International Journal of Innovative Technologies
WWW.IJITECH.ORG
ISSN 2321-8665
Volume.06, Issue.02,
July-December, 2018,
Pages:0521-0529

Mechanical Design and Analysis of Automatic Coal Crushing Machine

T. HARISH BABU[1], B. NARENDER RAO[2]
[1]PG Scholar, Dept of Mechanical Engineering, SVITS, Mahbubnagar, TS, India.
[2]Assistant Professor, Dept of Mechanical Engineering, SVITS, Mahbubnagar, TS, India.

Abstract: A crusher is a machine designed to reduce large rocks into smaller Coal rocks, gravel, or rock dust. Crushers may be used to reduce the size, or change the form, of waste materials so they can be more easily disposed of or recycled, or to reduce the size of a solid mix of raw materials (as in rock ore), so that pieces of different composition can be differentiated. Crushing is the process of transferring force amplified by mechanical advantage through a material made of molecules that bond together more strongly, and resist deformation more, than those in the material being crushed do. Crushing Coals hold material between two parallel or tangent solid surfaces, and apply sufficient force to bring the surfaces together to generate enough energy within the material being crushed so that its molecules separate from (fracturing), or change alignment in relation to (deformation), each other. The earliest crushers were hand-held stones, where the weight of the stone provided a boost to muscle power, used against a stone anvil. Querns and mortars are types of these crushing Coals. The solid model of crusher machine and blades is developed in CATIA V5. Tetrahedral mesh is generated for the model using ANSYS. Static, Eigen and frequency responses analysis of both mild steel body and high carbon steel blades are carried out. Inter laminar shear stresses are calculated for composite propeller by varying the number of layers. The present thesis deals with modeling and analyzing the crusher blades of a crusher machine for their strength. A propeller is a complex geometry which requires high end modeling software. Most conventional Coal recycling machines crushes Coal only into cullet. The resulting cullet is used for making Coal again if it is transparent or brown, and other cullet is mixed in secondary concrete products, asphalt paving and blocks. The cullet, however, is low-value-added products, and its use in business is limited. On the other hand, Super sol, produced by the Coal Recycling Plant, has a wide range of application, such as a light embanking material in civil engineering, a culture medium or an inorganic soil amendment in horticulture and agriculture, a purification material in water purification and an insulator in architecture. It is now used in various areas for various purposes. The stresses obtained are well within the limit of good crushing and hard elastic property of the materials. The results were compared with failure theory and found they were within the safe limits.

Keywords: CATIA, ANSYS, CAD.

I. INTRODUCTION

A Coal crusher accommodates pummeling of Coal to a yield size of 3" or less. Reusing tasks may extend from basic, physically sustained, independent machines to indulgent pulverizing frameworks finish with screens, transports, crushers and separators. All non-Coal contaminants should by and large be expelled from the Coal preceding reusing. The procedures utilized as a part of Coal pulverizing for reusing includes similar strategies utilized by the total business for smashing into little bits of (Coal crusher). Innovation is changing individuals' work designs, in the s a me way, the Coal squashing process is likewise changing constantly. The customary Coal squashing creation process has been a long way from meeting necessities of the general population. Just progressed new write Coal crusher and its wise procedure can meet the advancement of the business. Zambia is quickly pushing on the national foundation, which requires a considerable measure of building materials, as well as necessities a ton of Coals as shown in Fig.1. As we as a whole know, Coal utilized as a part of Crushers Grinding Mills all parts of our lives, have the capacity of capacity, as well as have improving impact. After vast scale urban framework and decimation, the rest of the Coals for the most part move toward becoming was drift additionally involve extensive space, the most vital thing is that it effectively motivations damage or demise in the event that we lose the was Coal. What's more, a t a similar time, we require a ton of Coal preparations. So it is vital and dire that how would we can transform was Coal into treasure, spare assets and a great deal of urban development reserves.

Fig.1. Coal is to pound.

Most ordinary Coal machines pound Coal just into cullet. The subsequent cullet is utilized for making Coal again in the event that it is straightforward, and other cullet is blended in optional items, black-top and squares. The cullet, be that as it may, is low-esteem included items, and its utilization in business is restricted. Then again, delivered by the Waste-Coal Recycling Plant, has an extensive variety of use, for example, a light embanking material in structural building, a culture medium or an inorganic soil alteration in cultivation and farming, a cleansing material in water purging and a separator in design. It is presently utilized as a part of different regions for different purposes. Be that as it may, current Coal pounding process has been far not quite the same as the customary strategy, which receives the arrangement of buoy Coal smashing creation. The framework is essentially made out of fall of plate, plate and crusher machine. The hardware passes on the unfit Coal fall in the mechanical production system straightforwardly to roller crusher pounding floor stockroom for auxiliary pulverizing and squashing, so it falls a point through the fall plate, at that point associate plate roller union, inadequate Coal been transported to the Coal Crushing apparatus, there is a cone smashing distribution center underneath plate and crusher, the base of the devastating distribution center introduce optional crusher, the pounded class after auxiliary pulverizing been into dissemination over belt framework, Board roller Coal and crusher are transparently introduce on the floor, dust with passage and exit of crusher all can fly out and afterward contacts the roller transport gear and the exchanging qualified Coal surface, the second pounding is likewise similar to this. These are the new stream of present day Coal pounding process which contrasted and the customary smashing strategy is technique more sheltered and proficient, it is likewise exceptionally accommodating for big business' long haul speculation interests. Ti me in consistent advance, The New Type of Coal Crusher has some specialized updates each yea r, for time is cash in the market rivalry, which can make the greatest creation productivity in the most limited time will win the favorable position in the market.

A. Benefits of the Coal Cycler/Crusher

The Coal cycler Coal group deals with support of the crusher and containers, and furthermore gathers the Coal all the time. For cordiality outlets the volume lessening prompts bring down gathering cost, reserve funds away space, less taking care of, less clamor issues, a critical diminishment in OH&S dangers and a tidier work environment. For bigger inns the investment funds can add up to $30,000 every year, estimated in circumstance cost of $25 every hour. Up to half of the month to month expense for the crusher and Coal is typically as of now recovered by the diminishment in gathering cost or by crusher and Coal is normally as of now recovered by the lessening in accumulation cost or by sparing 15 minutes every day on work costs. For Coal gatherers the idea of on-premises pounding prompts better productivity; a higher esteem for every payload, bring down get recurrence 9Coal rather than air) and less defilement of the cullet. Executing the Coal Cycler in Coal reusing gathering can bring about a 60% higher gross overall revenue per payload as shown in Fig.2. The gathered Coal, at last, is taken to the Visy preparing plants in Sydney and Melbourne for programmed arranging. At this stage the squashed Coal particles are called cullet. Coal cycler has adjusted the yield from the crushers to meet Visy necessities and can ensure a recuperation rate of Coal for reusing that is far above industry normal.

