ISSN No:-2456-2165

Thermal Analysis of Composite Steam Turbine Blades

Shane Amith Kumar[1]*, T. Paramesh[2], Hanuma Naik[3]
1, 2 & 3 Dept. of Mechanical Engineering,
St. Martin's Engineering College, Hyderabad, India

Abstract:- In this paper, a promise is made to eliminate the failure of the wind turbine by testing the Mechanics. The underwater exploration zone has an area with 30MW turbine motors used for marine systems and is made of epoxy-leave and inconel 680 super mixes. Going before disappointment, the sharp edge turbine worked for about 10000 hours while its relational life was estimated to be about 15000 hours. Mechanical testing was performed in anticipation of the occurrence of sharp vibrations due to a decrease in development at an increased temperature and presented by greater external forces. The turbine model profile on the gas edge is transmitted using the CATIA V5R20 system. The edges of the turbine are broken due to their warmth compared to the basic presentation. It was apparent that there was no evidence of paralysis of the portion of the sharp edge indicating an increase in the inner edge that many would have thought could be imagined. The most prominent nerves and muscles are seen near the base of the turbine edge and the upper surface near the ends of the extremities. Most unprecedented temperatures are seen on the tip of the hot spots and with a slight heat down the edge. The temperature distribution decreases from the clip to the support of the cutting surface area. Temperatures were observed below the molding temperature of the solids.

Keywords:- *Steam Turbine, Marine, Blade, Analysis, CATIA V5R20.*

I. INTRODUCTION

The steam turbine is a mechanical device that converts hot brains into stressful mechanical functions. The steam turbine takes into account its superior thermodynamic capacity tonnes, considering the use of various stages in steam improvement. It comes in a 32 closer way to deal with the exact result. Steam turbines are used for siphons, blowers and other shaft-driven contraceptives in an assortment of sizes ranging from the smallest 0.75 kW to 150 MW turbines used to generate electricity. Steam turbines are widely used for marine applications for vessel inspired structures. As used for flight applications, the introduction of late gas turbines, which are increasingly used in the energy age field, has been engulfed with steam turbines. Its ability to achieve 4 to 10 times the weight of gas turbine sales by using high temperature and weight of gases and the power of the wind, by moving up and down through pairs of fixed and moving edges. Protects. Blower is essential to the work fluid that is central to progress. The ratio of work fluid and speed required is high, so everything that is considered an alternator or focus point blower is required.

II. LITERATURE REVIEW

S.Gowreesh et.al reviewed for a cooperative, warm, specific evaluation of the basic phase rotor bleeding edge of a two-stage gas turbine using ANSYS 11.0. This is an important finite element method of programming. The temperature course at the rotor edge is reviewed using this point. The structure of the turbine bit of the gas turbine is highlighted, derived from the Force Turbine's foundation scheme for the improvement of the current turbo fly motor. It is realized that a detailed study of temperature results can be done to overcome the mechanical and hot nerves involved. . Kauthalkar et.al is the explanation behind the turbine advancement, the most incredible ratio to the power of the working fluid, which turns it into a responsible task with a great deal of practicality. The gas turbine seems to be the most important sustainable quality, low cost, least enterprise and least startup time. John.v et.al focuses on game planning and the prediction of gas turbine bleeding edge, CATIA is used to create robust models and ANSYS programming for FEmodel by applying boundary conditions, which, in addition to this paper, combines post-preparation and asymmetry of sharp edge life. TK Ghosh et.al notes that the essential identified resources and ideas that are limited to the imperative of trademarks have reliably led to the elimination of stretching to develop new steam turbine power plants. Considering their yields, even a modest increase in productivity can result in significant savings for consumers. Since everything that considers cycle efficiency depends disproportionately on steam turbine performance, continuous improvement is sought to increase turbine productivity.

Reactions such as Kenji Nakamura et al., General problems, high efficiency and improved operation endurance are smarter than basic hardware for steam turbines and hot force lifespan. By developing the temperature and weight of the steam turbine working conditions, the propulsion force of the steam will be aged, thus the turbine is appreciated with high temperature conditions of 700 toC. Zachary Stuck et.al addresses the purpose of the steam turbine utility by talking about the simple structure of steam turbine sharp edges, special center tension complete alignment, the material used for the development of steam turbine front rows, and the turbine edge. Understand the factors that cause depression and its turbine depression in its own way.

