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Design And Analysis Of Marine Engine Crankshaft Made Of Epoxy E Glass Using Fea

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ABSTRACT

Crankshaft is one of the component in an I.c engine which is converts the reciprocating motion of the piston to motion is rotary. Where as in this reciprocating compressor .it converts to the rotary motion. In order to do the conversion between the two motions, the crank shaft has “crank throws” or “crankpins” additional bearing on surfaces whose axis is offset from that the crank, to which “big ends “of the connecting rods from each cylinder attach.

A crankshaft of 4 stroke single cylinder I.C Engine. so that the two revolution of crankshaft for each stroke. In this peak pressure acting on particular engine crankshaft. The crankshaft of the located by model is designed using of CAD SOFTWARE CATIA V5.the accurate dimensions of that material standards. CATIA V5 the best design software in design tools it can be easily design components based on that particular dimensions and analysis accurate results in ANYSIS.

In this project to compare optimization and analysis of the crankshaft on two different materials Aluminum Allo and Epoxy E Glass. This results to be taken and evaluated given load conditions and following the deformation results are shown in ANSYS.

1. INTRUDUCTION

Now a days automobile industries to be facing huge number of issues and then requires to be responses in order to be present competitive. Present competitive world has to produce components with reasonable cost and production values should became high. The global market companies is use the high software tools like the computers CAD tools and thesaurus in the f.e.a . if any component can be designed by the with help of Optimization techniques and then its numerical methods. It should be design a solid model by using CAD tools, the condition and operating mechanism how to meet the components in production time .because of using the modern methods it will reach the competitive with in little span.

The general considerations of designing a crankshaft;

The Crankshaft materials different kind of materials is to be usually cast iron, steel forging, cast steel, modular iron it produce is easily crankshaft. In order to strength would be follow design it approximately same in list then it low expensive follow. it will be made in shape it not following . then cranks certainly with high outcomes

Crank Materials and Construction

From the sources of we know the basic design and modification of crankshaft it decided life span of shaft by performing the stress analysis test. in this test conclude that all features of crankshaft. Most critical factor of design in motor modification process it will be follow use of fillet and constant radius . Sometimes critical conditions if you face any problem that the chose alternator.

Cranks Influence on Parts

Then changing low and mid rpms then the crank shaft size will increase to require torque. It will be design taken the modified crank shaft it output of torque range will be same of the engine speed. If the connected connecting rod it will be changes of stroke intake flow velocities are to be created. it also effected the piston value

By the way the use of internal resistance of the crank is to be decide to decrease then the engine acceleration very firstly then will get to the best result in compression ratio .then it applies dynamic pressure on the single cylinder then it recovers the power loss in rarer cylinder it to be use the rocker ratio then sever them itself .shade higher ratio is improve by high rpm power of it initial cost.

First of all we know how much amount of deflection of the crankshaft it will use be hide of working of rear cylinder in engine. Deflection of was occurred in reward cylinder it be decrease the position of cylinder it will related to rear cylinder then to be help of sparking of in engine it also help to the cam and crank to decrease it. the total deformation amount of crank shaft deflection is to effect the use of torsion vibration in damper it usually to decrease amount of life span .

