

Overall Improvement in Performance of Mahindra Yuvraj 215 NXT Tractor

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Abstract- The agricultural tractor is used by farmer for agricultural work. In ideal condition tractor converts all the energy from the fuel into useful work. But the most of the potential energy is lost in the conversion of chemical energy to mechanical energy. In this project we are trying to improve overall performance of Mahindra Yuvraj 215 NXT tractor by different method. For this improvement we are going to deal with same method like using Metallic Recuperators for heat recovery, reduce failure possibility of Connecting Rod, produce electricity from waste vibration energy, Thermo electrical Generator for recovering heat energy, Material changing by familiar alloy and many more.

Keywords- Connecting rod, waste heat recovery, thermoelectric generation, Vibration harvesting, Additives

I. INTRODUCTION

In this project we deal with increasing performance of Mahindra tractor. In real operating condition the total energy is not obtained after conversion of energy from one form to another form some of the energy is wasted either in the form of vibration, friction and heat etc. so we here give some suggestions for improving the efficiency of tractor and using them will increase the efficiency of tractor and try to redesign connecting rod by which its life of connecting rod will increase and the excess weight of connecting rod will decrease so that it becomes economical for Manufacturing industry and cheap for customer also. Here we are doing Analysis of connecting rod in Ansys 12.1 for its redesign. We have used Ansys 12.1 due to its result of Meshing is good. We have suggested some devices like thermoelectric generator for obtaining electric energy from waste heat energy from silencer. Piezo electric crystal for harvesting the vibration energy and obtaining electric energy from vibration of tractor. We here also suggested some additives for increasing the efficiency of tractor when they are added with fuel in the engine. We have given suggestion for increase in height of tractor from ground level which will reduce the damage of crop. It is found that due to its height from ground will damage the crops.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Here for finding the solution of problems which arise in tractor we have seen some already research paper of Connecting rod analysis, waste heat recovery, harvesting of vibration energy etc. to get the idea about the possibility of failure in the connecting rod and to get the idea about the best software for the analysis. We also used the internet for finding the best alternatives materials for connecting rod and whose production cost is less and reduce the weight of the connecting rod and cheaper than present connecting rod. We have attended the GEDA workshop to get the information about the waste energy recovery and to get the information of devices which will be used to recover the waste energy. We also took training at Mahindra workshop for getting the detailed knowledge of its working principles of engine and its elements which are used in the tractor and also for finding the faults which arise in the present tractor and taking the reviews from customers of tractors and farmers and taking information of their experience on Mahindra NXT 215 tractor.

III. ANALYSIS OF CONNECTING ROD FOR REDESIGN

Here we have done the analysis of connecting rod for getting the information and to know the strength of present connecting rod. Here first we have made the model of connecting rod in Pro – e 4.0, here we have used the Pro – e 4.0 because we have good control over that software and it is faster in making model and after making the model we have done the analysis of connecting rod in Ansys 12.1 here in this analysis we have done four analysis of connecting rod that is big end compressive, big end tensile, small end tensile and small end compressive. Connecting rod under working condition faces all such forces.

Here before starting the analysis we have done the Meshing of connecting rod. The meshing is the process of dividing the big elements into number of small elements for the purpose of obtaining better and accurate results.

Here we have done the Tetrahedral meshing which produces high quality meshing for boundary representation of solid structural model. Since the tetrahedral is found to be the best meshing technique which will give the accurate and best results.

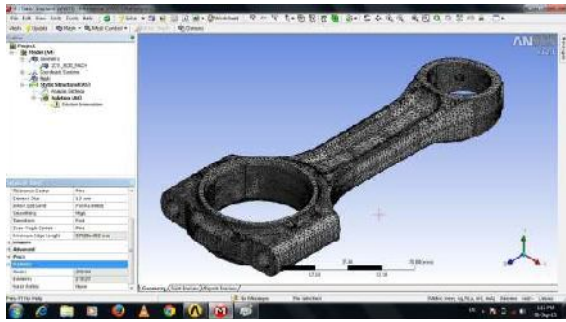


FIG.1, Meshing of connecting rod

And after doing meshing all the four analysis is done and the result shows that possibilities of the connecting rod fails is more in the Small end compression and Big end compression both under 90 KN force