T. Maisek et.al built 3000 rpm The use of the steam turbine for a 1220 mm sharp edge highlights the new game plan. The final stage is resolved with a sharp edge significant expansion, mid-length tie-executive association and fir-tree downtail. The final stage Air Foil is optimized from the mineralization point of view of its expanding power. In order to produce a sharp edge of 3000 rpm 1220 mm, pushed evaluation techniques were applied to eliminate direct parts of the pulsating structure. Paired rotor-like edge evaluation is like the motivation behind the idea. Check assessment to confirm selected results, for example, rotational vibration testing on a fast test rig. The level of excitation was examined and analyzed in addition to the belching relationship of the blade's structure.

Tulsidas et al stated that if an ideal geometry could be found, a wide assortment of turbo-mechanicals would combine the inertial geometry used in the industry. Form, Base Filter Pressure Fixation Factor when Stacked. In Yasutomo Kaneko et.al, a new standard game-plan of HP front lines was created to improve the unlink quality and heat efficiency of the steam turbine's HP (high pressure) end edges.

III. EXPERIMENTAL WORK

In this work the turbine edge is organized using the CATIA and the arrangement system is explained a little bit at a time in the going with propels.

Step I: Now click on the starting catch at the most noteworthy purpose of the toolbar It shows different modules to show 'Mechanical Design', in which case select 'Part Design'.

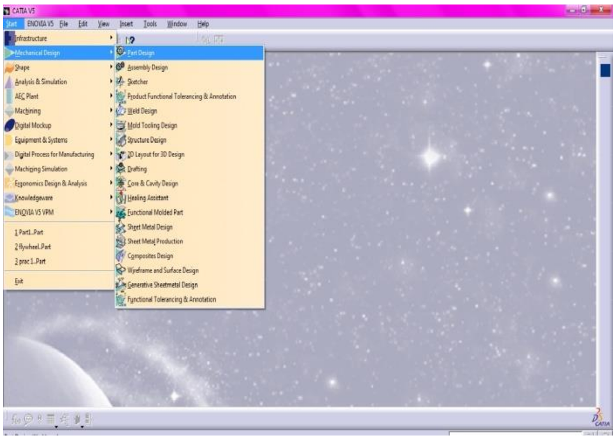

Fig 1:- Selecting the module.

Step II: Dia draws a stream of 100, the reference point in the center,

Step III: Remove using the pad alignment and add the remaining 57mm additional planes