2. CRANKSHAFT DESIGN ISSUES

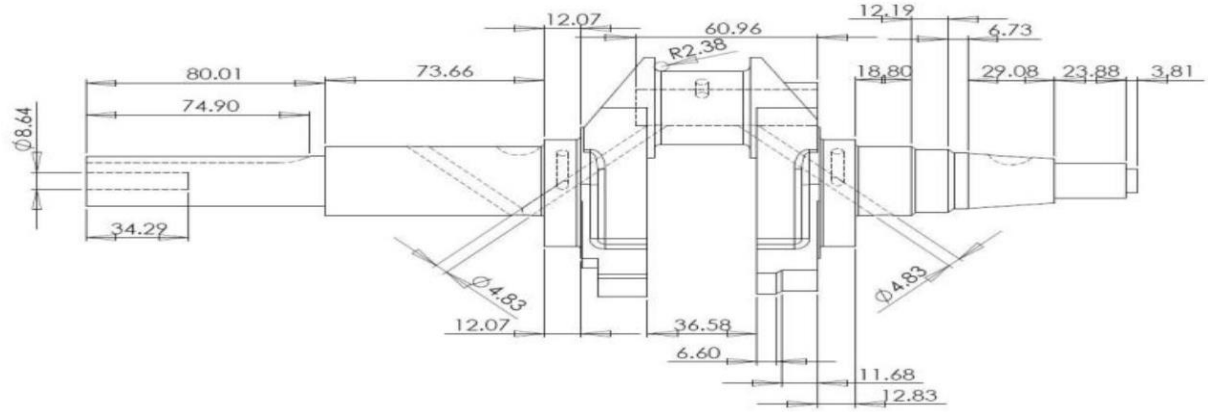
In present situations engineer to design a product they should be flow the rule of design software tools. To compare the other products what is the design values how to overcome the various standard requirements. should be follow the given criteria to be use the perfect design should take the some bending and tensional strength to be created how much amount of mass moment inertia is to be need.by the using the different crank shaft designs to be checked in the different accepts to solve the problems of crank fatigue Tensional resistance frequency high.beacause of high stiffness and the bending reflection to be reduced the regions .in case the friction increased different journals to be disturb the dynamic film and it will be peak points. it will be increase the leakage of greater radial it should be cause of losses lubrication

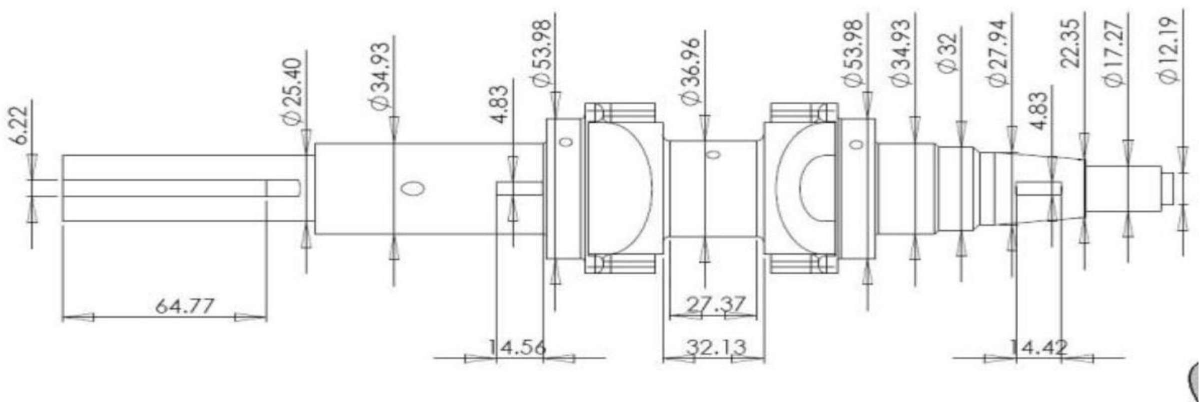
If you applied to the load of metal part it will be deflected of parts and there is no rigid.in case of small crankshaft a deflection will be large. By the way use of spring response to be like behaves the one degree to another degree. the ultimate results stress level is to be calculated by using material ultimate strength the stiffness the particular material to be calculated results of to its properties. Young’s modulus of material and modulus of elasticlikity

