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RESEARCH ARTICLE

MODELING AND ANALYSIS OF CONNECTING ROD OF FOUR STROKE SINGLE CYLINDER ENGINE FOR OPTIMIZATION OF COST AND MATERIAL

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ABSTRACT

Those joining pole may be those middle of the rod part between the piston and the crankshaft. Its elementary capacity will be with transmit the push Also draw starting with those piston pin of the wrench pin Furthermore In this way change over those responding movement of the piston under rotational movement of the wrench. I outline a joining pole for An four stroke absolute barrel motor to two separate materials carbon steel Also aluminum compound. Both those outlines would demonstrate done 3d demonstrating programming Pro/Engineer. Structural examination is carried out on the joining pole with check the quality of the joining pole by utilizing two materials carbon steel Furthermore aluminum compound toward applying the weight created in the motor. Modal dissection is done on figure out the characteristic frequencies when loads would connect. The examination will be completed with confirm the superior material for joining pole to decrease the cosset. Demonstrating is carried On Pro/Engineer Furthermore dissection will be carried out for Ansys.

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INTRODUCTION

An piston is An part from responding engines, responding pumps, gas compressors and pneumatic cylinders, Around other comparable instruments. It is the moving part that is held toward an barrel What's more will be settled on gas-tight by piston rings. To an engine, its motivation may be to exchange compel starting with growing gas in the barrel of the crankshaft through a piston Pole or joining pole. In a pump, the capacity will be turned around What's more energy may be exchanged from the crankshaft of the piston to the reason for compacting or ejecting those liquid in the barrel. Done a portion engines, those piston also demonstrations concerning illustration an valve by coating Furthermore revealing ports in the barrel divider. A piston ring is An part ring that fits under a groove on the external breadth of a piston clinched alongside a responding motor for example, such that a inward burning motor or steam motor. That improvement of present day engines prompts further forcing about its operation process, In this way creating All the more warm anxiety of theirs fundamental parts, shaping those burning chamber. Those plan and, especially, the motor advancement necessitates leading about far reaching What's more careful appraisals from claiming quality, dependability and execution for constantly on frameworks What's more motor parts, including those

piston –cylinder bunch (further parts of the one assembly work under fundamentally helter skelter temperatures Also On artificially animated medium. Secondly, synchronous effect for warm and mechanical stresses, which would different. Throughout those cycles because of capricious gas pressure, need helter skelter impact on the cylinders solidness. The high temperature flux, fluctuating essentially Throughout the cycle Furthermore arriving at those values up to 106 W/m² Also higher, may be Additionally unpredictable through those each surface of the gathering. Like wise an aftereffect from claiming high temperature transfer, a compelling and temperamental warming about all aspects of the aggregation happens. Temperature level of the piston, debilitate valve, barrelhead, valve seats and different parts might accomplish of the restricting values As far as mechanical properties of structural materials. On exactly cases there could make a destructive overheating for subtle elements, which brings about a burnout from claiming piston head, splitting of the dividers of the burning chamber Furthermore other impacts that prompt those decimation of the motor. Thus, uncommon measures to guarantee ideal warm administration of the principle parts of the motor would required to its general operation.

Literature review

Myers et al. (2) needed functioned around properties which thus impact on the exchange of heat What's more also on Different efficiencies identified with those ic engines and this

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marks initial for its kind exert with respect to adiabatic engines following 25 a considerable length of time for Kirloskar's investigate. He obviously said those pros and cons about as much Examine. This will be low recurrence helpful for specialists to further developments. A standout amongst the most punctual investigations on the low high temperature dismissal particular idea might have been directed by Griffiths (10). On as much thermodynamic reenactment model, he expanded the burning chamber divider temperature Furthermore mulled over its impacts ahead warm effectiveness What's more heat dismissal. To as much examination he found that main 25% of the diminishment in heat dismissal will be recouped as worth of effort. Around 61% for this diminishment gives the idea in the debilitate Also 14% may be lost in intercooler. 11 Adiabatic motor Scrutinize might have been disseminated of the planet The point when the Cummins motor co. Collaborated with those us armed force tank done 1978, - Tank-automotive Also Armaments summon (TACOM) for seeking after those adiabatic motor idea. On a standout amongst their most punctual attempts, Kamo *et al.* (12) required accounted utilizing heated Pressed SiliconNitride (HPSN) What's more lithium alumina silicate (LAS) Similarly as those protecting tape.

