

# Design and Development in Rear Axle Line(RAL) Washing Machine for Crown Wheel and Pinion

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**Abstract**— The crown wheel and pinion are the power transmitting component in the vehicle. When these components are failed then serious problems may occur in the vehicle. Therefore it takes more time to repair the gears. When a gear is fractured then the detailed analysis is to be done. The gear is failed due to the irregular compositions and manufacturing defects. During the manufacturing process of the crown wheels, operations performed are such as, crown wheel cutting, heat treatment, lapping, washing, testing, etching etc. Crown wheels and pinions are used to transmit the power in rear axle of an automobile.

**Index Terms**— Crown wheel and pinion, Transmission system, RAL( Rear Axle Line)

## I. INTRODUCTION

Crown wheel and pinion are the important components of RAL (Rear Axle Line). Machine used to wash out the lapping paste from the teeth of crown wheel and pinion is a special purpose gear washing machine. Lapping paste is spread all over the teeth of both the gears for finishing purpose. This washing machine has three main stations, loading-unloading station, spray washing station and air blow off station. After loading the components on the pallet of the machine, pallet goes to the inner chamber of the machine at which high pressure jets washes out the entire lapping paste. In return journey of the pallet air blow off station blows comparatively cooler air than washing chamber onto the components. The temperature of the washing media is about 55-60degree Celsius. The quality of washing is checked by a process called as Millipore value test. Millipore value is checked once in a week for performance check of washing. This value should be in the predefined range every time the test is done.

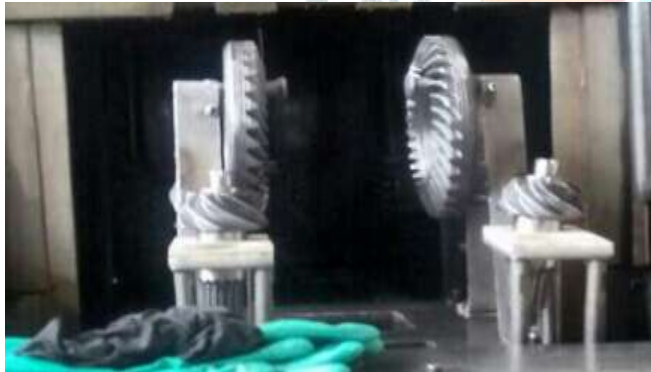


Fig.1 (Old pallet in the machine)

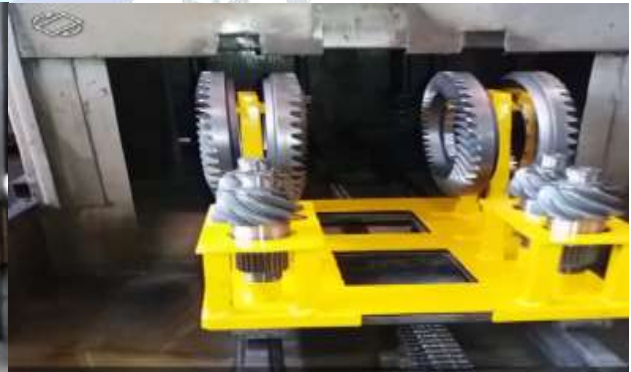


Fig.2 (Newly designed pallet)

## II. LITERATURE REVIEW

1. Nicoleta-Elisabeta Pascu Gabriel Jiga have studied about lapping process. Lapping is a superfinishing process. In case of crown wheel and pinion, the process is used to improve surface finish of already made teeth. In lapping, the gear to be lapped is run under load in mesh with cast iron toothed laps. Abrasive paste is introduced between the teeth. It is mixed with oil and made to flow through the teeth. Better surface finish and less jerks are the results of lapping.
2. Santosh S Bagewadi I G Bhavi did the work on design and analysis of crown wheel and pinion in a differential gear box. Detailed modeling, assembly and analysis of tooth of crown gear and pinion is performed in Pro-E. Finite element analysis is performed to analyse the crown gear tooth for working load. Induced equivalent stress is less than allowable stress.
3. Yatish Rao have studied case study strengthening of axle shaft by heat treatment to overcome twist. This case study gives the information about ,an important use of axle shaft is use to transmit the power between two parallel planes. Axle shaft can experience severe impact load when there is sudden drop in clutch pedal during the vehicle operation under the loaded condition. Insufficient case depth and lower core hardness could cause the low surface shear strength

### III. METHODOLOGY

In above project our main aim is to increase the productivity of the gear washing machine by changing the design of pallet of the machine suitably. Pallet is like a trolley, arrangement for mounting crown wheel and pinion sets. While redesigning the pallet of the machine the entire machine assembly should be constrained this is the only condition. Before redesigning the pallet, the capacity of the older pallet was 2 sets of crown wheel and pinion. After making suitable changes in the pallet, the capacity becomes double than the previous one. The below fig. 3 shows the drawing of the new pallet sketched on design software Catia.