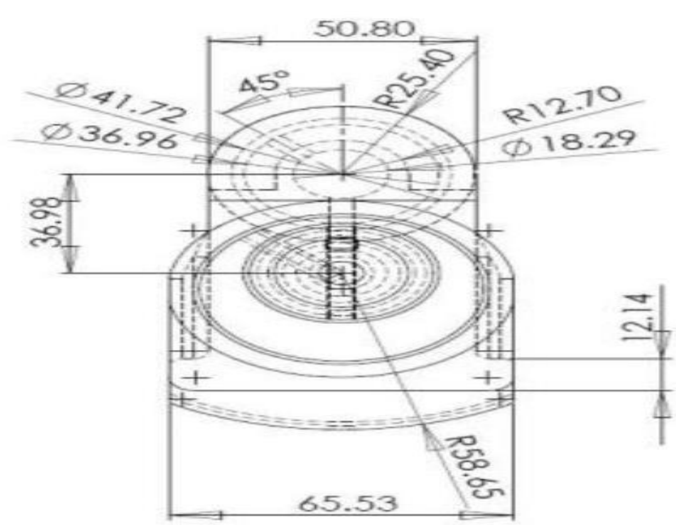
Basically you have to the two components then that are to be identical to each other in all cases but the exception in only conditions e tensile strength. If you can compare the two.

Components deflection is to be same why because the applied will be increases of each component. then the final condition of a component is less strength and it become permanent stretching’s at low stress. Yield strees reach the component by using the high strength and then it will be deform continuously of the components. The aluminum alloy material to be used present crankshaft is constant young’s modulus. the material properties to be selected different material to be calculated high stress position of the crankshaft that’s why automatically improve stiffness. it will be different material to be added of works to maintain less MMOI.

3. Dimensions diagram crankshaft:







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4. HOW TO DRAW CRANK SHAFT IN CATIA