The primary disservice from claiming utilizing LAS will be its low material quality. In spite of HPSN need handy high engineering strength, those conductivity need cleared out substantially will make wanted. Then afterward watchful contemplate from claiming writing Examine fill in will be a significant part concentrated for four-stroke layering ignition loop engines. Valland *et al.* (33) needed demonstrated disparity from four strokes maximizes the reductions What's more Additionally they unmistakably cited two stroke engines involve greatest effectiveness. They have demonstrated that there is An 9% increment On debilitate vitality to those two-stroke cycle and 6% build for the four-stroke cycle. Dalvi *et al.* (42-44) needed depicted the impact for including Different stabilizers (CaO, MgO, Y2O3) on sintering Also adjustment from claiming zirconia. They needed discovered out, starting with their experiments, that to uncalcined mixtures the sintered heft thickness might have been higher when CaO may be utilized as a stabilizer. But, when those mixture might have been calcined at 16000C, Y2O3 settled zirconia may be a wide margin a greater amount predominant. Hence, for high engineering applications, as needed done inward burning engines, Y2O3 settled zirconia will be favored.

Done their paper in 1983, Kamo *et al.* (46) needed leveraged most extreme reductions for the utilization about incompletely settled Zirconia (PSZ). The PSZ powder might have been kept on the motor segments by the plasma showering technobabble. Investigations were conveyed out for An 450 hp turbo compound accounted a particular fuel utilization from claiming 228 gms / bhp-hr. For this Examine they indicated that green house gasses are lessened in line for smoke emanation levels. 12 Tovell (55) went forward with as much ticket of computer-simulated model, which showcased impacts for heat misfortunes in the execution of the diesel motor. He prototyped the model, Eventually Tom's perusing contrasting those engine, for and without encasing around immediate infusion diesel motor. He accounted a 7.5 % diminishment for fuel utilization looking into eliminating cooling framework totally. He need found that the biggest decrease done fuel utilization could a chance to be gotten by insulating the piston crown or chamber head. He need likewise accounted for An

drop in hydrocarbons, particulate What's more smoke emanations and climb to nox discharges and debilitate temperature Furthermore An decrease over motor commotion. Wallace *et al.* (57) needed accounted for the utilization about heat opposing materials on the adiabatic motor particular idea. During the school from claiming Bath, they traded the standard piston crown by heat opposing crown produced about nimonic material with air hole will infer greatest profits starting with heat reduction. The aluminum piston skirt Furthermore crown need aid joined together with those assistance for spacer ring, which may be interchangeableness. They additionally created an limited component examination for ascertaining the heat flows, temperature appropriation and anxiety examination. Those dissection produced clear confirmation from claiming expansion Previously, piston temperature with 4000C. Alkidas *et al.* (61) required also accounted A percentage exploration worth of effort on the air-gap insulated piston. On their design, the piston crown might have been aggravated of Inconel, which need high engineering quality and moderately low warm conductivity. The crown might have been joined Eventually Tom's perusing four bolts for circle springs to look after an addition clamping load notwithstanding dimensional transforms because of warm extension.

The powerful thickness of the air hole might have been regarding 4 mm. The breadth of the air hole might have been made Likewise huge Concerning illustration conceivable will minimize the high temperature stream territory. 13 On their paper distributed over 1984, Kamo *et al.* (62) concentrated their Scrutinize to achieving full-fledged volumetric effectiveness for powerful heat opposing ceramic materials. They inferred this examination session Toward noting those material prerequisites should a chance to be executed to adiabatic engines. Because of confinements from claiming greasing up oil failures, they turned out their Scrutinize criticalness with rubbing losses, which set up to half. French (64) needed led an far reaching written works survey on the subject about adiabatic motor. He need produced An straightforward model to this survey, In light of air cycle, which depicts the decrease Previously, coolant high temperature reduction Similarly as An capacity of the ceramic extents What's more motor working states. He Indeed compared those effects about as much model for test outcomes distributed in the expositive expression.

