FE ANALYSIS AND EVALUATION OF CONNECTING ROD BY USING ANSYS AT DIFFRENT LOAD CONDITIONS

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Abstract*— The connecting rod is one of the basic parts of the IC engine of the vehicle. The connecting rod is the association between the cylinder and the crankshaft. These changes during the cylinder response movement in the rotational movement of the drive shaft. In the engine, the rod is mainly made of steel and aluminum compounds or titanium. As a connecting rod is rigid, it can transmit thrust or pull and thus the rod can also rotate the handle through each half of revolution, i.e. push the piston and pull the piston. Previous mechanisms, including strings, may want to draw the simplest. With race engines, simply press the connecting rod. Who suffers structural deformations, for example, in this project; we model three special thicknesses of the connecting rod. These are the 6 mm, 8 mm and 10 mm connecting rods of the 2016 solid construction planning software and the static structural analysis of the Ansys 16.0 work program. Thus the parts that are modeled are converted into an IGES file to be imported into the Ansys workbench and the static structural analysis is done with a loading load of 85kg, 105kg and 120kg, the materials used for this project are made of aluminum alloy. Applying these conditions to the limits and the load of the connecting rod, one will find the stress strain strain FOS.

I. INTRODUCTION

In a reciprocating inside burning engine connecting rod or conrod associates the cylinder to the crank or crankshaft, close by the crank they shape a simple component changes over reciprcating development into turning development. Connecting rod wills changes over pivoting movement into reciprocatary development. Generally to change of engines they have been first the utilization of this way. The primary statute of the associating pole is to change over the reacting advancement into spinning development and the a different way. Push and draw a barrel that could transmit drive. This progressions the bar and the crank. It can be known as the center of the engine. An connectingrodespecially plays out the operations of pushing the chamber and removing the barrel. Thusly, the arrangement of an engine works. This gives the engine quality to start and sink into the internal gadget for which it is used. Some time recently, there were engines that can play out additional push operations or balance operations, however at the present time in the technique for usage of the engine affiliation it is possible to perform pushed and balance operations. The complete of the bar is related with the barrel with the help of the pole and moreover the tremendous end of the bar is related with the crankshaft. The basic statute of configuration is to exchange the response advancement by turning the change and the backwards. Push and attract a chamber prepared to transmit drive. This turns the bar and the key. It could be known as the point of convergence of the engine.

A partner bar passes on a ton of chamber push and barrel extraction operations. In this sense, the instrument of an engine works. This offers imperativeness to the engine to start and incorporate within the device to which it is associated. Some time recently, there were engines that can perform push operations or pulling operations, however the use and passage of the blessing strategy to be used to relate the engine can perform push and weight operations. Little to leave a touch of the post is associated with the chamber with the help of the stick and moreover the gigantic retainer a bit 'of the bar is connected with the key shaft.

II LITERATURE REVIEW

Webster et al. (1983) finished 3 dimensional restricted segment examination of a high-pace diesel motor interfacing pole. In this examination there used the best compressive load how divides measured likely, and the most versatile load which is basically in the inaction store of the chamber meeting mass and the weight transports at the barrel stick surrender and wrench surrender had been settled probably. They showed the associating pole top every one thusly, and besides showed the jar request the usage of shaft factors and multi point basic conditions.

Repgen (1998), develop completely as for shortcoming tests completed on same included substances made of powder metallic and c-70 metallic (split part steel), in this paper he makes the exhaustion quality out of the solid steel part is 21% better than anything the powder metal viewpoint and using the break low maintenance impacts in a 25% esteem markdown over the customary metal assembling technique. These essential issue suggest that a break part texture will be the material of slant for metallic solid associating pole and moreover determines two unique steels are assessed, a changed littler scale alloyed steel and a changed carbon steel. Distinctive issues determined with the guide of repgen are the need to keep up a vital separation from move spots along the isolating line of the bar and the best, need of four surfaces inside the substance association and amassing method to reduce contrast in microstructure and collecting of close net shape vital advance.

Stop et al. (2003) inquired about micro structural lead at various designing conditions and propose speedy cooling for better grain length and lower compose ferrite content. From their examinations they construed that laser indenting indicated satisfactory break part comes to fruition, while differentiated and recommended and wire lessen scores. They updated the break part parameters as, associated water driven strain, move foundation and geometry of part barrel essentially in perspective of concede time.They examined split part extreme carbon littler scale alloyed metallic (zero.7% c) with carbon metal (zero.48% c) the utilization of turning bowing shortcoming research and assumed that the past has the same or favored depletion control over the later and assessment of these break part high carbon scaled down scale alloyed metallic and powder metallic and build totally in light of uneasiness weight 18% higher than the later exhaustion

III DESIGN AND DRAFTING

Solid Works is mechanical showing robotization programming that exploits the natural Microsoft Windows graphical customer interface. It is a smooth-to-separate contraption which makes it conceivable for mechanical designers to snappy embodiment musings, investigate distinctive roads with respect to limits and estimations, and bring models and correct delineations

Design of Connecting Rod:

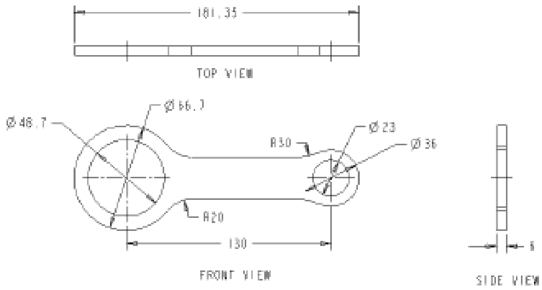


Fig1: Dimension for connecting rod

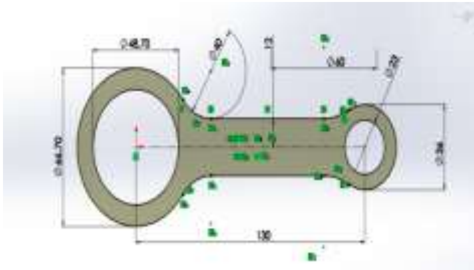


Fig2: Shows Connecting rod design model

IV FE ANALYSIS OF CONNECTING ROD

Material Property

Aluminum alloy7075 series materials are used for manufacturing of con rod or, material used for the model of connecting rod.In following table mechanical properties are mentioned as the material of connecting rod.

	A	B	C
1	Property	Value	Unit
2	Density	2770	kg m^-3
3	Isotropic Secant Coefficient of Thermal Expansion		
6	Isotropic Elasticity		
7	Derive from	Young's Modulus and Poisson's Ratio	
8	Young's Modulus	7.1E+10	Pa
9	Poisson's Ratio	0.33	
10	Bulk Modulus	6.9608E+10	Pa
11	Shear Modulus	2.6692E+10	Pa

Max Stress, max strain and max displacement over teethes are shown in figure, for different thickness of connecting rod on different load conditions.

Stress **Strain**

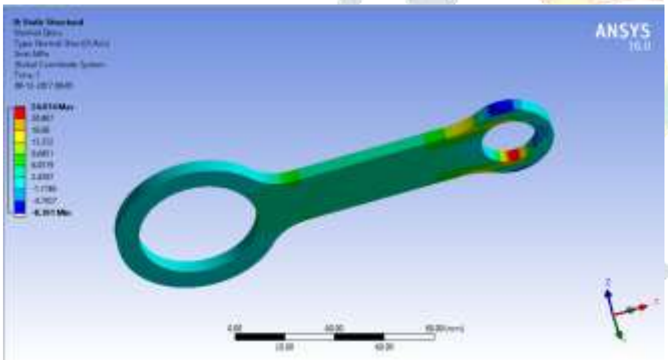


Fig 3: Normal stress on connecting rod for 6mm

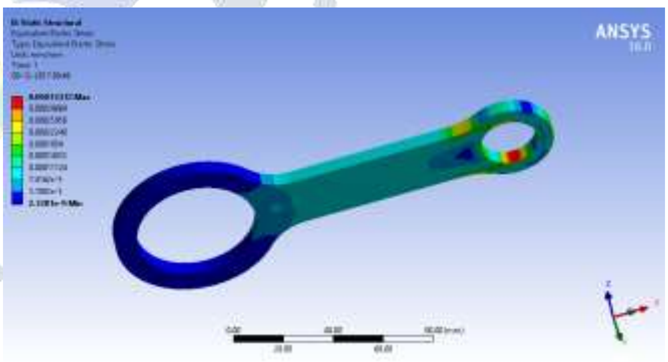


Fig 4: Strain on connecting rod for 6mm

FOS **Stress on section A-A, B-B, C-C & D-D**

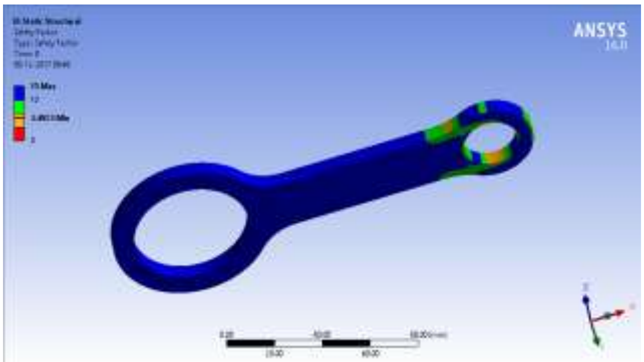


Fig5: FOS of Con Rod for 6mm thickness

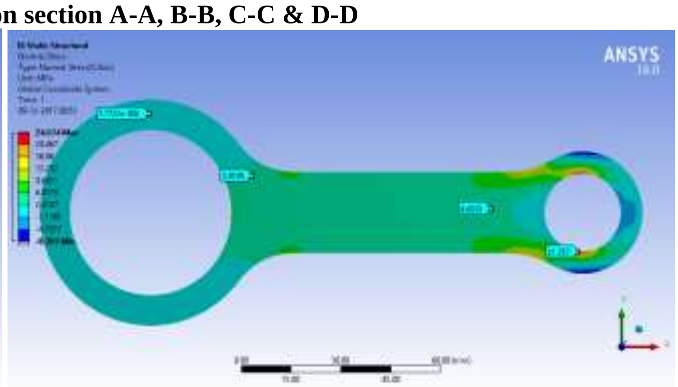


Fig6: Normal stress distribution on 4 different critical sections

V ANALYTICAL CALCULATION

The following table shows the values of stress, strain, deformation and factor of safety for con rod of thickness 6mm