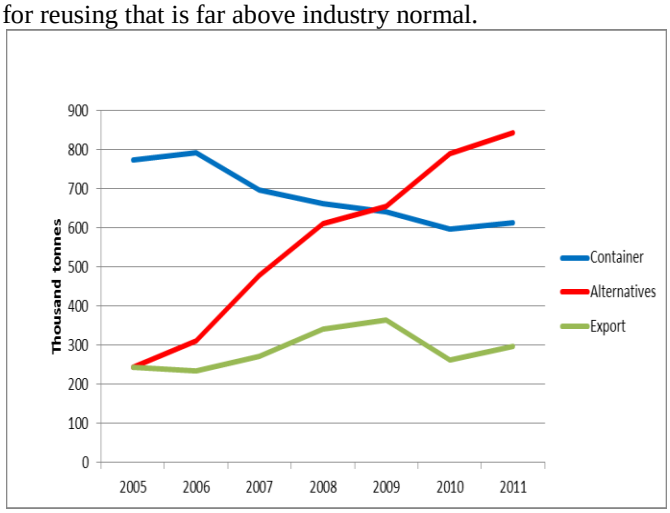

Fig.2. Volumes of Coal by end utilize.

III. WORKING PRINCIPLE

A. Coal Crusher Machine

Coal Crusher Machine is to utilize the high turn speed mallets to smash the waste Coal coming into the devastating council of the Coal crusher machine as shown in Fig.3.

Fig.3. Coal crusher machine.

The standard of little Coal crusher machine is as per the following:

- In the devastating assembly of the Coal crusher machine, there are numerous mallets which are introduced on the inside shaft t. The engine influence the inside shaft to pivot in fast. In this manner, the mallet on the inside shaft additionally pivots in rapid.
- The squander Coal goes into the devastating chamber through the feed bay, and after that it is squashed by the fast mallets into little pieces.
- On the base of the Coal crusher machine, there is half-round sifter, and on the strainer there are numerous gaps. Just the little Coal pieces can experience the sifter, the huge size Coal pieces will be pulverized again by the mallets.

B. Working Principle of Crusher

The structure of crusher: fundamental edge, whimsical shaft, an expansive belt pulley, fly wheel, swing , side watch plate, flip plate, Rear section, alter hole screw, reset spring, and settled and swing load up and so on., and the flip plate additionally assumes a part of security. The engine transmits control through belt and belt pulley, drives the swing encompass the unconventional shaft do intermittent movement. The edge between flip plate and swing increments when swing climbs, which influences the moving to get closes to the settled. In the meantime the material is pressed, rubbing, granulating and other various broken. The point of Crusher between flip plate and swing diminishes when swing moves down, the moving of Crusher moves from settled by the pulling of pole and spring, the items subsequent to pulverizing will be released from the outlet of Crusher.

C. Advantages Particularly Cost Friendly

Diverse sizes of Cogelme crushers can process from 4 to 24th of Coal Coals. On account of high proficiency and low working expenses, for a long time Cogelme Coal crusher has been picked and utilized by the fundamental European Coal Coals recyclers and Coal industrial facilities.

D. Application, Crushes To Optimal Sizes

Likewise know n as Coal Crusher, Cogelme Cylinder Mill ideally pounds high volumes of Coal after they have been isolated from different materials: wood, metals, plastic, and so forth., and productively obliterates Coal with the items inside as shown in Fig.4.

Fig.4.

Barrel process is a perfect answer for Coal Coals recyclers, makes, and sustenance makers, in reality anyplace Coal holders, drink Coals or nourishment jugs are an issue.

IV. DESIGN METHODLOGY OF AUTOMATIC COAL CRUSHING MACHINE

CATIA (Computer Aided Three-dimensional Interactive Application) is a multi-stage CAD/CAM/CAE business programming suite created by the French organization Dassault Systems. Written in the C++ programming dialect, CATIA is the foundation of the Dassault Systems item lifecycle administration programming suite. CATIA contends in the top of the line CAD/CAM/CAE advertise with Cero Elements/Pro and NX (Unigraphics).

Modeling of Automatic Coal Crushing Machine in CATIA V5: This AUTOMATIC COAL CRUSHING MACHINE is composed utilizing CATIA V5 programming. This product utilized as a part of vehicle, aviation, customer merchandise, substantial building and so forth it is ground-breaking programming for outlining convoluted 3d models, utilizations of CATIA Version 5 like part configuration, get together plan as shown in Figs.5 and 6.

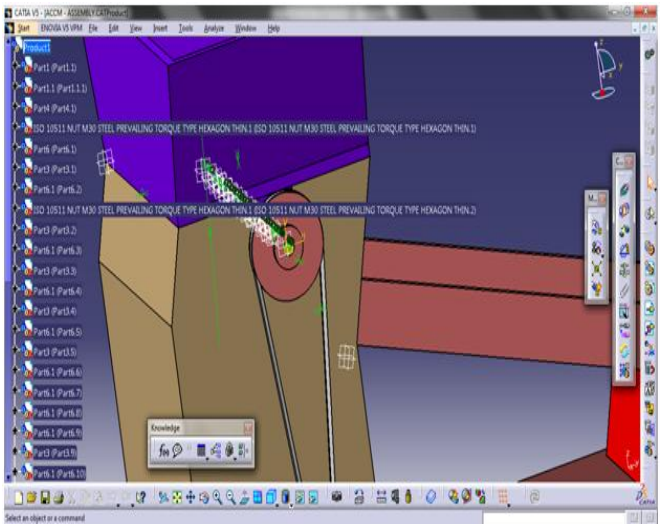

Fig.5. Model outline of AGCM in CATIA-V5.

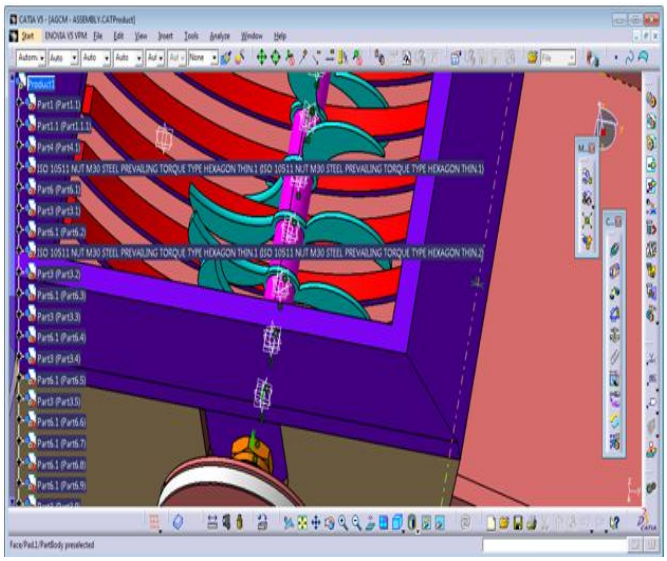

Fig.6. Model course of action of sharp edges in CATIA.

V. ANALYSIS OF AUTOMATIC COAL CRUSHING MACHINE

A. Procedure for FE Analysis Using ANSYS

The examination of the Crusher edge, brambles, Tubs, and shafts are finished utilizing ANSYS. For contend gathering isn't required, engine and joined pulley framework is to did by applying minutes at the pivot area along which hub we have to specify. Settling area is base legs of bar get together machine.