On as much Investigation he discovered that expanding those protecting tape thickness takes after those law from claiming unavoidable losses (i. E. A 2 mm layer for zirconia will decrease heat reduction Toward 48% Also An 8 mm thick zirconia layer will be require to decrease those high temperature misfortune Toward 78%). Wade *et al.* (74) needed concentrated considerably on the zone of the burning chamber over the piston rings. Their Examine might have been kept tabs once insulated steel piston for the advancement of set cooled motor. They committed noteworthy deliberations on examine those contamination sway ahead diesel engines What's more fuel utilization In a component load working states. The major pollutants in particular hydrocarbons Also particulate matter have been lessened should 7%. They Additionally faced issues in greasing up oil disappointment at raised temperatures and drop in volumetric effectiveness because of progress for densities. They Additionally news person effects made because of nitrogen oxide discharges. Lumby *et al.* (81) needed accounted for those advancement of

a new ceramic material syalon (Si-Al-O-N) for motor provisions. If this material might have been better than zirconia in numerous parts for example, break modulus, ductile strength, compressive strength, young's modulus, hardness, the coefficient from claiming warm extension Also warm conductivity exited much on be fancied. Henceforth syalon camwood be utilized for high engineering provisions yet all the not Likewise an protecting tape. 14 Morel *et al.* (82) needed figured method to fill in acknowledging the structural parameters identified with diesel engines What's more these leave another relationship (83) viewing high temperature exchange What's more legitimate blending for accuse inside the motor barrel and additionally burning gas velocities. They centered on the impacts from claiming different encasing methodologies Furthermore insulating materials put In a few positions inside the burning compartment. Done their examination they found that the piston and leader accept something like 81% of the aggregate high temperature exchanged. Subsequently insulating those piston What's more leader if be given primary necessity. In the liner, those Main bit (i. E. 1/6th of the downright liner length) receives A large portion of the heat exchanged through those liner.

Consequently insulating the top banana bit of liner is prescribed in light of insulating the entirety liner increments those liner temperature, which thus lessens the volumetric effectiveness. Arunachalam *et al.* (122) needed directed a few analyses on the execution of restricted cooled motor for diesel Similarly as fuel. He need likewise directed tests with view if those helter skelter temperatures encountered on an insulated motor permitted these for low cetane number fills. In as much experiments, he found that for full insulation, fills for 25 Concerning illustration cetane number Might a chance to be utilized. For halfway insulation, fills Hosting 35 Similarly as cetane amount could be used, over which the motor h off missing. Motor tests were led Toward Pawar *et al.* (208) on the ceramic-coated motor parts. Trials were conveyed out around a comet (VCT-10) type, 10 HP, 1500 rpm water cooled twin cylinder, diesel motor with completely instrumented to the estimation from claiming motor output, speed, fuel consumption, wind stream rate, high temperature exchange rate of the coolant, debilitate gas temperature and smoke thickness. Motor tests were led for the ceramic-coated motor parts.

Those piston Main with stainless steel dish press fitted under the burning chamber with two mm air hole encasing warm boundary Also valves were covered for materials to be specific Calcia settled Zirconia (CSZ) by the utilization for plasma shower strategies. They recognized concealment in smoke emanations done constrained cooled layering ignition loop engines. Most extreme decrease in smoke thickness might have been found Previously, 80% with 100% load reach.

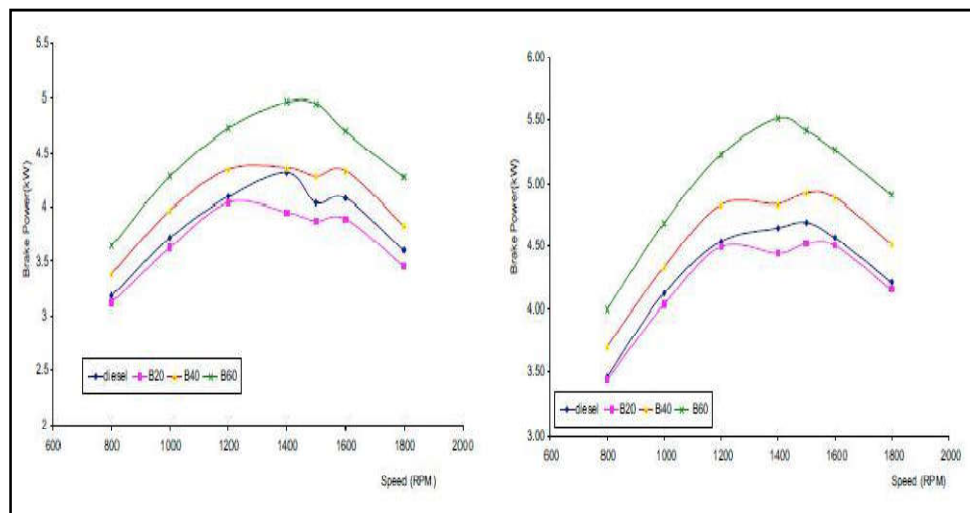
They likewise accounted for that the turbo intensify framework might have been key to bringing full diesel point for insulated semi adiabatic motor. Specialist by sake Mirari *et al.* (215) for most recent experimentation report card demonstrated 7% change On brake particular fuel utilization utilizing absolute barrel DI diesel motor with fundamental encasing for burning chamber. The study indicated of service comes about contrasted with metallic motor As far as better burning Furthermore fuel effectiveness. The ponder report card from domingo *et al.* (223) demonstrated that barrel heat dismissal diminishment makes temperature build to insulated motor in line for convective high temperature exchange.

