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Design and Analysis of Modified Trumpet Axle

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***Abstract*: Design of trumpet axle is a static mechanism element and is used for the transmission. In this paper we are modifying the existing trumpet axle from the failure side and done static analysis on the modified model. Since every part is having a fixed lifecycle, it is essential to analyse its core parameters. The Finite Element Analysis is mathematical technique for solving Engineering problems. Then the strain, stress, deformation and static analysis results are calculated. Hence the redesigned rear trumpet axle casing of tractor is found to be in safer mode. Finite element model is carried out for the trumpet axle using ANSYS. The serious location of the trumpet axle has to be recognized and redesigned to ensure the safety all the frequency values ANSYS. The objective of this study is to analyse the redesign to its efficient requirements and to rise its life period opportunities These results provide a technical basis to avoid upcoming damage to the trumpet axle.**

***Keywords*: Modified Trumpet Axle**

1. Introduction

The term 'tractor' taken from the Latin word 'trahere', means 'pull'. It is an engine or vehicle designed for towing wagons or plows. Today, tractors are used for in, towing or hauling objects that are really hard to transfer. One usually sees a tractor on farms used to impulse agricultural equipment that plow or harrow fields. The first tractors from the 1800s and early 1900s, were powered by steam engines. These tractors were phased out due to the instability of the steam engine that caused blasts, or stuck the driver in a belt driven connection. The replacements were built with an internal combustion engine. Machinery has found its way into updating the tractor. Nowadays, tractor have Global Positioning Systems (GPS) and digital sensors attached to farm tractors.

A tractor is a definitely design to provide a high tractive energy at low speeds, for the purposes of haulage machine used in farming. Mainly, the term is used to define the characteristic farming tractor. Agricultural tools may be pulled on the tractor and the tractor may also run a source of power if the transmission is successfully runs the required power. The first tractors, powered by steam engines, were phased out followed by the internal combustion engine.

Current tractors are manufactured by a rollover protection system (ROPS) that protected the driver from being crumpled in the event that the vehicle rolls over. New Zealand was first country who required the ROPS to be built in to tractors in the year 1960. Before this system was built, many driver farmers were killed in accidents when the tractors rolled top of them, crushing them in the process.

2. Types of Axles

- Rear Axles
- Front Axle
- Stub Axle

A. Rear Axle

In between the differential and the driving wheels is the rear axle to transmit power from the differential to the driving wheels. It is clear from the construction of the differential, that the rear axle is not a single piece, but it is in two halves connected by the differential, one part is known as the half shaft. The inner end of the half shaft is connected to the bull gear of the differential. and the outer end of the driving wheel. In rear wheel drive vehicles, the rear wheels are the driving wheels. Whereas, in front wheel drive vehicles, the front wheels are the driving wheels. Dead axles simply remain stationary, do not move with the wheels. A housing completely encloses the rear axles and the differential, protecting them from water, dust and injury, in addition to mounting their inner bearings and providing a container of the lubricant.

B. Types of Rear axles

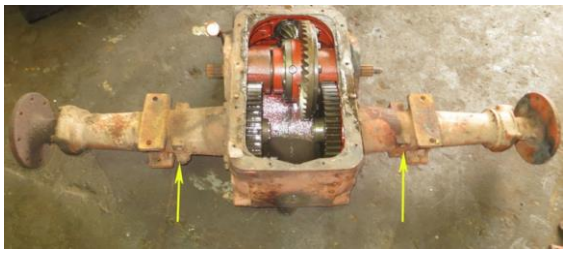
Depending upon the methods of supporting the rear axles and mounting the rear wheels, the rear axles are of the three types.

1. Semi-floating axle
2. Full floating axle
3. Three quarter floating axle

- *Semi-Floating Axle:* A semi-floating axle has a bearing located on the axle and inside the axle casing. It has to support all the loads as listed above.

Therefore, it needs to be of a larger size, for the same torque output, than any other type. The inner end of the axle is supported by the differential side gear. It is thus relieved of the job of carrying the weight of the car by the axle housing. The outer end has to support the weight of the car and take end thrust. The inner end of the axle is splined to the differential side gear. The outer end is flanged so that the wheel can be bolted directly to it. In some design, the hub of the wheel is keyed to the outer end of the axle. The vehicle load is transmitted to the axle through the casing and the bearing, which causes the bending or shearing of the axle. The semi-floating axle is the simplest and cheapest of all other types and widely used on cars.

- *Full-Floating Axle:* A full floating axle has two deep groove ball or taper roller bearings, located between the axle casing and wheel hub. The outer of an axle is made flanged to which the wheel hub is bolted. The axle is not supported by bearing at either end, and its position is maintained by the way that it is supported at both ends. Thus the axle is relieved of all strain caused by the weight of the vehicle on the end thrust. It transmits only the driving torque. For this reason, it is called full floating. The axle may be removed from the housing without distributing the wheel by removing the nuts. An additional advantage of this design is the ability to the vehicle even if it has a broken axle. This type of axle is more, expensive and heavier than the other axle. It is usually fitted on commercial vehicles.
- *Three-Quarter Floating Axle:* This type of axle has a bearing placed between the hub and the axle casing. Thus, the weight of the vehicle is transferred to the axle casing, and only the side thrust and driving torque are taken by the axle. The inner end of this axle has the same construction as that of the semi-floating axle. Although the three-quarter floating axle is more reliable it is not as simple as the semi-floating axle.

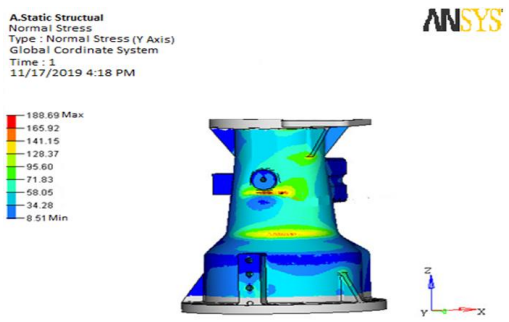


3. Trumpet axle casing

The failure occurs due to nonstop running of the tractor. The failure occurs in the form of crash. During running condition tractor parts meets with new atmosphere in which failures occurs easily etc., due to that the impact load and vibration acts on the wheels and the axle casing. The trumpet axle casing problem occurs only because of continuously running for a long period and also the place where it is functioning. For example, highly dry area like where the atmospheric temperature will be more than 41 to 55°C. The trumpet axle breaks due to the crashes formed through running environments. Thus the problem is consider and the existing model is put in the static structural analysis. In this analysis, we calculate the maximum stress concentration. The internet sources have a detailed report of it says and out of every 500 components 10 components get failed during long running. In this one third of the defective casings is found in dry place area.

4. Analysis and result

At first we will design the component and then put in the meshing with different load, stress etc. then the further result has been received with the help of analysis.



S. No.	Description	Model
1.	Material	Cast Iron (graded)
2.	Normal Stress(min)	8.51
3.	Normal stress (max)	188.69
4.	Displacement (min)	0
5.	Displacement (max)	0.89

5. Conclusion

Thus the trumpet real axle casing component was redesigned successfully using creo 2.0 software. The static structural analysis was analyzed successfully and the stress, displacement and frequency values are within the Factor of Safety of the material as the result can be compared with the existing model. this analysis report, it is clear that the redesigned model is under safe mode when compared to existing model. Casting defects are also rectified in the component. From this analysis the designer gets a super knowledge around the product in different atmosphere.

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