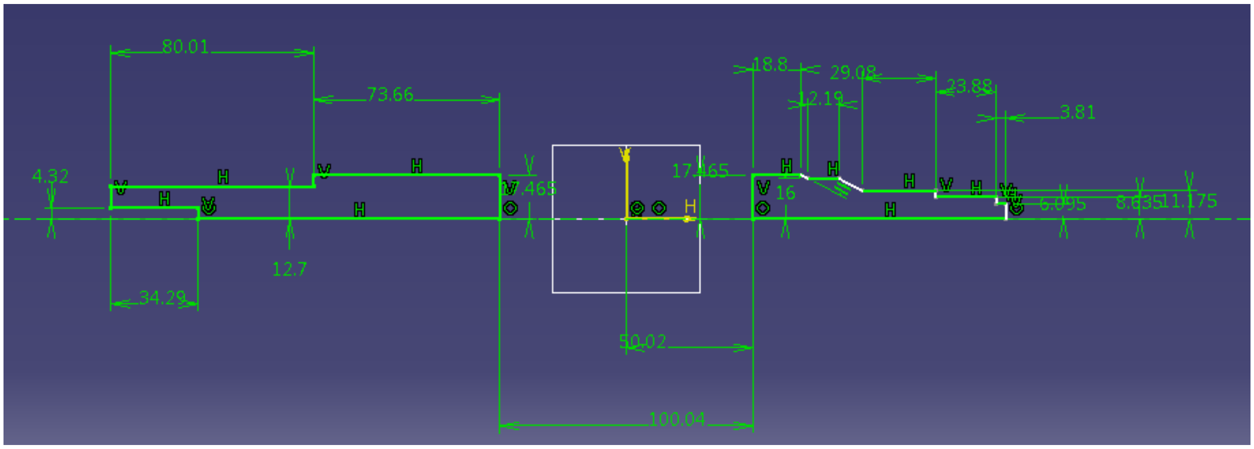

Fig 1 crankshaft line diagram

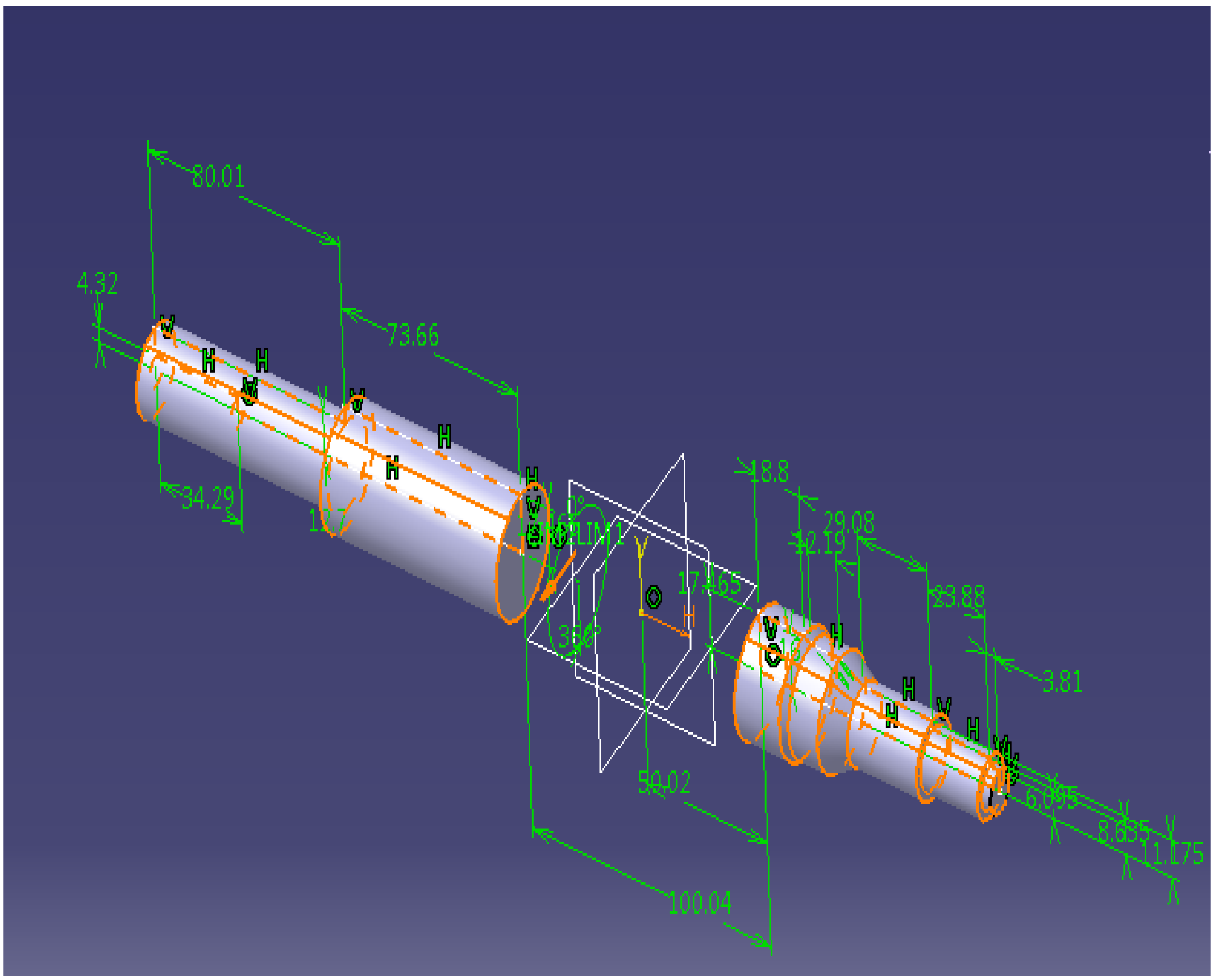

Fig 2 shaft model

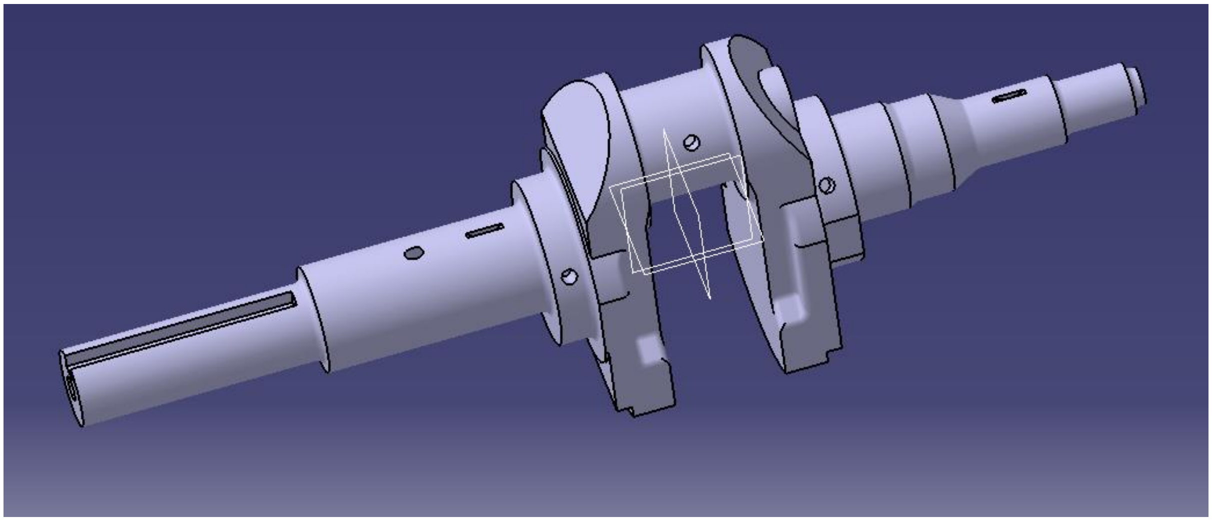

Fig 3 **final crank shaft**

5. Material properties to be using

Aluminum alloy

Physical Properties	Metric	English
Density	2.6989 g/cc	0.097504 lb/in³

Chemical Properties	Metric	English
Atomic Mass	26.98154	26.98154
Atomic Number	13	13
Thermal Neutron Cross Section	0.215 barns/atom	0.215 barns/atom
X-ray Absorption Edge	7.9511 Å	7.9511 Å
	142.48 Å	142.48 Å
	172.16 Å	172.16 Å
	172.16 Å	172.16 Å
Electrode Potential	-1.69 V	-1.69 V
Electronegativity	1.61	1.61
Ionic Radius	0.510 Å	0.510 Å
Electrochemical Equivalent	0.3354 g/A/h	0.3354 g/A/h

Mechanical Properties	Metric	English
Hardness, Vickers	15	15
Modulus of Elasticity	68.0 GPa	9860 ksi
Poissons Ratio	0.36	0.36
Shear Modulus	25.0 GPa	3630 ksi

Epoxy E glass

Physical Properties	Metric	English
Density	1.90 g/cc	0.0686 lb/in³

Mechanical Properties	Metric	English
Tensile Strength at Break	490 MPa	71100 psi
Compressive Strength	300 MPa	43500 psi
	415 MPa	60200 psi

Thermal Properties	Metric	English
CTE, linear	11.0 µm/m-°C @Temperature 20.0 °C	6.11 µin/in-°F @Temperature 68.0 °F
Maximum Service Temperature, Air	130 - 150 °C	266 - 302 °F