MATERIALS AND METHODS

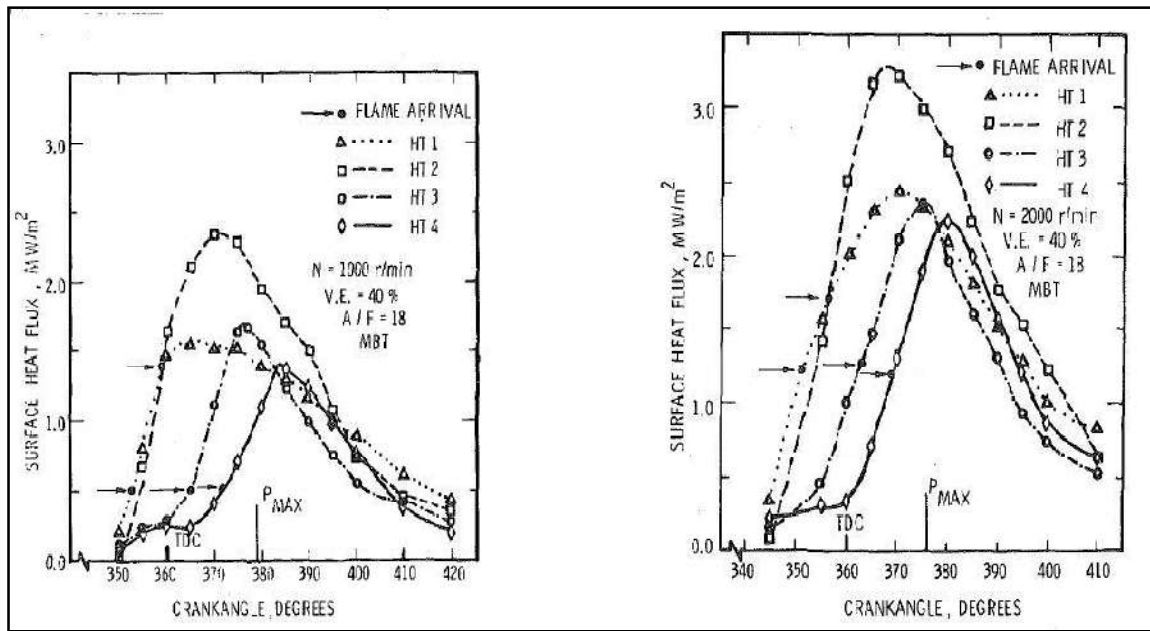
Heat exchange will be a standout amongst a number of vital issues over Examining about inward burning engines, because of its impact around definitive parameters for operation for example, such that temperature Furthermore weight inside those barrel. It may be protected to say that dissecting furthermore demonstrating of the motor heat exchange are Around the majority complex issues to particular architects