Step IV: Draw the foil edge removed from the UIUC foil data base

Step V: Project the foil from the plane to the surface of the pad

Step VI: Remove using the pad request

Step VII: Using the Round Model Definition Course around the Base Bend

Step VIII: Create shaft openings using pocket request

Step IX: Final View

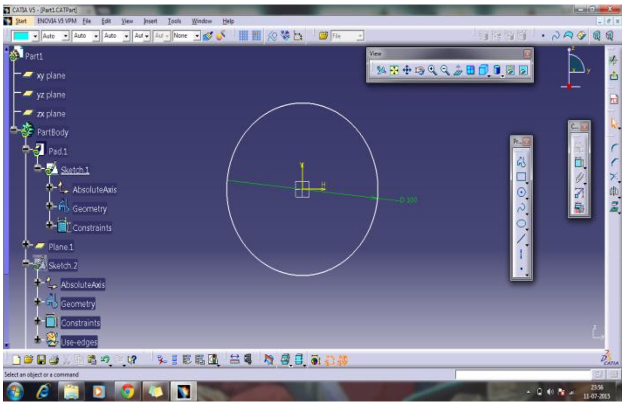

Fig 2:- Screenshot of Step II

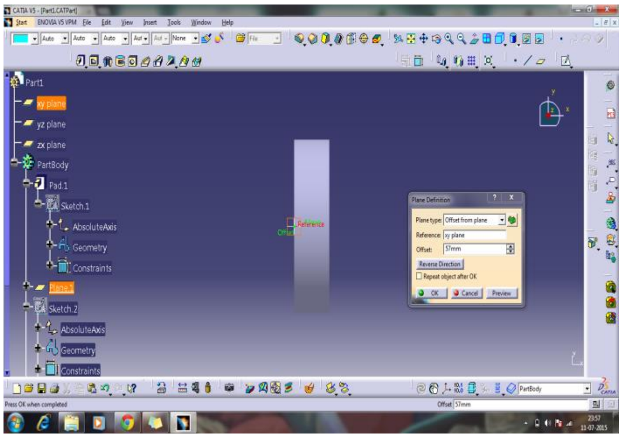

Fig 3:- Applying Extrude command

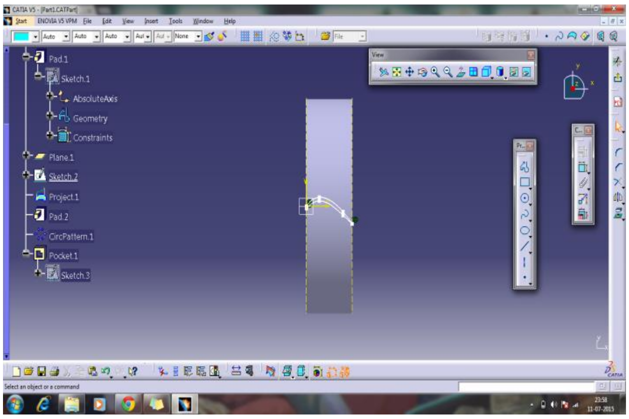

Fig 4:- Extraction of foil blade

