

Remanufacture of Automobile Axles

Contributor: Raghu Echempati
Affiliation: Mechanical Engineering Department
University of Mississippi
University, Ms 38677
Phone: (601) 232-5698
Email: meechemp@olemiss.edu

Type: Design Problem
Student Time: Three Weeks
Location: Take home

Summary

Every year millions of automobiles are scrapped in USA. In most cases, a majority of these vehicles contain reusable parts that can save millions of dollars. This project deals with the remanufacture of front wheel axles of an automobile. Since these axles come out of front wheel drive automobiles with power steering, boots filled with oil form a part of the assembly. The axles are replaced because defective boots allow the gear oil to drain out, damaging the CV (constant velocity) joint. During re-manufacturing, new boots are replaced and the existing axles re-installed. First year students can address issues such as environmental to dispose the rubber boots, draining oil, and issues concerning cleanliness of the shop floor. Senior students may address the issues concerning the design of a device to automatically remove the boots, automation of the whole process, cost, and packaging of remanufactured axles. Since team work is important to cover the several aspects of this project, this work may be done in a group of 3 or 4 students. This information can be used in the understanding of the re-manufacturing of automobile components.

At the end of the project, the students will hand in project specifications, alternative solutions, the final concept, and a diagram or sketch of the device.

ABET Descriptors

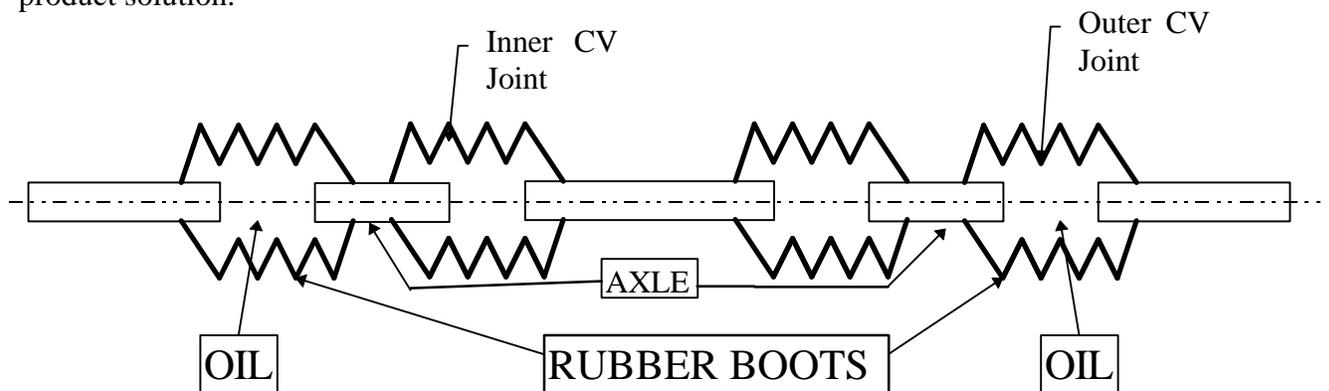
Engr Sci Content: First Year Engineering
Type: Systems Design
Elements: Establish objectives, set up environmental and other issues
Features: Design methodology, creativity, design alternatives, open-ended, feasibility, re-manufacturing
Constraints: Performance, cost, time, safety, stability,
Effort: Team

Remanufacture of Automobile Axles

You are to address issues concerning the re-manufacturing of automobile axles that come from power steered vehicles. You may visit a local automobile service station to look at and understand the function of different components of an axle and its assembly. You are to discuss the various issues concerning the re-manufacturing of automobile parts, subassemblies or assemblies. You are then to develop different conceptual ideas to design a device that removes the boots, drain the oil and to clean the axles and the CV joints. You are to define the scope of the project clearly and write the design specifications to the best of your ability. You may use any available literature in assisting you to study the different other similar devices. The information developed in this project may be used to understand the design process, functional design, environmental issues, assembly and the remanufacture of automobile components and similar other devices.

You will also have to consider other factors such as environmental issues, OSHA regulations, safety, human factors, its cost, reproducibility of parts, etc. You should describe how the unit may be tested if remanufactured.

You will hand in a report outlining your activities and results. It must include a complete design specifications as well as a drawing with enough detail showing your product solution.



Schematic of the Front Wheel Axle and Boot Assembly

Remanufacture of Automobile Axles

Engineering Notes:

Objectives/Comments

A comprehensive study of the re-manufacturing of usable components may be assigned to the students as a part of literature survey. Students will collect the statistical data concerning the wastage to the US economy due to scrapping of automobiles. They can calculate the reprocessability index of products based on some of the available analytical models. They can study impact of re-manufacturing on the metallurgical changes of the original components, and also on the environmental issues. The students can visit a local automobile service station to actually see the axles to fully understand the problem. Students may want to visit a web site on internet, or go to a library to obtain more information.

Expected Outcome

The student is expected to understand the scenario and discuss the various issues concerning the re-manufacturing of automobile components. In this exercise, the number of components of the axle, and the method of disassembly to remanufacture may be understood thoroughly. The students are expected to define the scope of the project, the objectives, and the design specifications. The report should document each activity, including a sketch of the product in sufficient detail showing the dimensions and to show how the remanufacture takes place.

It is expected that students will be exposed to the design process before undertaking this project. As a result, they should be able to determine the design steps from the given information and form the process accordingly.

Discussion/Follow-up

The project may be continued in future classes like, Static force analysis, Detailed Stress Analysis of the disassembly equipment using finite element analysis, Materials Selection, Machine Component Design, Senior Capstone Design. Other issues like economics, manufacturing issues, human factors ,etc. Liability and safety issues may also be discussed in the other design courses.