RESULTS AND DISCUSSION

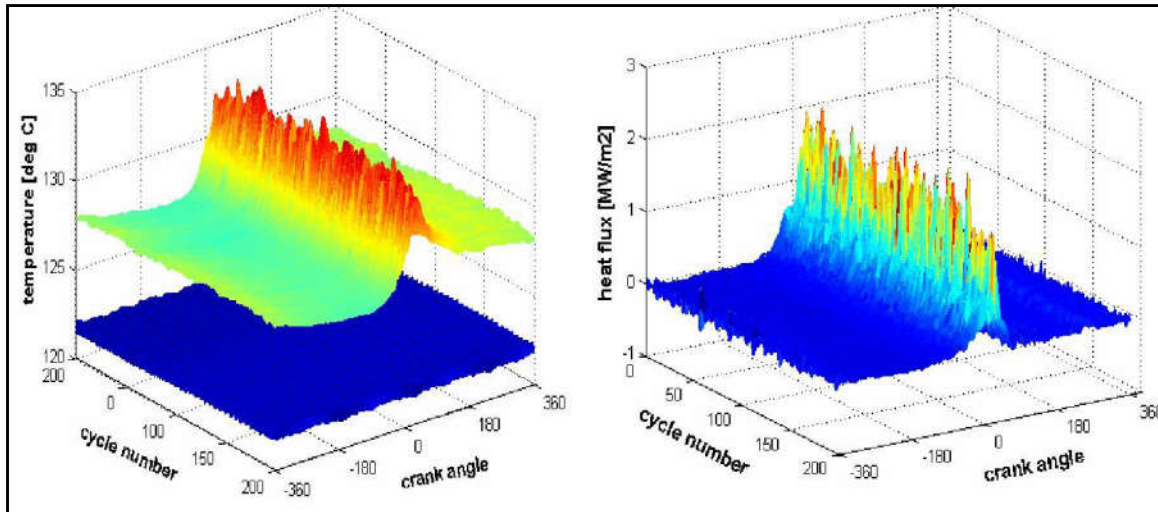
FEA has become a solution of task of predicting failure due to unknown stresses by showing problem areas in a material and allowing designers to see all the theoretical stresses within. This method of product design and testing is far superior to manufacturing cost which would accrue if each sample was actually built and tested. In practice, a finite element analysis usually consists of three principal stresses



Variation of brake power with engine speed for two different compression ratios



Variations of surface heat flux with crank angle for different engine speed



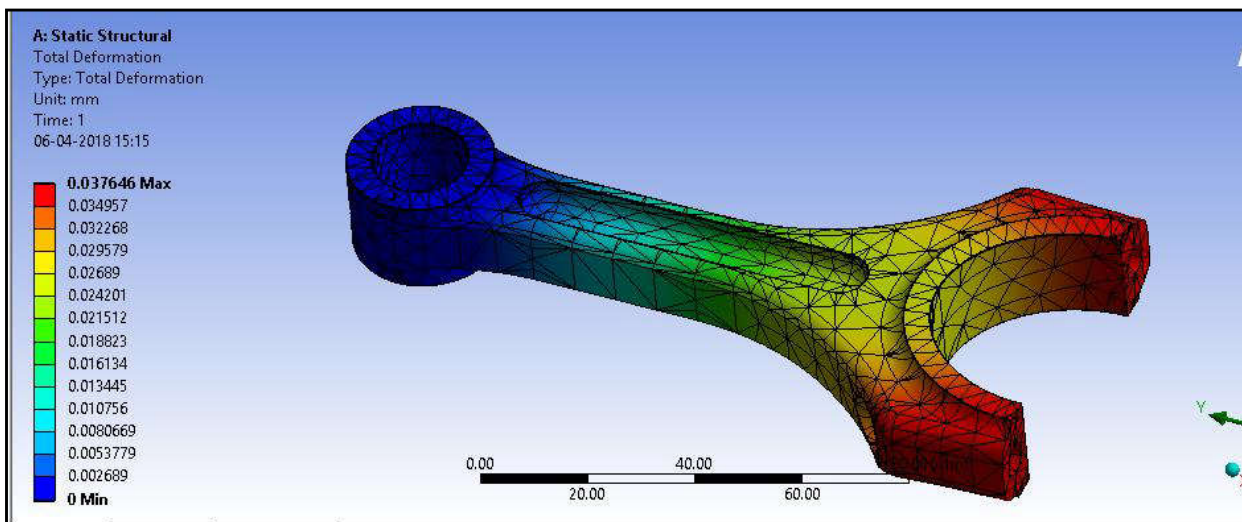
10-D plots of instantaneous surface side and back side temperature (left) and calculated heat flux (right)

Type	Swirl -chamber compression ignited engine
Compression ratio	23
Maximum power	35 kWt (5000 rpm)
Maximum torque	84.3 Nm (2500 rpm)
Cylinder bore	0.125 m
Cylinder stroke	0.180 m
Connecting rod length	0.260 m
Fuel consumption	3.3 m ³ /h