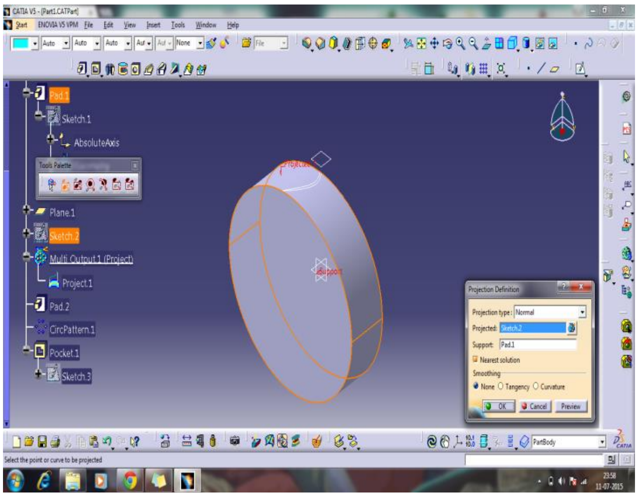

Fig 5:- Projection of foil

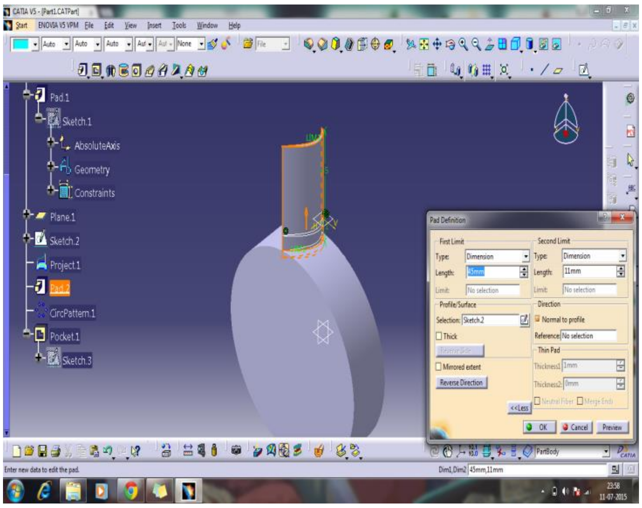

Fig 6:- Applying Pad Command

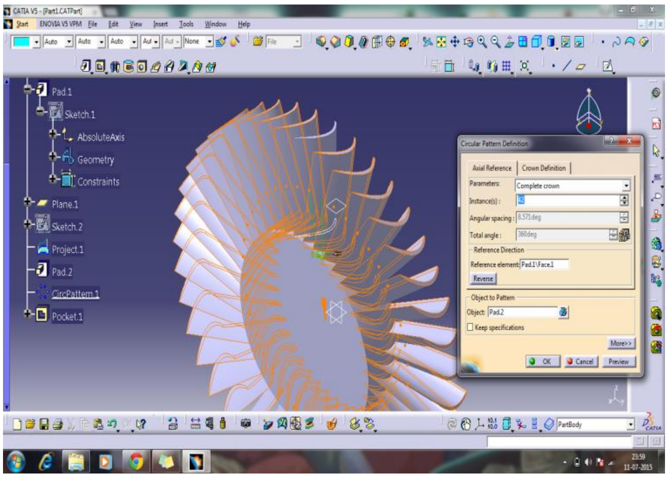

Fig 7:- Creating circular base

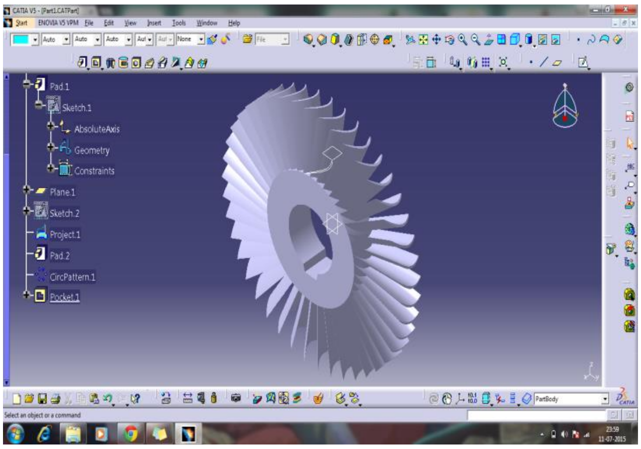

Fig 8:- Shaft hole creation

Fig 9:- Final view of the design

After the arrangement model, Import the geometry model from the PC which is starting at now done in catia by giving right snap on the geometry. The underneath figure shows the accompanying.