B. Preprocessor

In this stage the accompanying advances were executed:

Import Document in ANSYS Window:

Document Menu > Import> STEP > Click alright for the flew up discourse box > Click

Peruse" and pick the document spared from CATIAV5R20 > Click alright to import the record

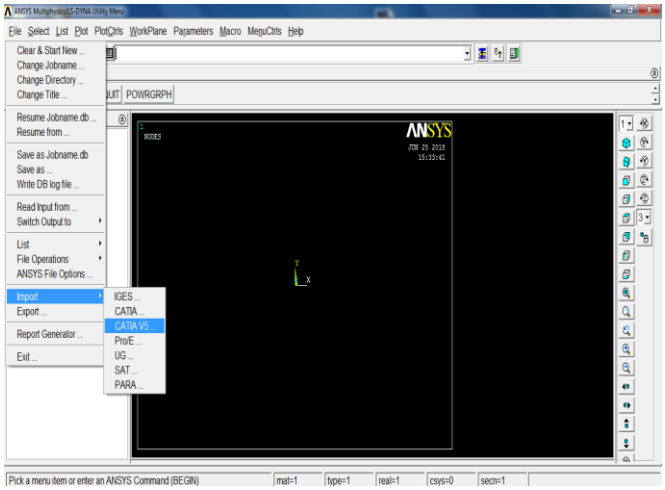

Fig.7. Import board in Ansys.

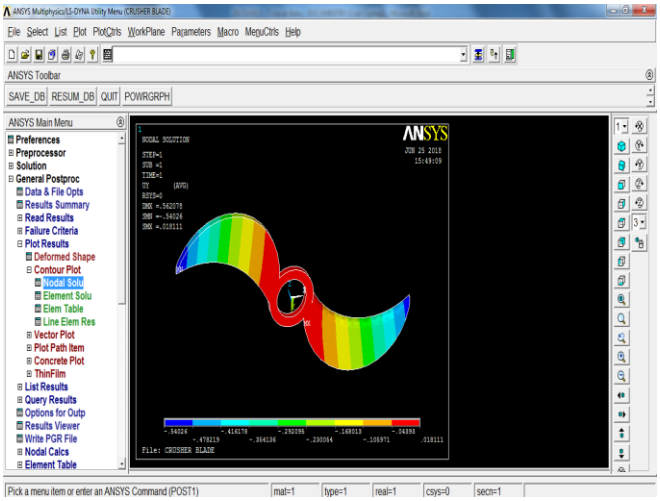

Fig.8. Displacement picture.

In the wake of finishing the cross section of every get together parts next is to do investigation in view of the OEM (Original Equipment of Manufacturer) application as shown in Figs.7 to 10. So every one of the models which are turned along which pivot that we have to specify in the Analysis programming to get precise outcomes according to the first segment. A portion of the segments are should have been fathomed utilizing static examination. Which is specified beneath what segments are expected to do which kind of investigation? Load is connected and settling at the base key area of Motor, Was approved in the second reproduction. Approval The tooling comprised of twist kick the bucket, and weight bite the dust. The material and geometric properties are recorded.

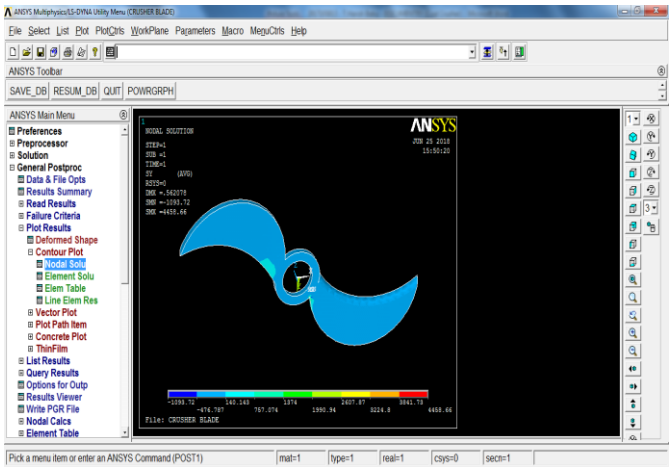

Fig.9. Stress picture.

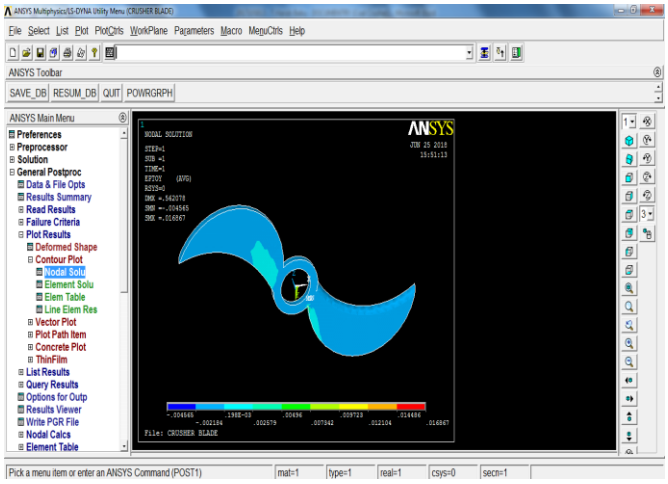

Fig.10. Strain picture.

VI. DISCUSSION ON ANALYSYS RESULT

Results of this paper is as shown in bellow Figs.11 to 37.

A. Results of Displacement Investigation

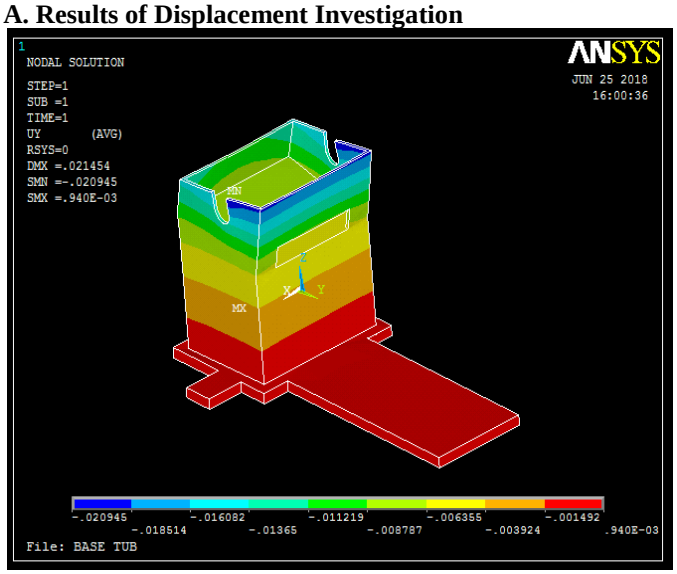

Fig.11. Displacement of Base Tub.