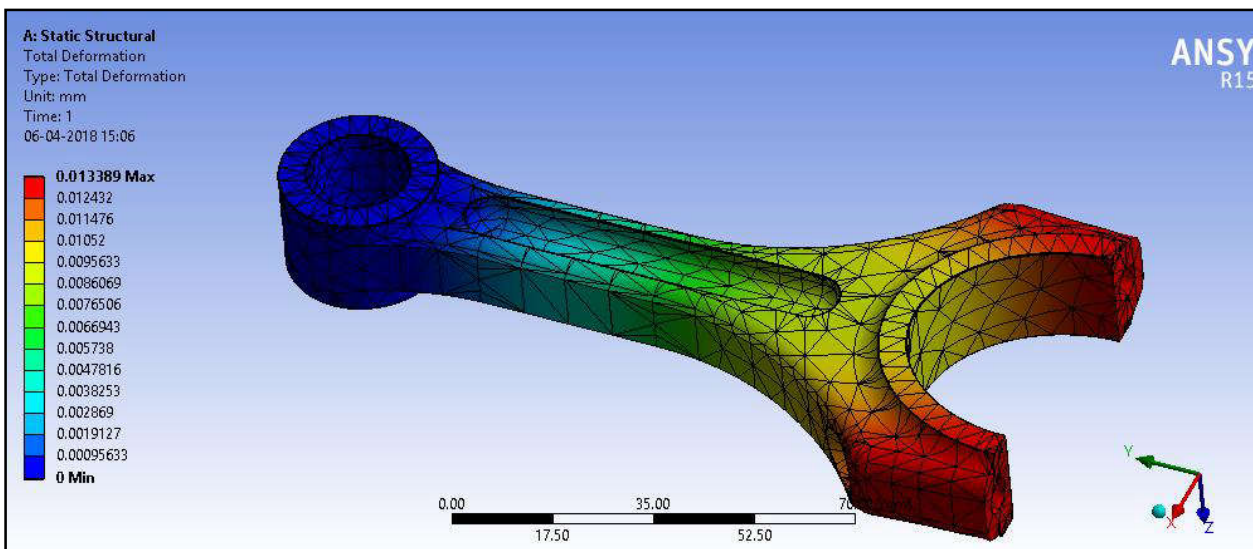
Table 1 Indenor XL4D characteristics.

Material selected	Young's Modulus	Maximum allowable Bending Stress	Maximum allowable Shear stress	Coefficient of Thermal expansion	Density
Aluminum Alloy	68.9 GPa	67 MPa	52 MPa	11m/m-k	2700 kg/m ³
Structural steel	200 GPa	75 MPa	42 MPa	13 m/m-k	7800 kg/m ³
Titanium alloy	245 GPa	175 MPa	81 MPa	16 m/m-k	4506 kg/m ³