6. RESULTS

ALUMINUM ALLOY

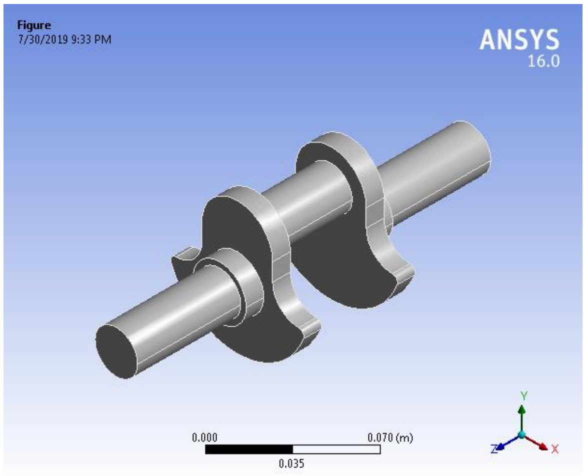

Fig 4 crankshaft

MESH

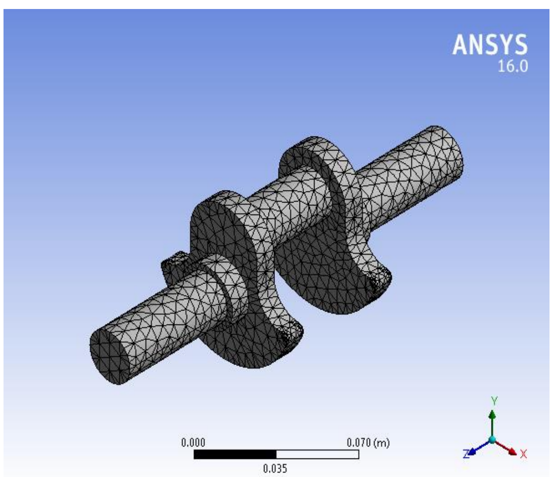

Fig 5 mesh

STATIC STRUCTURAL

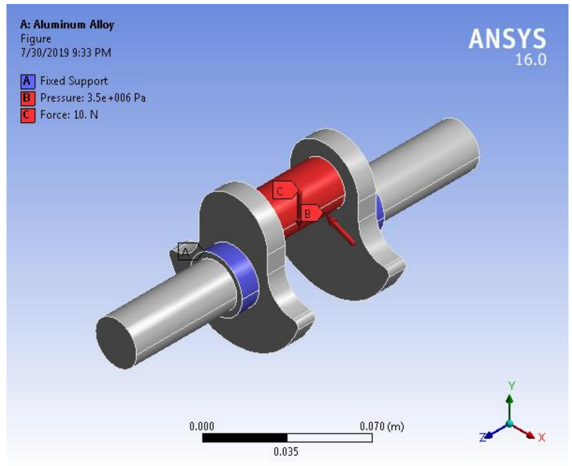

Fig 6 static structural

TOTAL DEFORMATION

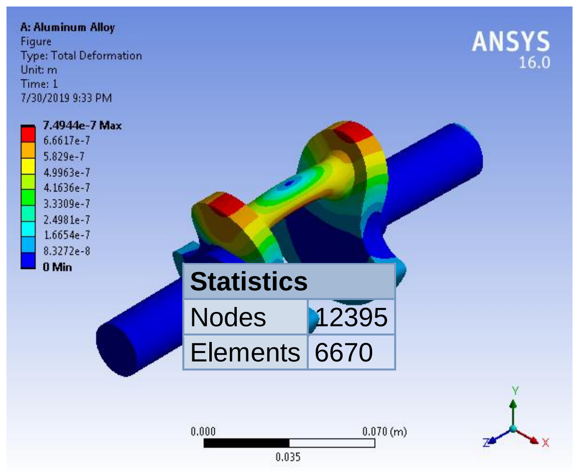

Fig 7 total deformation

EQUIVALENT ELASTIC STRAIN

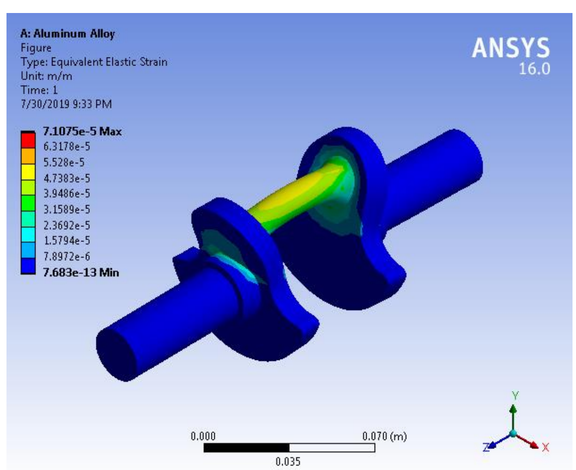

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Fig 8 equivalent elastic strain