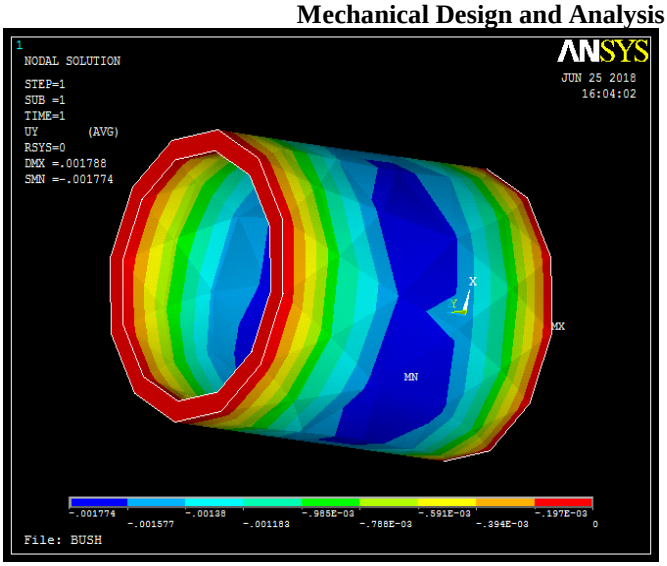

Fig.12. Displacement of Bush.

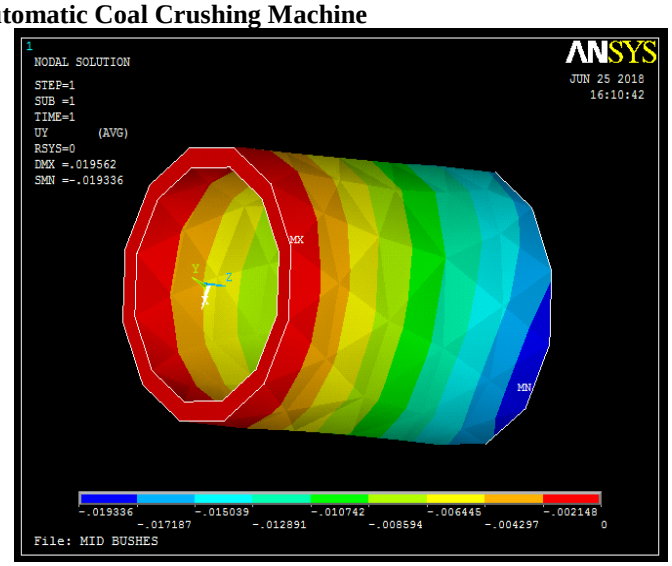

Fig.15. Displacement of Mid Bushes.

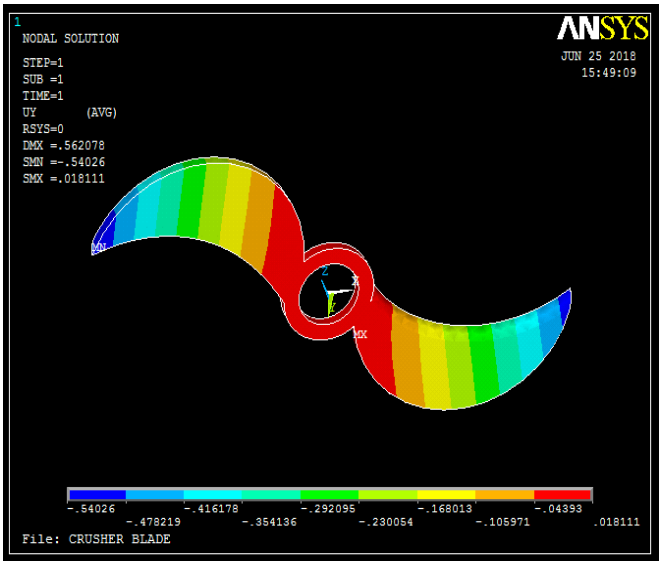

Fig.13. Displacement of Crusher Blade.

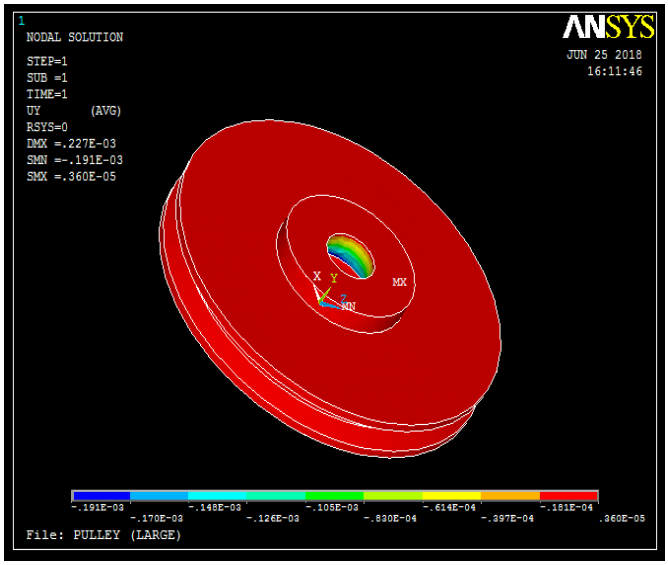

Fig.16. Displacement of Pulley – Large.

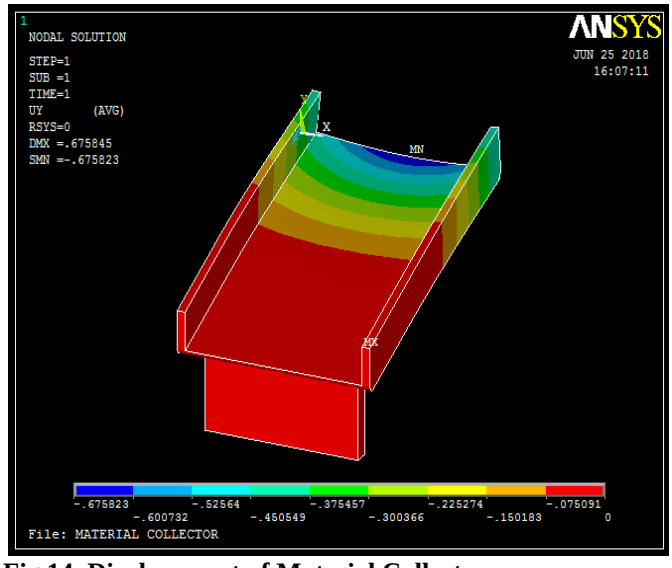

Fig.14. Displacement of Material Collector.

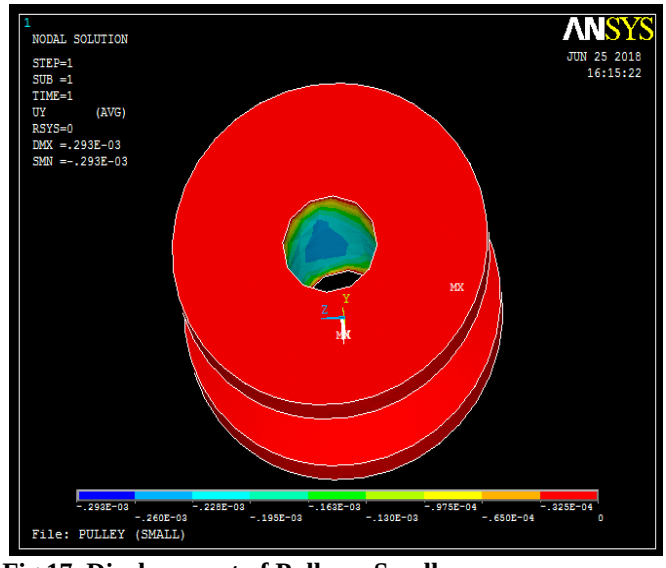

Fig.17. Displacement of Pulley – Small.