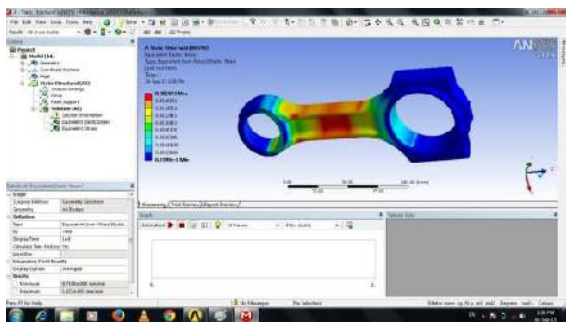


FIG. 2, Big End compression

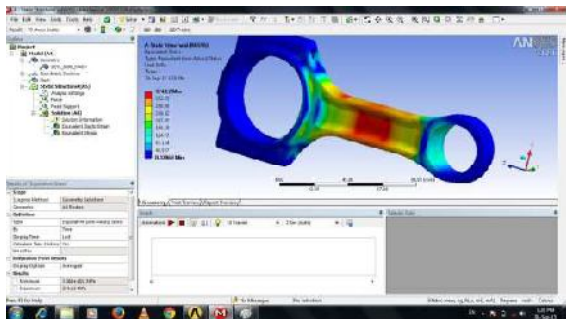


FIG.3, Big End compression

It is also found from analysis that connecting rod also have some of excessive weight which after removal will not affect the performance of connecting rod.

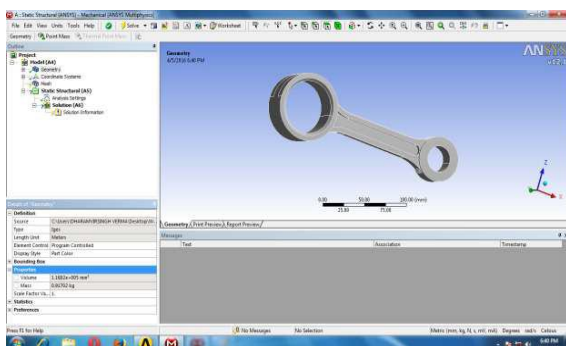


FIG.4, Connecting rod after removal of weight

Before removal of weight of connecting rod its weight is about 1.018kg and after removal of that weight its weight is decrease to 0.91702kg and its problems of failure is reduce by using familiar metal alloy increase the life and reduce the weight of connecting rod

IV. OTHER IMPROVEMENTS FOR INCREASING PERFORMANCE OF TRACTOR

(A). Increasing the height of tractor from ground level

It is found that crops are damaged due to present height of tractor means while farming or going through crops some of the crops is damaged due to height is tractor. Below figure 5.shows the present height of tractor



FIG.5, original height of tractor from ground

But this damage of crop is only reduce of eliminate by increase the gap between tractor and ground or increase the height of tractor and after increasing the height the problem of crop damage will sure eliminate the figure 6, shows the tractor after increasing height of tractor.



FIG 6. Tractor after increasing the height

(B).Thermoelectric generation

A Thermoelectric generator is a device that converts heat (temperature differences) directly into electrical energy through a phenomenon called the Seebeck effect.

It is found that exhaust gas have more temperature while going through silencer so using Thermoelectric couple will be useful in recovering the electric energy from that waste heat energy of exhaust gas. Instead directly open these exhaust gas in environment we here first sent such gas to the contact with one end of thermoelectric device thwn supply to environment while other end is open to air or place in coolant. Due to this temperature difference thermoelectric generator will produce electric energy which will used to chare small devices in tractor .

About total 20 % of energy is wasted in the form of heat energy

Below figure.7, show the arrangement of Thermoelectric generator.

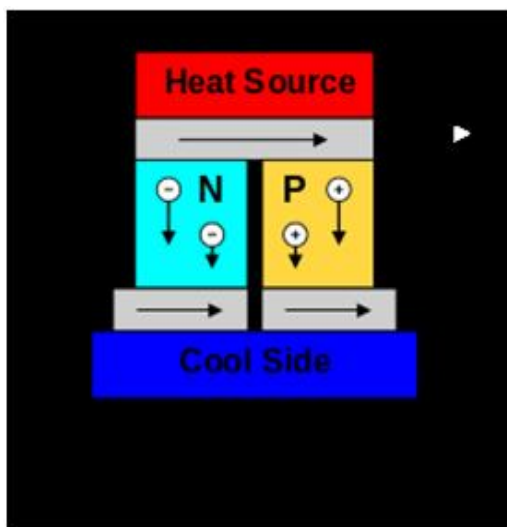


FIG.7. Thermoelectric Generator

(C).Vibration energy harvesting

When the tractor run with some speed the it is seen that its body is fully vibrate due to mechanisms inside the engine and its nearly 3.5% of energy is wasted in the vibration. This vibration energy can convert directly into electric energy using pezo electric crystal, this energy obtained can directly used to charge the small devices and also in charging the battery of tractor the energy obtained from such device is not that much heigh that's why it is useful for charging small devices figure.8, shows the arrangement of the pezo electric crystal

