced aluminum alloys. Aluminum alloys may contain copper, manganese, magnesium, silicon, and/or chromium to increase strength and durability.

Methodology:

STEP 1: Collecting information and data related to propeller blade.

STEP 2: A fully parametric model of the propeller blade is created in **SOLIDWORKS** Software.

STEP 3: To analyzed using ANSYS Workbench 14.5 to obtain Velocity ,Thrust etc…,in various blade angles.

STEP 3: Manual calculation are done.

STEP 4: Finally , we compare the results obtained from Experimental and ANSYS Software And also compared geometry & materials.

BLADE MEASUREMENT:

BLADE DIMENSION:

Hub width = 5 cm

HUB Radius = 3 cm

Blade length = 20 cm

Hub hole radius =1.6 cm

hub hole depth =0.7 cm

Blade maximum thickness =.9 cm

Chord length = 3 cm

Twist angle = 45 deg

BLADE WEIGHT MEASUREMENT:

BLADE 1 = 0.133 Kg

BLADE2 =0.148 Kg

BLADE 3 =0.140 Kg

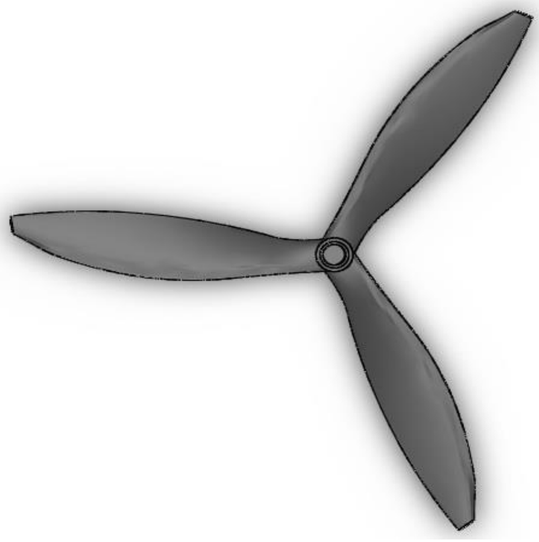
Hub = 0.223 Kg

Hub with blade total weight = 0.706 Kg

Material selections = **Aluminium material**

DESIGN PROPELLER IN SOLIDWORKS:

Modelling of the propeller is done using SOLIDWORKS. In order to model the blade, it is necessary to have sections of the propeller at various radius. These sections are drawn and rotated through their 0degree pitch angles.

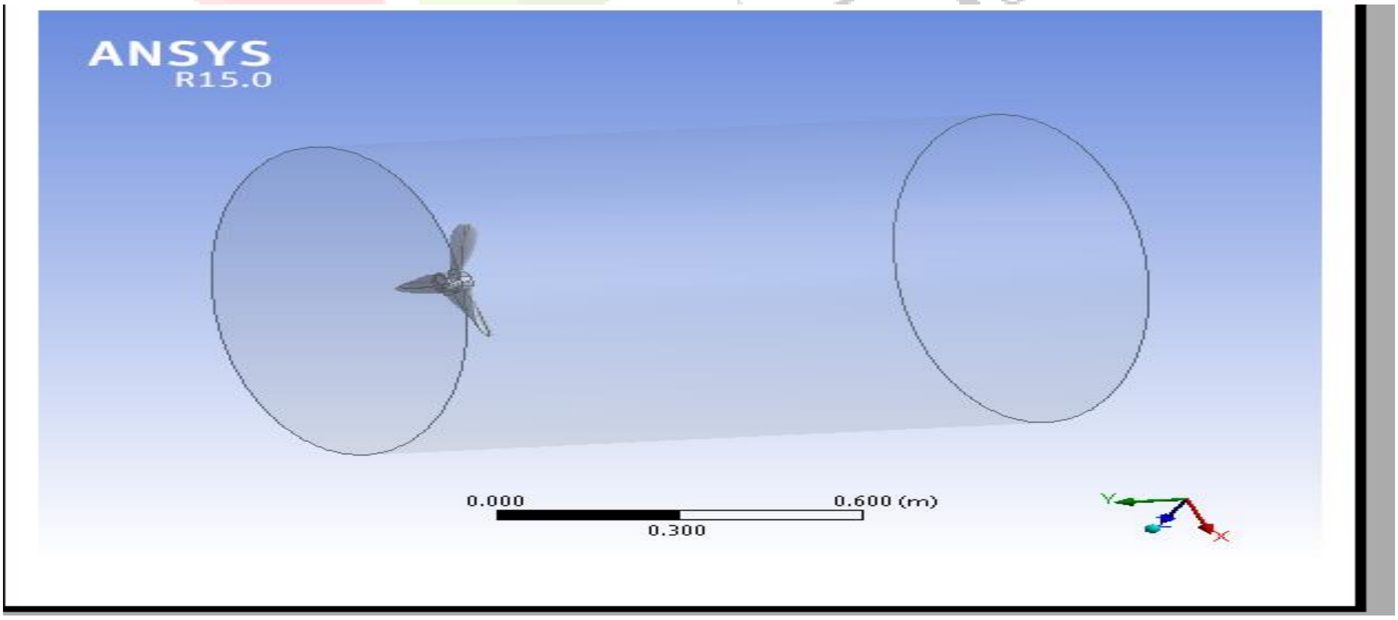


Generic Step using Problem in ANSYS:

Like solving any problem analyticaly, you need to define 1) solution domain, 2) physical model, 3)apply the boundary conditions and 4) the physical properties. If the main difference in extra step in mesh generation. In this steps the dividing the small elements when become solvable to otherwise too complex situation.

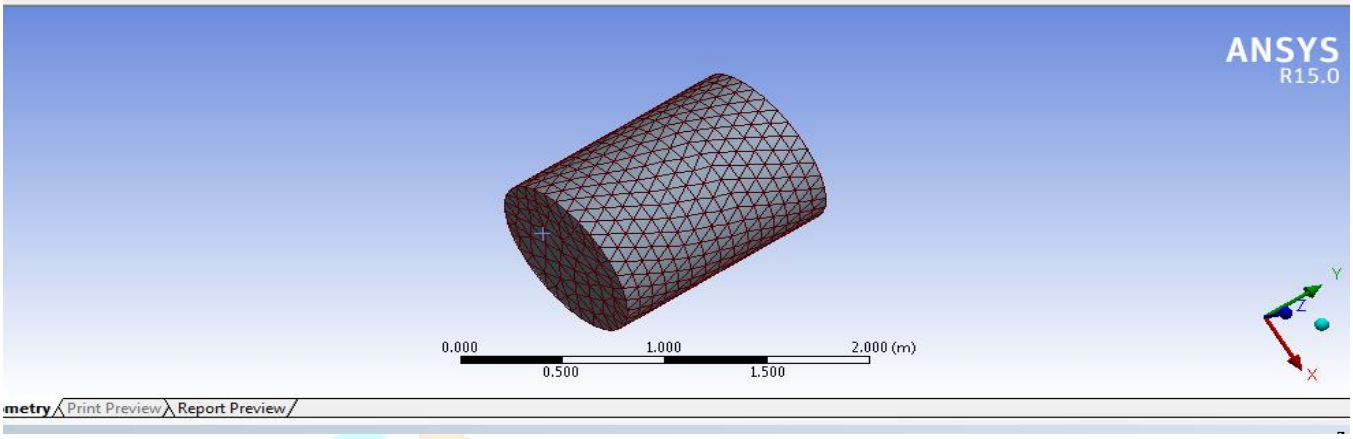
Build Geometry:

Construct a two or three dimensional representation of the object to be modelling and tested using the X,Y,Z co-ordinate system withiANSYS.



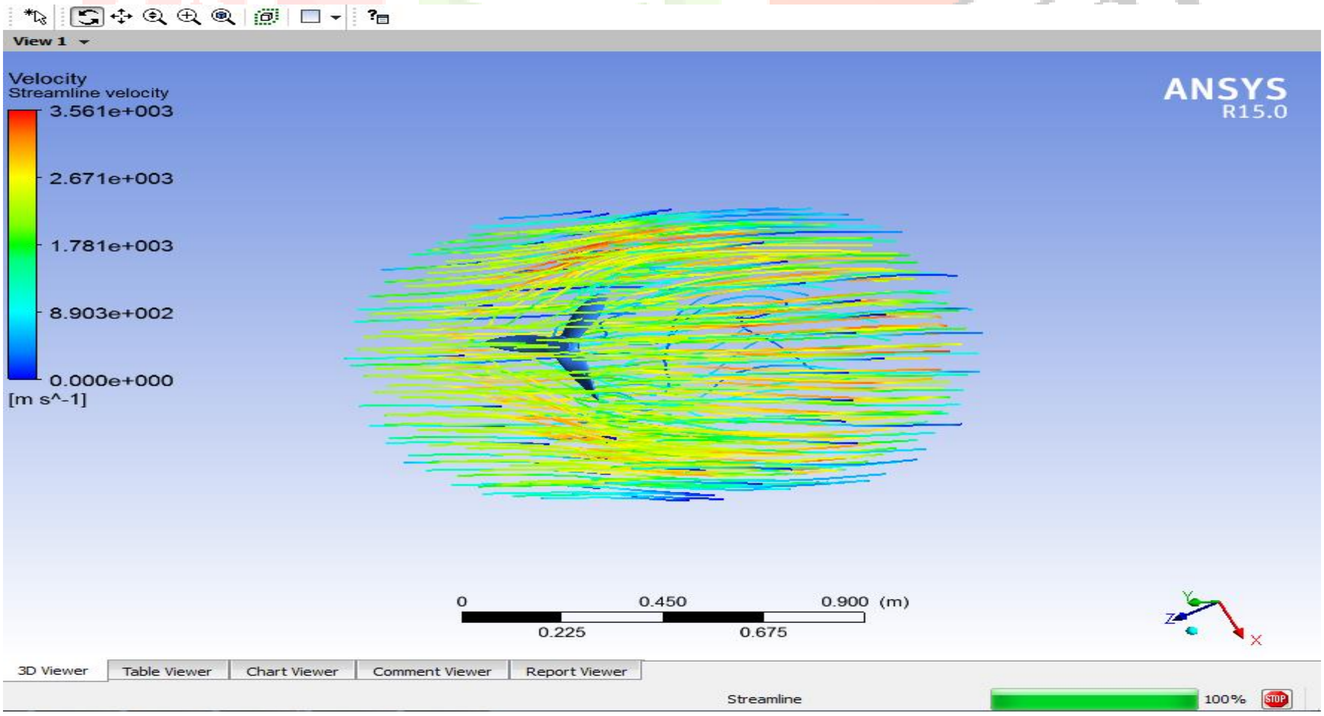
Generate Mesh:

In this point ANSYS understand the setup of the part. Now the model system should be analysis the finite piece.



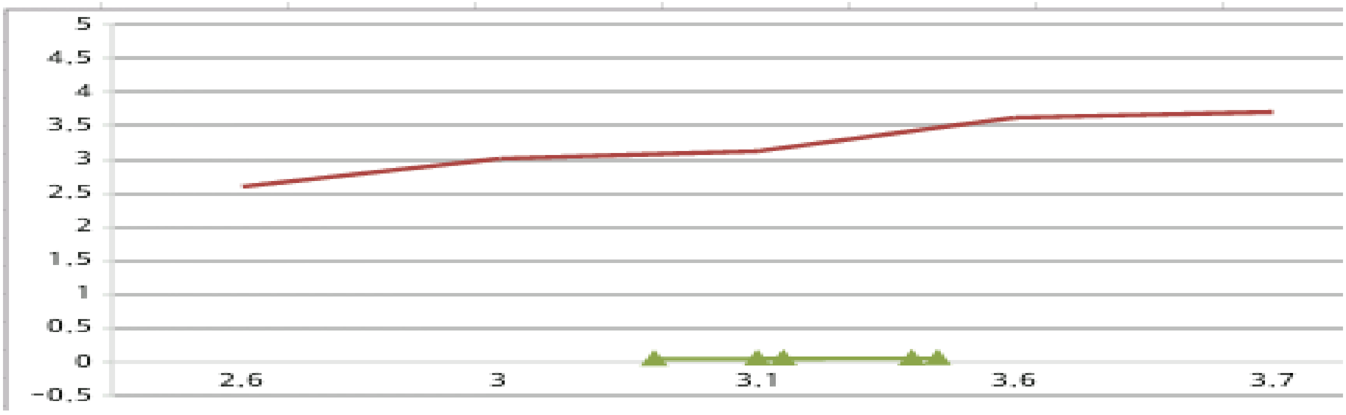
Apply load:

Once the system is fully designed, the last step should be the system with constraints, such as physical loadings or boundary condition



Obtain Solution:

This is actually a step, because ANSYS needs to understand within what state,



the problem must be solved. Present the Results: After the solution has been obtained, there are many ways to present ANSYS' results, choose from many options such as tables, graphs.

ANALYTICAL SOLUTIONS:

Angle	Impulse	Speed	Time	Power	Velocity	Thrust
0	5	1020	0.015	0.1041	2.6	0.044
0	5	1060	0.0092	0.1698	3.0	0.0470
0	5	1120	0.0081	0.1929	3.1	0.049
0	5	1150	0.0075	0.2083	3.6	0.052
0	5	1210	0.0069	0.2264	3.7	0.053

EXPERIMENTAL SOLUTIONS:

Angle	Impulse	Speed	Time	Power	Velocity	Thrust
0	5	1020	0.015	0.1041	2.5	0.042
0	5	1060	0.0092	0.1698	2.9	0.045
0	5	1120	0.0081	0.1929	3.0	0.048
0	5	1150	0.0075	0.2083	3.4	0.050
0	5	1210	0.0069	0.2264	3.6	0.051

COMPARISON TABLE:

S.no	Experimental values	Analytical values	Error
1	0.042	0.044	0.002
2	0.045	0.046	0.001
3	0.048	0.049	0.001
4	0.050	0.052	0.002
5	0.051	0.054	0.003

RESULT:

As the aim of the project is to increase the thrust performance, the major sources used for this aluminium material.the propeller is analyzed using method in ANSYS Software.

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