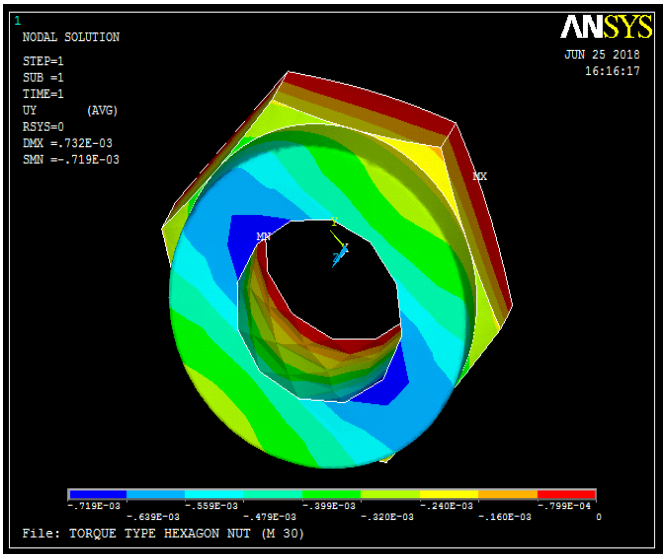

Fig.18. Displacement of Hexagon Nut.

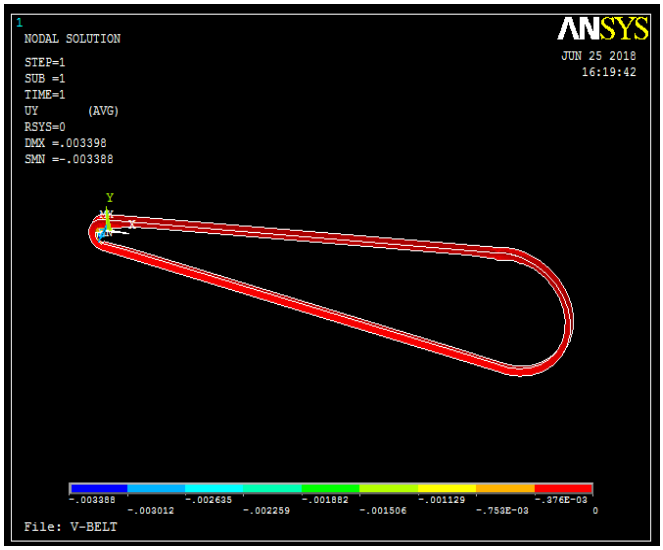

Fig.19. Displacement of V-Belt.

B. Results of Stress Investigation

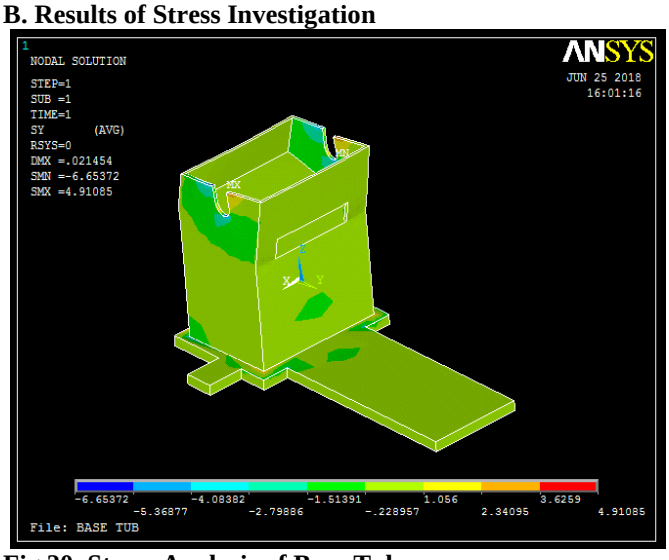

Fig.20. Stress Analysis of Base Tub.

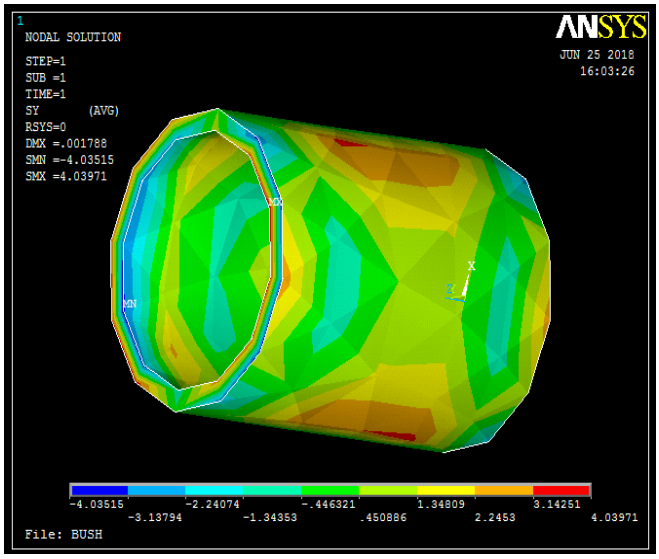

Fig.21. Stress Analysis of Bush.

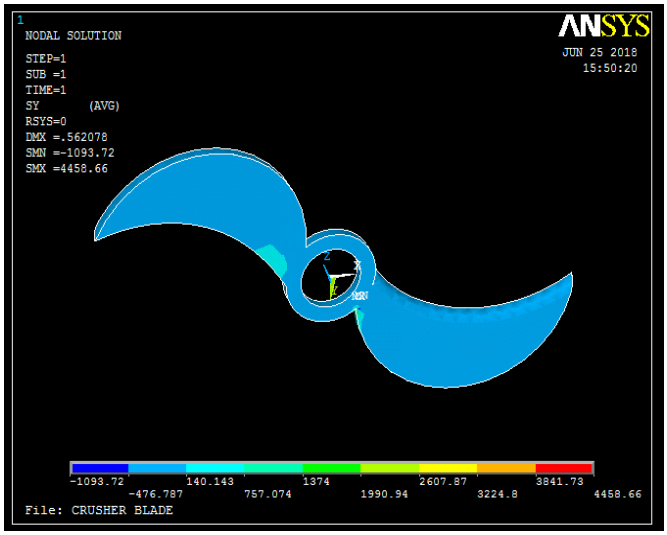

Fig.22. Stress Analysis of Crusher Blade.