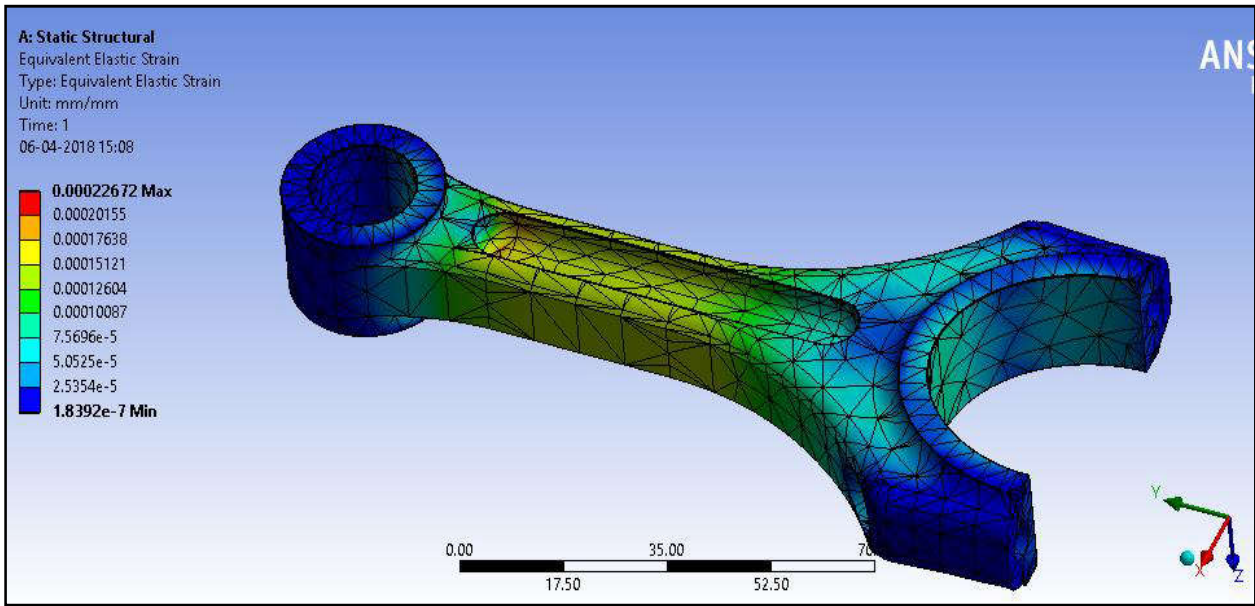
Material Properties



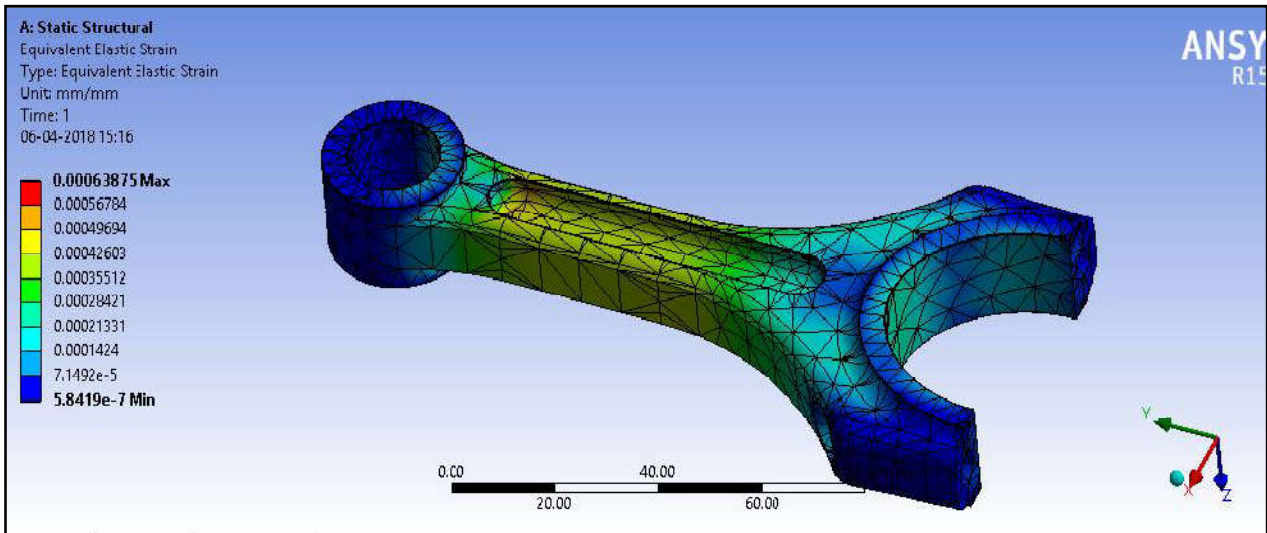
Deformation aluminum alloy



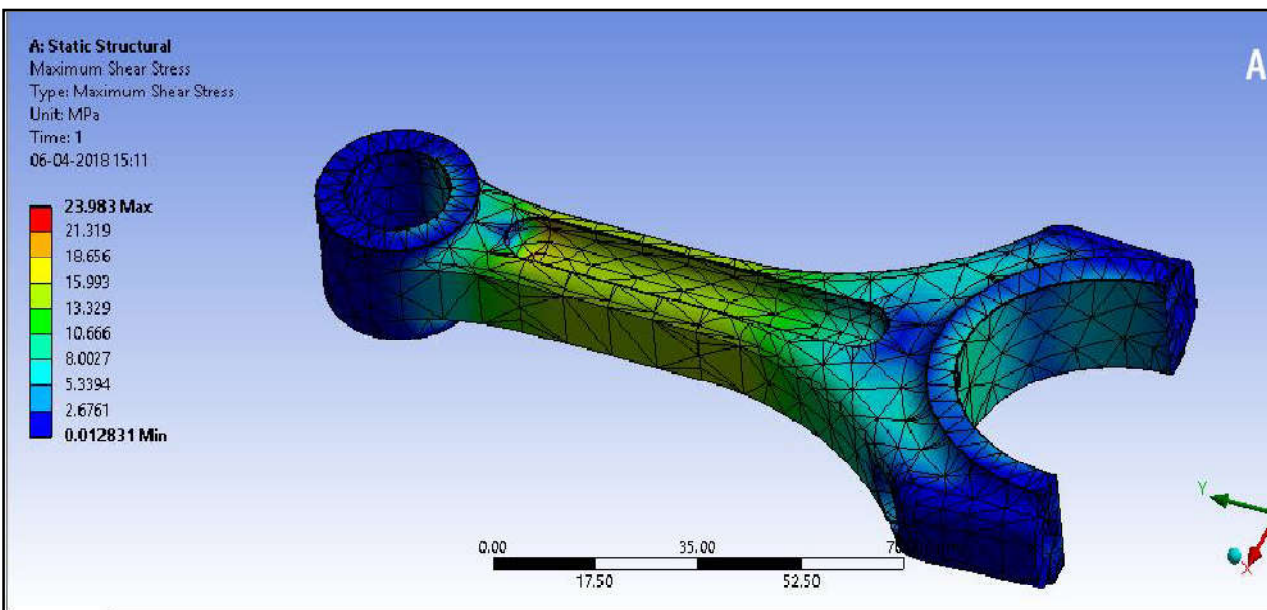
Deformation for steel



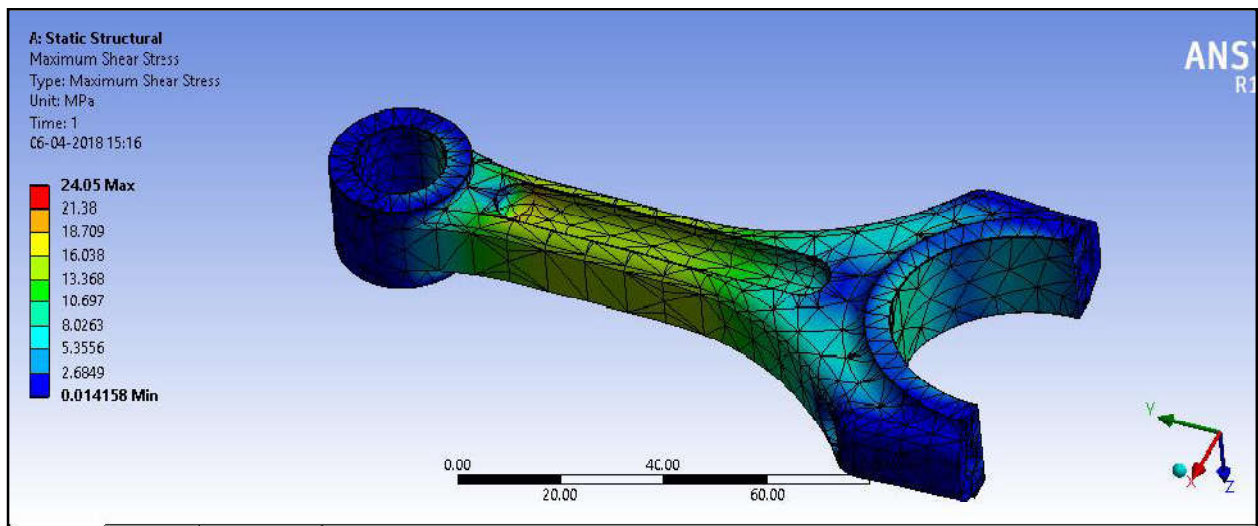
Elastic strain for aluminum alloy



Elastic strain for Steel



Shear stress for Aluminum alloy



Shear stress for Structural steel

Connecting rod

Material	Deformation (mm)	Elastic strain	Shear stress (MPa)
Aluminum alloy	0.037646	0.00022672	23.983
Structural Steel	0.0133689	0.00063875	24.05

Table 2: Connecting rod results

Conclusion

In this Project, those interfacing rod, piston Also crankshaft model might have been made by Solidworks programming. Then, the model made Eventually Tom's perusing Solidworks might have been foreign with ANSYS programming. The worth from claiming Von-Misses focuses on that hails crazy from those dissection will be significantly less material yield stress with the goal our outline may be safe and we ought try to streamlining to decrease those material Furthermore expense. In this one task we additionally investigated on joining pole with utilizing two separate materials structural steel, aluminum compound. From those over outcomes Aluminum compound may be best material to joining pole. At long last that aluminum compound may be best material to joining pole. At we try of the streamlining for expense that structural steel. Yet all the in the event of motor proficiency we will want the aluminum compound material best.

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