EQUIVALENT STRESS

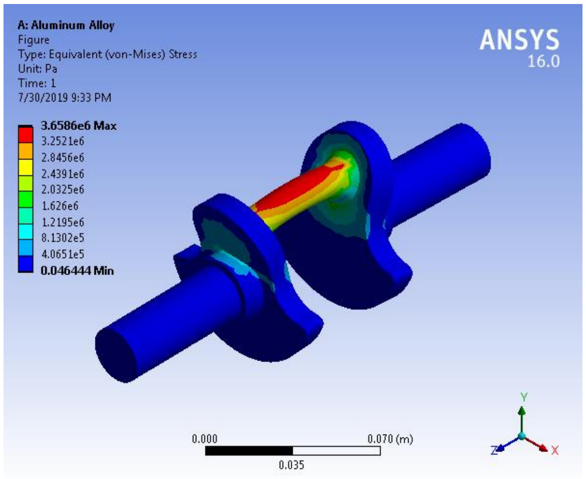


Fig 9 Equivalent stress

EPOXY E GALSS

TOTAL DEFORMATION

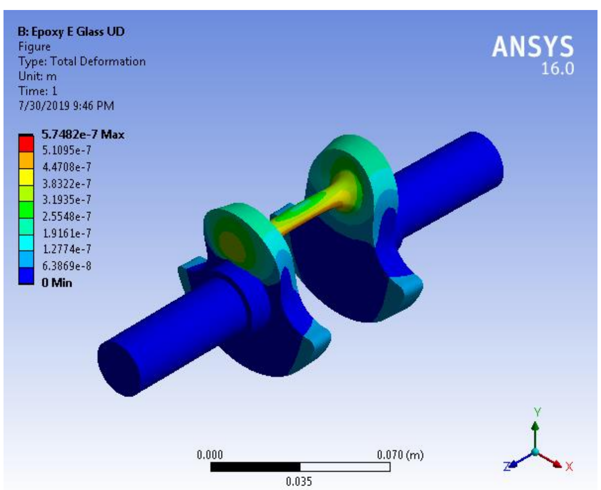


Fig 10 Total deformation

EQUIVALENT ELASTIC STRAIN

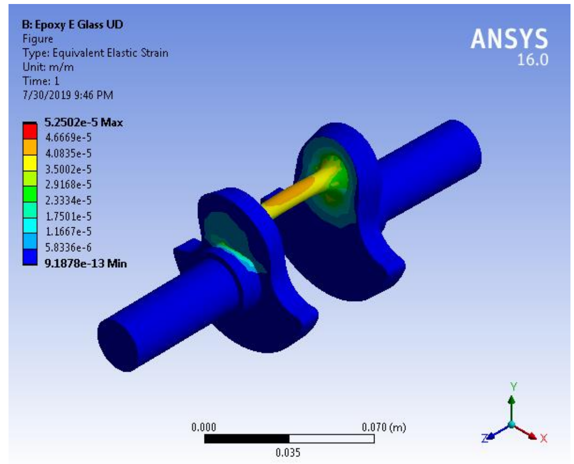


Fig 11 Equivalent elastic strain

EQUIVALENT STRESS

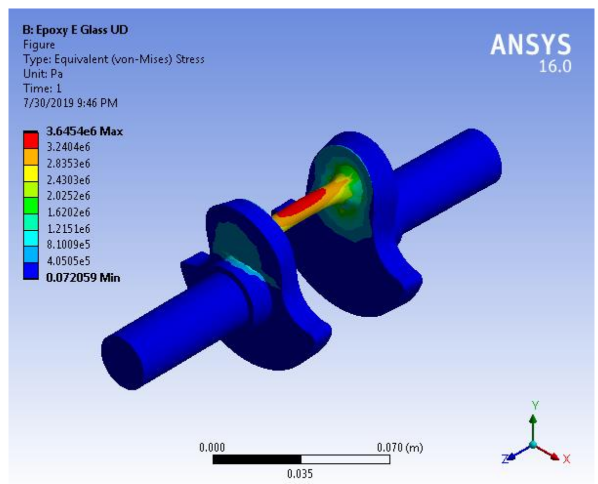
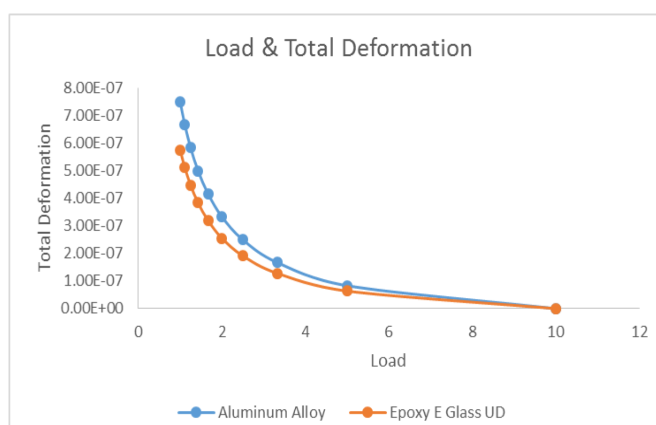
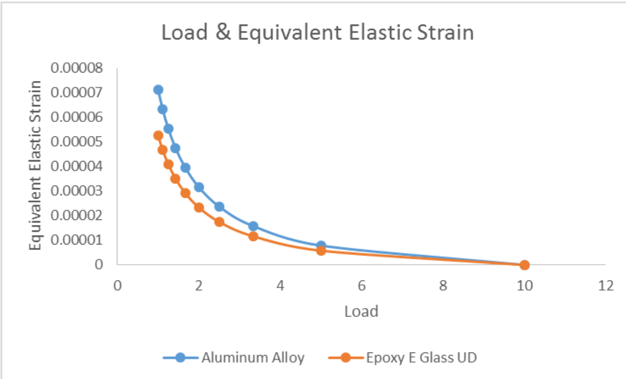


Fig 12 Equivalent stress

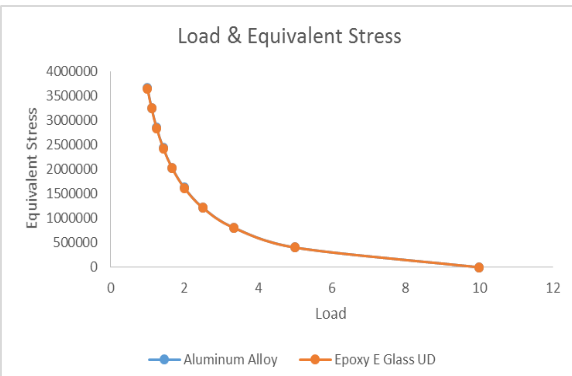
7. GRAPHS



Graph 1 load and total deformation



Graph 2. load and equivalent strain



Graph 3. load and equivalent stress

RESULT TABLE

Table 1. Result of Crankshaft

Result information	Aluminum Alloy	Epoxy E Glass
Total Deformation	7.4944×10^{-7}m	5.7482×10^{-7} m
Equivalent Elastic Strain	7.1075×10^{-5}	5.2502×10^{-5}
Equivalent Stress	3.6586×10^{6} N/m^2	3.6454×10^{6} N/m^2

8. CONCLUSION

According to the solution in software the values of both materials when its comparison was done. The deformation is less in Epoxy E Glass when compared to that of the Aluminum Alloy, the maximum stress is induced in Aluminum Alloy is more when compared Epoxy E Glass, the strain is more in Epoxy E Glass when compared to that of Aluminum Alloy. Hence the Epoxy E Glass is best.

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