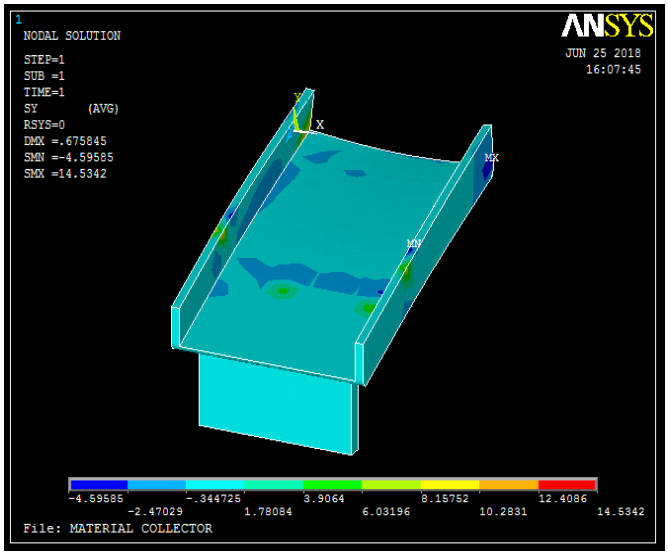

Fig.23. Stress Analysis of Material Collector.

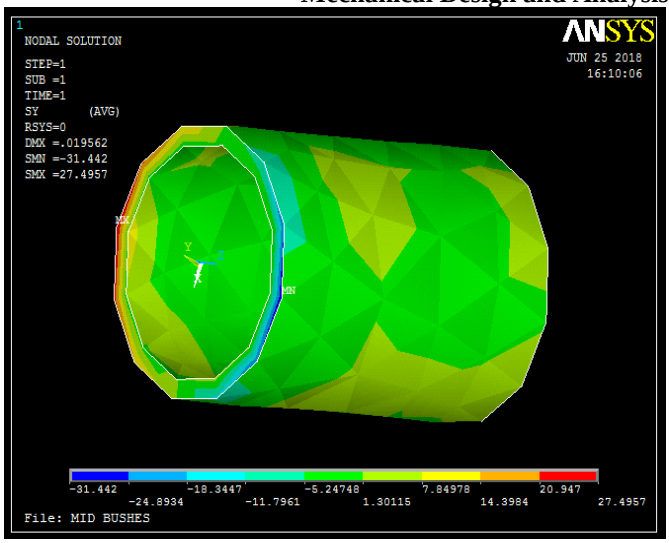

Fig.24. Stress Analysis of Mid Bushes.

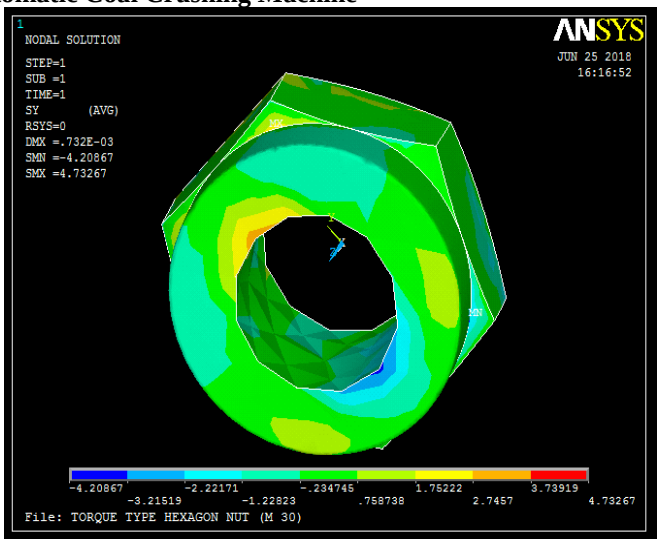

Fig.27. Stress Analysis of hexagon Nut.

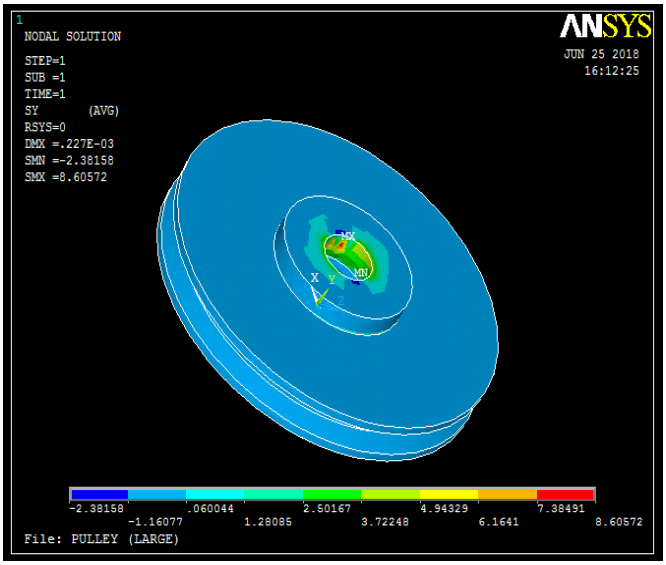

Fig.25. Stress Analysis of Pulley – Large.

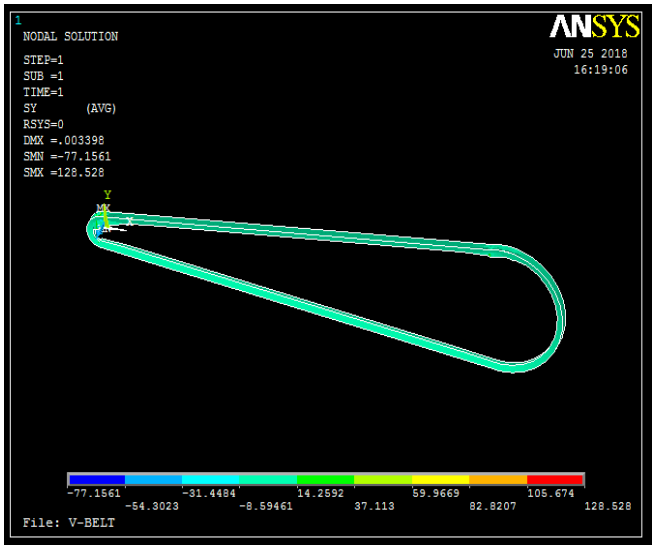

Fig.28. Stress Analysis of V-Belt.

C. Results of Strain Examination

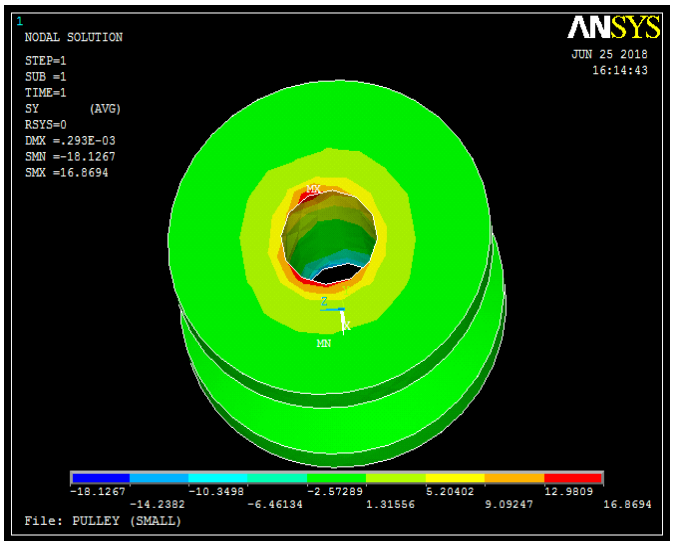

Fig.26. Stress Analysis of Pulley – Small.