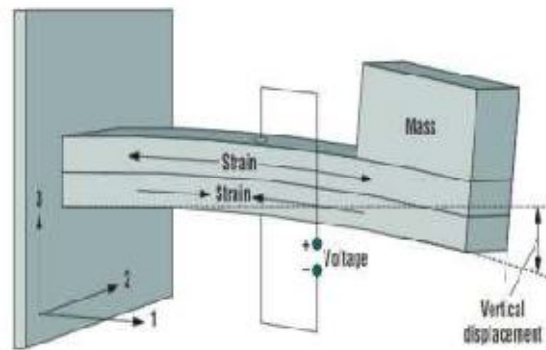


FIG.8, arrangement of pezo electric crystal

(D). Additives for diesel fuel to increasing efficiency of tractor

It is found that this tractor has low efficiency nearly (23kmpl) so to increase the efficiency of the tractor using some of additives which when added with diesel will increase the efficiency of tractor.

The additives like Ethylnitrate, Butylnitrate, Diisipropylether and Dimethylether , Nitromethane (NM) and Nitroethane (NE). Because Alcohol canbe used successfully in combination with diesel by adding certain additives

(E). Increase the number of valves

Here by increasing of the number of valves will increase the efficiency of the engine.

A multi-valve engine is one where each cylinder has more than two valves. A multi-valve engine has better breathing and may be able to operate at higher Revolutions per minute (RPM) than a two-valve engine, delivering more power.

Instead of using two valves using three valves or four valves increase the efficiency of tractor as well this makes complete combustion of fuel. This will help full in increasing efficiency as well reducing air pollution due incomplete combustion of fuel.

Below in figure.9, shows the present valve mechanisms of engine

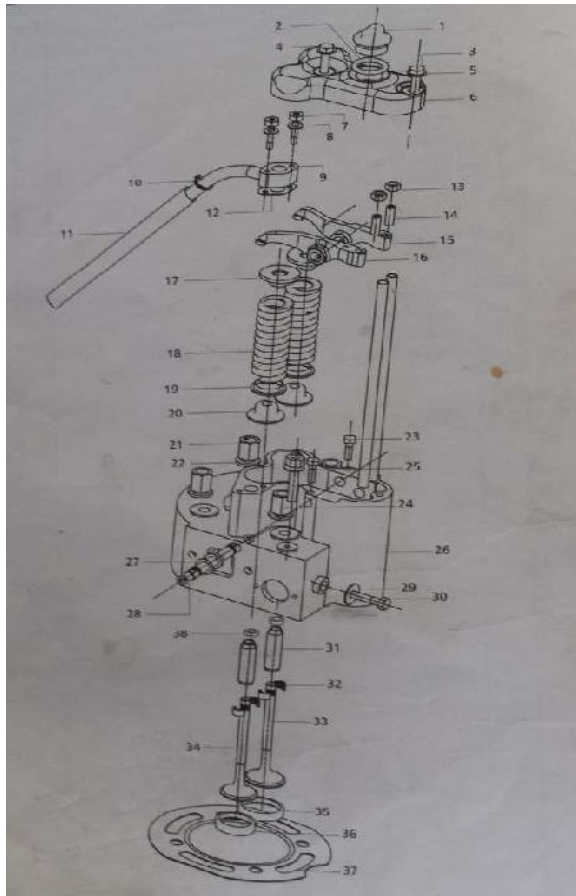


FIG.9, valve mechanisms of present tractor engine

V. CONCLUSION

In this project we have tried to increase the efficiency of the tractor so that it will become economical and become for efficient.

We have also given some suggestion of device which will helpful in recovering of waste energy.

This energy is free energy just once initial installation cost is height then no any other cost is involve

By experimentally a weight reduction of connecting rod (10 %), Also by Valve arrangement modification (Increase in thermal efficiency gain by 3- 4%)

By this different modification or changing method a farmer or driver can use maximum capacity and maximum waste energy of tractor by same input parametrs.

ACKNOWLEDGMENT

In the afterward to his epic tale on French revolution, victor Hugo, describes his working method. He wrote the tale

standing at an up right desk in pen and ink on oversize sheets of white paper. When he had completed his manuscripts he sent it to printer. No editors, no proof readers, no layout artists. He didn't even need any guidance or help for creating the masterpiece, but then, he has victor Hugo, and whose project work would have not been completed without any guidance and help.

We would not miss this opportunity to express our heart felt gratitude towards, **Mr. J. D. Ramani** my guide who, in his informal manner provided lots of valuable information, helps and guidance.

We are obliged to **Prof. J.D.RAMANI**, for their nice guidance and co-operation in my project.

Finally, we would like to thank my parent, and all my classmates who have played an unforgettable role in growth of my carrier by providing their constant co-operation and encouragement throughout our tenure of the course.

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