Load	Stress (Mpa)	Strain	Deformation(mm)	FOS
834N	24.07	0.00033372	0.016398	3.49

1030N	29.73	0.00041215	0.020251	2.82
1177N	33.97	0.00047097	0.023141	2.47

Table 1: Shows stress, strain, deformation and FOS of connecting rod of thickness 6 mm

Calculations
Load (p) = 834N
Thickness=6mm
Section A-A

Stress (σ) = $\frac{p}{(b-d)\times t}$

$= \frac{834}{(66-48)\times 6}$

$= 7.72 \times 10^{-2}$ Mpa

SectionB-B

Stress (σ) = $\frac{p}{b\times t}$

$= \frac{834}{36\times 6}$

$= 3.86 \times 10^{-2}$ Mpa

Section C-C

Stress (σ) = $\frac{p}{b\times t}$

$= \frac{834}{30\times 6}$

$= 4.63 \times 10^{-2}$ Mpa

Section D-D

Stress (σ) = $\frac{p}{((b-d)\div 2)\times t}$

$= \frac{834}{((36-23)\div 2)\times 6}$

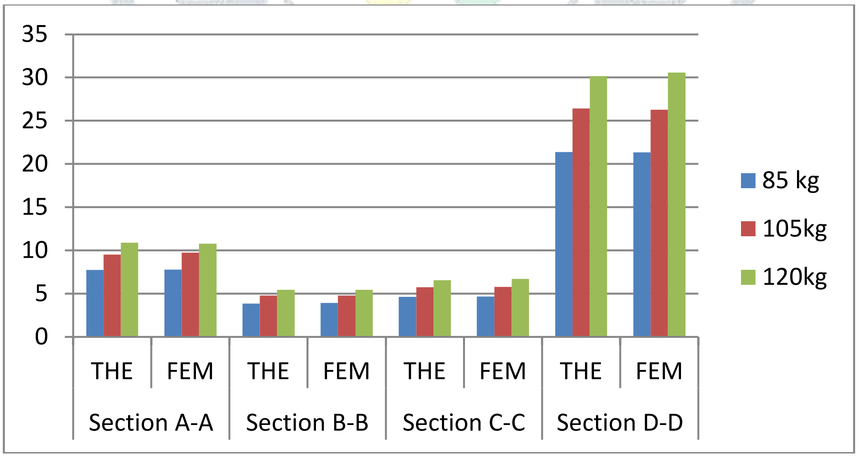
= 21.38 Mpa

VI Results

After calculating with same formula we will get the results as follow Thickness 6mm

Load	**Computed values**							
	Section A-A		**Section B-B**		**Section C-C**		**Section D-D**	
	THE	**FEM**	**THE**	**FEM**	**THE**	**FEM**	**THE**	**FEM**
85 kg	7.72e-02	7.77e-02	3.86	3.91	4.63	4.65	21.38	21.35
105kg	9.53e-02	9.75e-02	4.76	4.77	5.72	5.77	26.41	26.26
120kg	10.8e-02	10.7e-02	5.44	5.45	6.53	6.71	30.17	30.56

Table 2 Comparison of Theoretical and FEM Stress of 6mm Thickness



Graph 1 Comparison of Theoretical and FEM Stress of 6mm Thickness

Discussion:

Three different geometrical connecting rod 6mm, 8mm and 10mm thickness are modeled and transferred to Ansys workbench for analysis on three different load conditions of 85kg, 105kg, and 120kg.Results as stress, strain, deformation and DOF are tabulated in table and graphs are plotted, hence according result table and graph we found both Simulation and Analytical calculation values are approximately same, hence Results provided by simulation software ANSYS are acceptable

VII CONCLUSION

- Meanwhile by using analytical method at four different critical section of connecting rod stresses are calculated and noted, such as Sec AA, BB, CC and DD.
- By using probe option in ANSYS stresses are noted at critical section of connecting rod at Sec AA, BB, CC and DD on respective load and thickness values, results are noted and tabulated.

- Both theoretical and Fem calculated values at four different sections are tabulated and compared, and found both the values are approx same within the range of 1% error difference.

FUTURE SCOPE

In the present work, the structural static analysis on the connecting rod is carried out using the aluminium alloy of the material with the numerical method. The rod can be further modified with a lightweight material suitable for weight optimization; The optimization of the factor is to make less time to supply the product, it is stronger, lighter and much less the overall price productions. And we can use advanced composite materials and FRP materials to make the connecting rod that provides an extremely high strength-to-weight ratio compared to a commonly used alloying material, these composite materials being also economically acceptable.

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