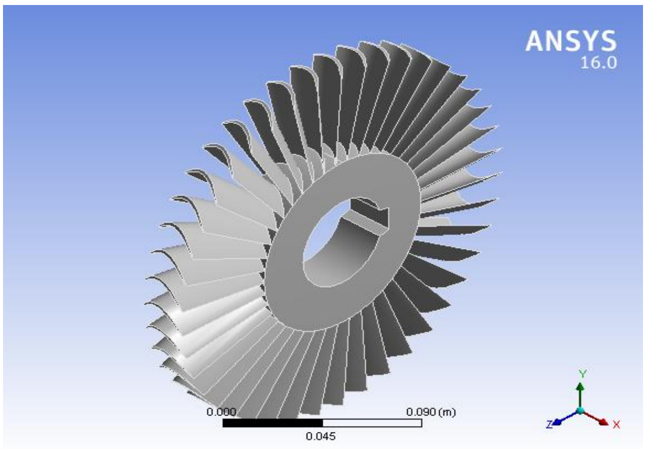

Fig 10:- Imported view from CATIA V5 R20

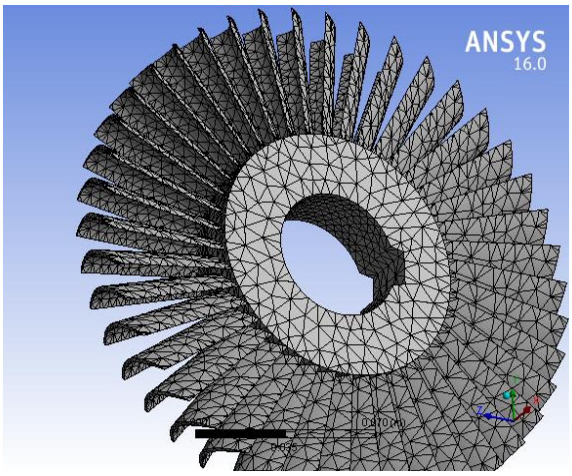

Fig 11:- Meshing View

Static Structural Analysis on Resin Composite Material

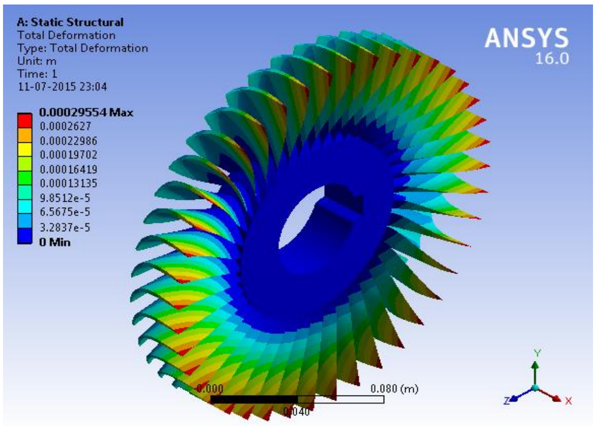

Fig 12:- Total Deformation

The range of total deformation is 0 to 0.00029554
Equivalent Elastic Strain

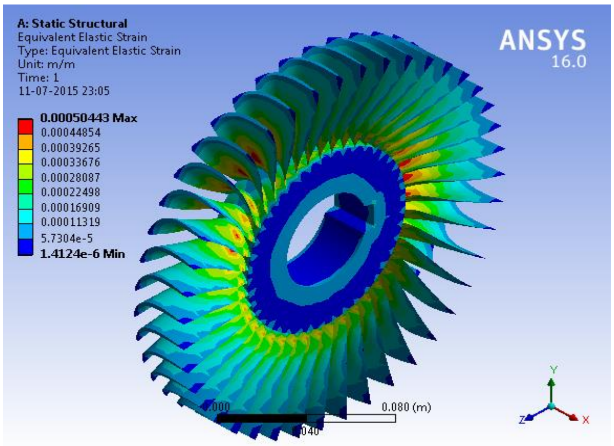

Fig 13:- Elastic Strain distribution

The equivalent elastic strain distribution ranges from 1.412e-6 to 0.00050443

Equivalent Stress

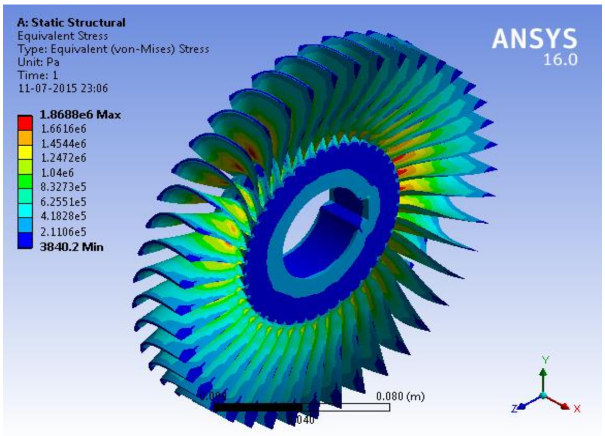

Fig 14:- Equivalent stress distribution

The equivalent stress distribution range from 3840.2 to 18688e6.