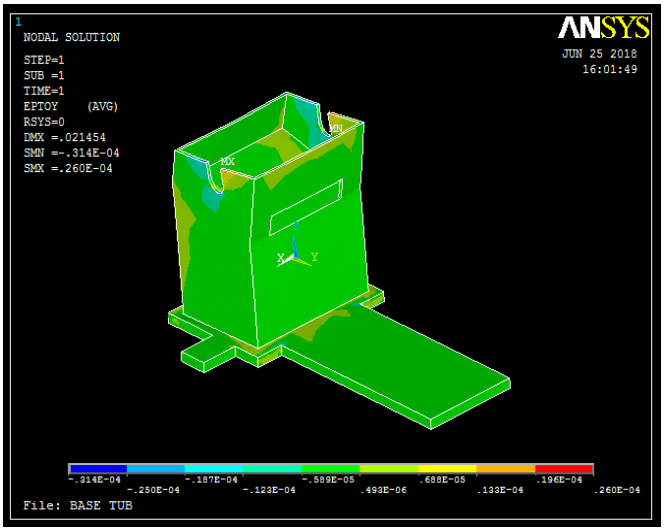

Fig.29. Strain Analysis of Base Tub.

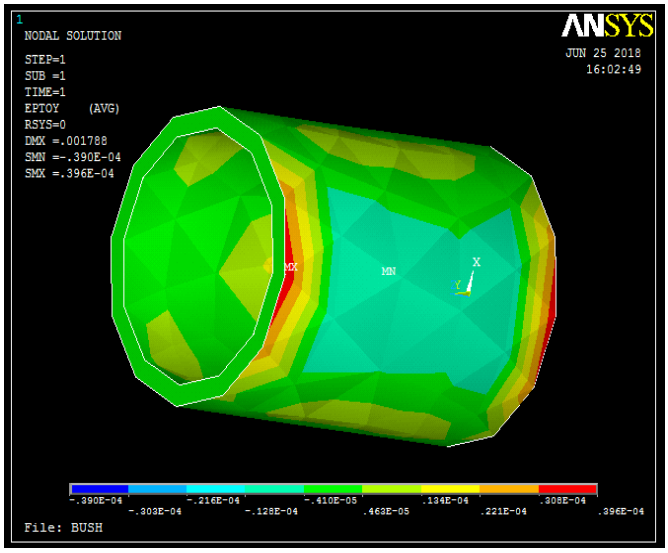

Fig.30. Strain Analysis of Bush.

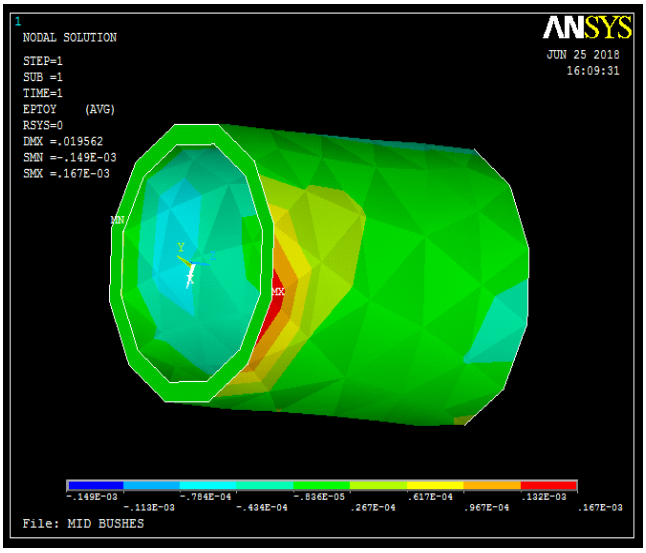

Fig.33. Strain Analysis of Mid Bushes.

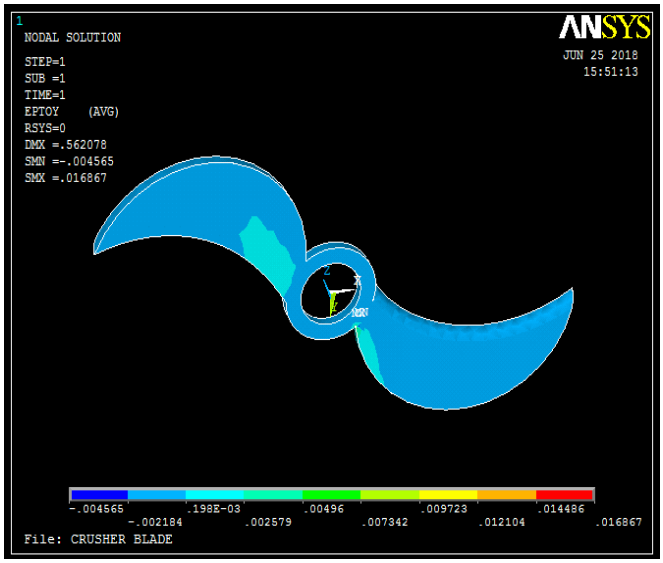

Fig.31. Strain Analysis of Crusher Blade.

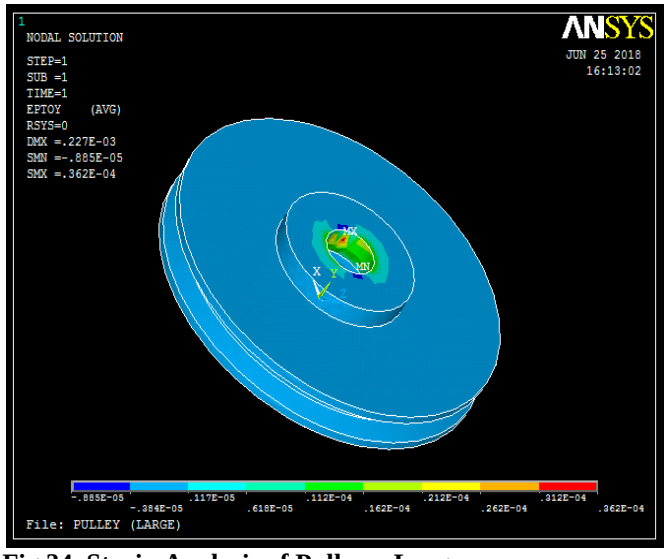

Fig.34. Strain Analysis of Pulley – Large.