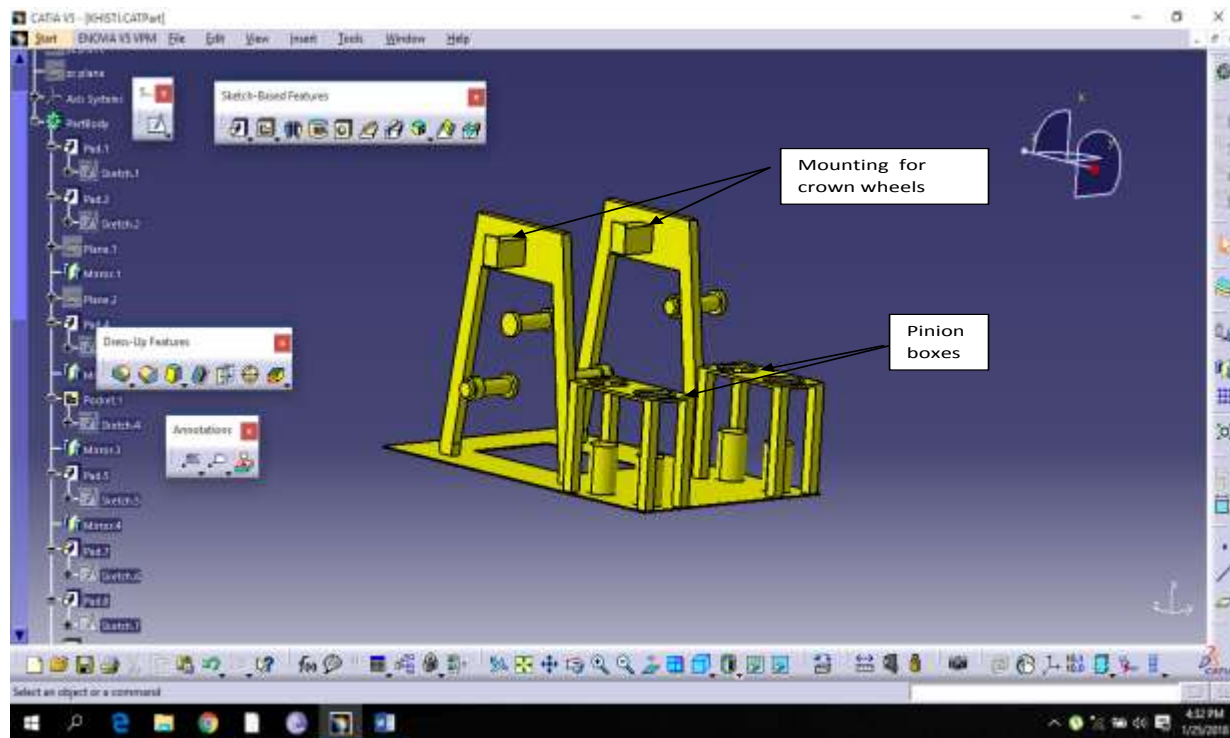


Fig 3:(Drawing of the pallet in catia software)

For older version of the pallet, capacity in one time was two sets of crown wheel and pinion i.e. (2 crown wheels and 2 pinions) for washing. The time required for washing two sets was about 3 mins and 30 secs. In newly designed pallet, capacity gets doubled that the previous one i.e. (4 crown wheels and 4 pinions). But the cycle time for both the pallets remains same. Thus in new pallet 4 sets can be washed at a time within the same time span.

### IV. CONCLUSION

We refer all the above papers to study about the crown wheel and pinion which are the essential components of automobile transmission system. By suggesting new changes in the pallet we have successfully increased the production rate of the gear washing machine. By increasing the production rate, saving of electricity and ultimately the cost reduction is achieved.

### V. REFERENCES

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