Static Structural Analysis Using Inconel 360 Material

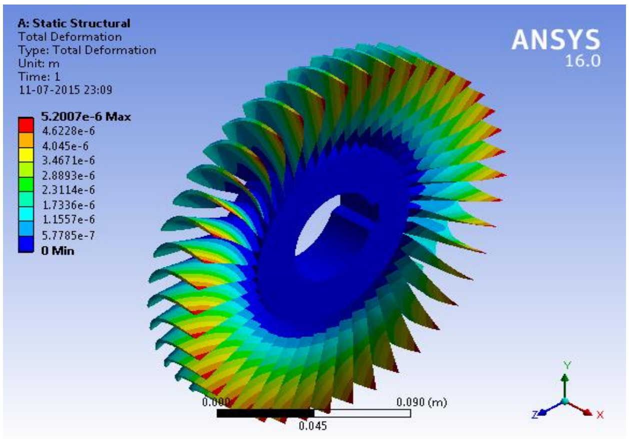

Fig 15:- Static Structural Analysis

Inconel 360 Material

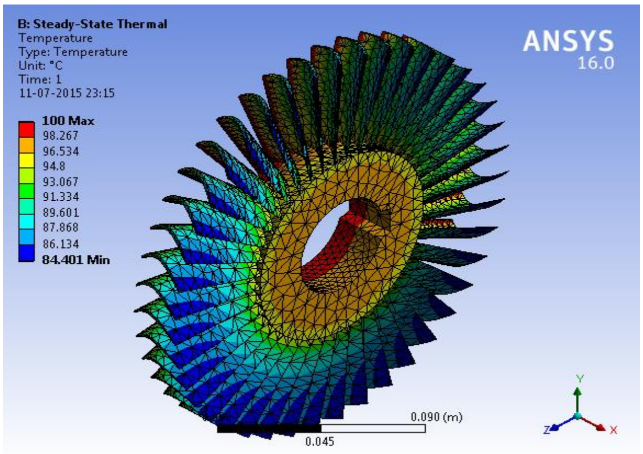

Fig 16:- Steady State Thermal Analysis

ISSN No:-2456-2165

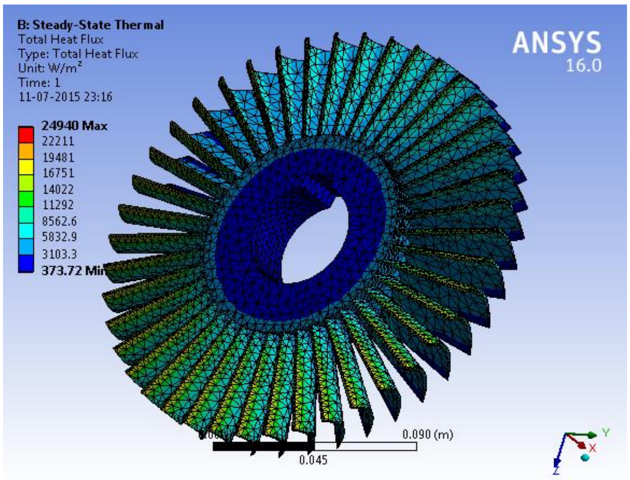

Fig 17:- Heat Flux Distrubution

Epoxy Resin Material

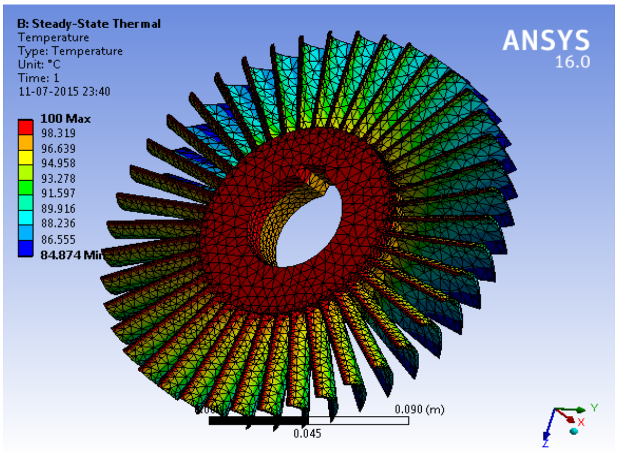

Fig 18:- Thermal analysis on the epoxy resin material.