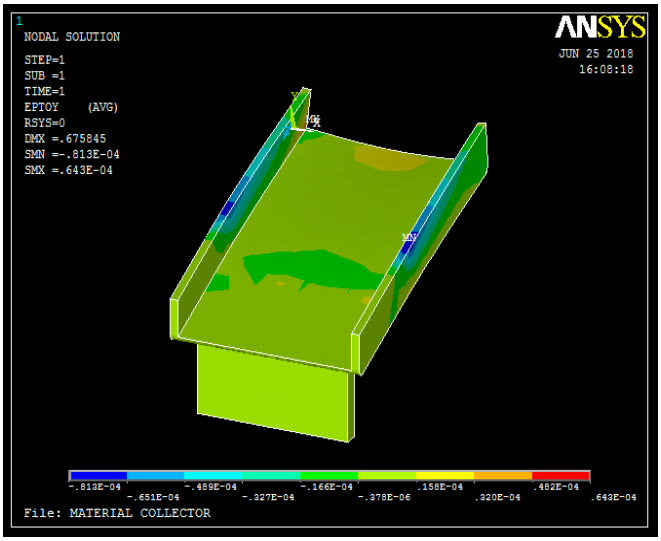

Fig.32. Strain Analysis of Material Collector.

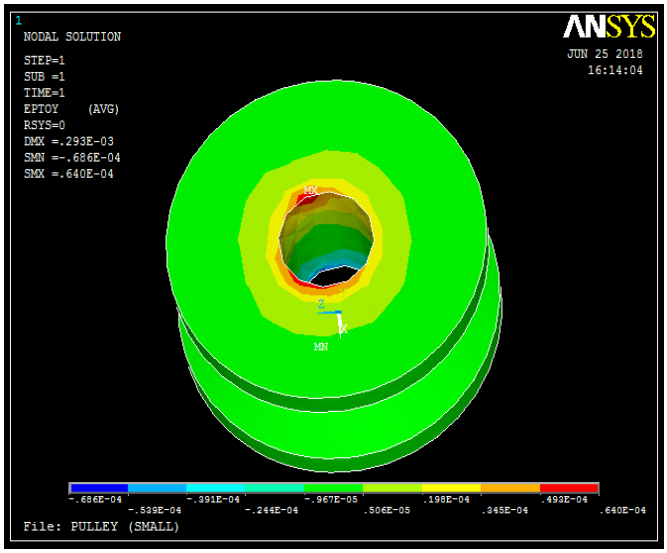

Fig.35. Strain Analysis of Pulley – Small.

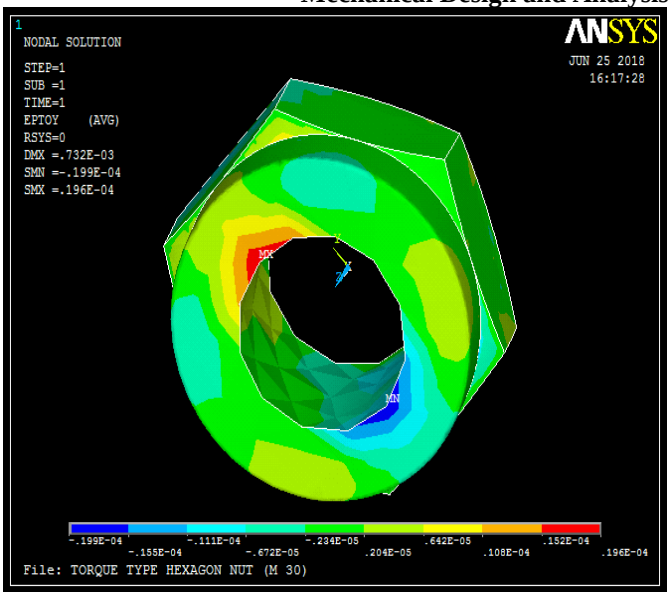

Fig.36. Strain Analysis of Hexagon Nut.

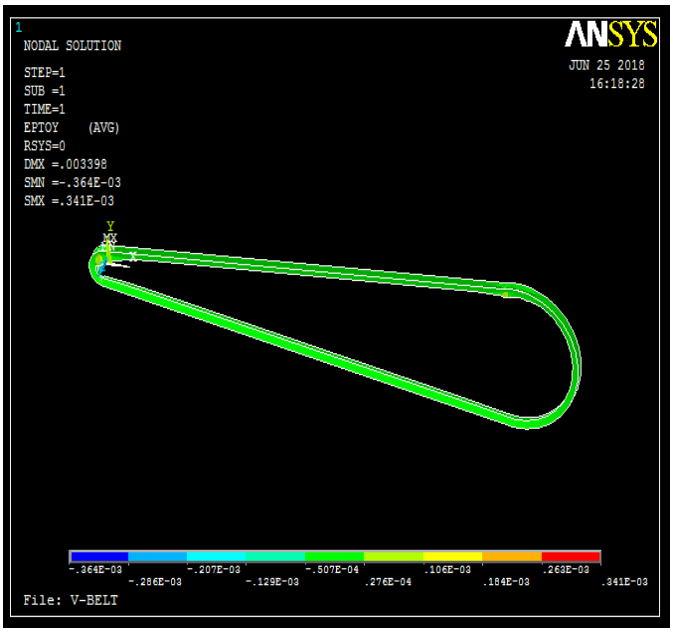

Fig.37. Strain Analysis of V-Belt.

VII. CONCLUSION

Most traditional Coal Crushing machines pound Coal just into cullet. The subsequent cullet is utilized for making Coal again on the off chance that it is straightforward. As appeared above figures the dislodging, stresses and strains of the entire gathering is coincided and comprehended utilizing Ansys and uprooting of the crusher edge is 0.181mm which is less. This is demonstrating to us that plainly every part in outfit get together is having minor relocation. Worry of the crusher sharp edge is at the settling area (Minimum Stress which is adequate). The esteem is 4458.66 MPa which is underneath the yield point. The most extreme strain of the crusher cutting edge is 0.168 MPa, this arrangement tackling with the assistance of Ansys programming so the greatest pressure is less .so we can finish up our outline parameters are around amend. The last outcome positive way .There is no issues while the outline of the machine. Last gathering is outlined and it can abandon disappointment. For demonstrating that above examination is done. Coal squashing Plant has an extensive variety of use, for example, a light embanking material in structural designing, a culture medium or an inorganic soil alteration in cultivation and horticulture, a purging material in water filtration and a separator in engineering. It is currently utilized as a part of different zones for different purposes. The burdens got are well inside the point of confinement of good pulverizing and hard versatile property of the materials. The outcomes were contrasted and disappointment hypothesis and discovered they were inside as far as possible.

VIII. REFERENCES

[1]'Coal making waste transformed into Coal-based concrete,' Contractor Magazine, June 2003.
[2]US4656741 * Oct 10, 1985 Apr 14, 1987 Couture Richard P Hand held and hand worked device for controllably punching a little air admission opening in a wore out expelled fluorescent lighting tube.
[3]'Small-Scale Recycled Coal-to-Fines Processing System
[4]US4819883 * Jul 22, 1987 Apr 11, 1989 Galland Henning Nopak, Inc. Coal breaking mechanical assembly
[5]www.wrap.org.uk/Coal
[6]http://patentscope.wipo.int/seek/en/WO2007031086
[7]Coal Crushers (www.americanrecycler.com/dec03/spotlight.html), recovered 2008-12-18)
[8](CEMCO Turbo TM54 Model Crusher (www.cemcoturbo. com/ index.php?page=turbo-54), recovered 2008-12-18)