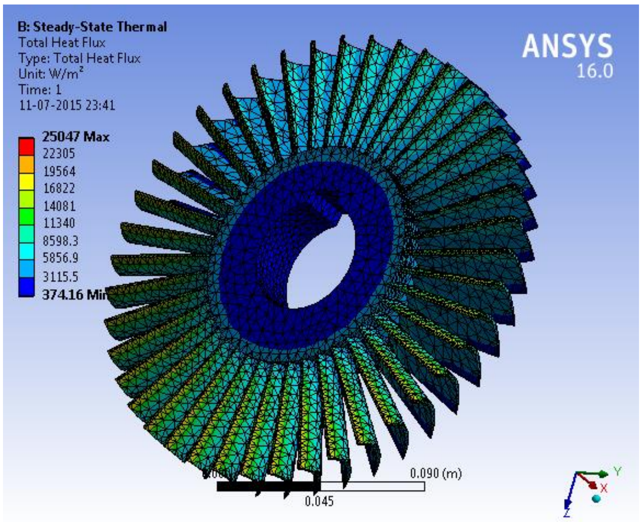

Fig. 19

IV. RESULTS

From the above imported structure from catia v5, under both static and model assessment we obtained results and those results are showed up underneath in plain. Assessment is done under required conditions on both composite materials i.e.; Epoxy fix tar, INCONEL 360

	Inconel 360	Epoxy cure resin,
Total deformation, (m)	5.2007e-6	0.00029554
Equivalent elastic strain, (m/m)	0.00050443	9.242e-6
Equivalent stress, (pa)	1.911e6	1.8688e6

Table 1:- Examination table for static structure investigation.

Maximum deformation	**Inconel 360**	Epoxy cure resin
Temp	84.401	84.874
HEAT FLUX	24940	25047

Table 2:- Comparison table for thermal analysis

V. CONCLUSION

The turbine front lines of a gas turbine cause the high temperature, high weight gases to disconnect the energy. These front rows are brought into temperature under solid conditions and exposed to extreme external forces. 42% of gas turbine motors are defective only due to blading problems and the frustration in the front parts of this turbine can have an interesting effect on the growth and performance of the gas turbine motor. In this evaluation paper, an attempt has been made to isolate the gas turbine sharp edge defect by mechanical evaluation. The CATIA V5R20 event is clearly displayed in CAD tolls and then brought to ANSYS 16 for additional static and hot evaluation. Two materials have been chosen to be clear, the INCONEL 360, EPOXY CURE RESIN, which are considered excellent materials for turbine bleed edges, considering the above evaluation for their quality and warm features. Form, 360 We consider that most of the materials have mechanical properties. When standing EPOXY from Cure Resin.

REFERENCES

[1]. S.Gowreesh, N.Sreenivasalu Reddy and N.V.Yogananda Murthy. "Convective Heat Transfer Analysis of a Aero Gas Turbine Blade Using Ansys", International journal of Mechanics of solids, vol4, No.1, March 2009(ppt55-62).

[2]. P.Kauthalkar, Mr.Devendra S.Shikarwar, and Dr.Pushapendra Kumar Sharma. "Anlysis Of Thermal Streses Distribution Pattern On Gas Turbine Blade Using Ansys", International journal of Engineering Education and technology, Vol.2, No.3, Nov 2010.

[3]. John.V, T.Ramakrishna. "The Design And Analysis Of Gas Turbine Blade",International Journal of Advanced Research and Studies, Vol 2, No.1, Dec 2012.
[4]. V.Raga Deepu, R.P.Kumar Ropichrla. "Design And Coupled Field Analysis Of First Stage Gas Turbine Rotor Blades", International journal of athematics and Engineering, Vol 13, No.2, Pages: 1603-1612.
[5]. S.S.Rao,"The Finite Element method in Engineering", BH Publications New Delhi, 3rd Edition, 1999.
[6]. Alexandros Makridis and John Chick, 2009, CFD Modeling of the wake interactions of two wind turbines on a Gaussian Hill, EACEW 5 Florence, Italy. 19th-23rd July 2009
[7]. Carlo Enrico Carcangiu, 2008, „wind turbine functioning and aerodynamics", CFD-RANS Study of Horizontal Axis Wind Turbines, Italy
[8]. Chalothorn Thumthae and Tawit Chitsomboon. Optimal angle of attack for untwisted blade wind turbine. Renewable Energy, Volume 34, Issue 5, May 2009, Pages 1279-1284.
[9]. Chaitanya Krishna Patsa, Subhani Mohammed, 2014, Structural Analysis of Super Alloy Gas Turbine Blade using FEA, International Journal Of Engineering Research & Technology (IJERT) Volume 03, Issue 01 (January 2014),