Volvo Group Truck Technology:
Transmission Gear Design and Manufacturing Concepts

Overview
The purpose of this project was to redesign a traditional spur gear currently being used in the T300 Mack Truck transmission for Volvo Trucks Technology. To consider this redesign successful, the newly proposed design should meet two of the following criteria: be more lightweight, more cost-effective, and provide a similar or increased load capacity. The redesign should include a proposed gear geometry, gear material, and associated manufacturing process.

Objectives
The team first had to research all topics of gear design, from materials commonly used to innovative manufacturing technologies. Once background knowledge was acquired, the team had to quantitatively compare all options in order to recommend the best. Comparisons through FEA testing on SolidWorks and economic analysis of material and manufacturing costs were carried out. For our final recommendation, the design must meet the criteria given (cost, weight, load capacity) and also be feasible for implementation.

Approach
- The initial stage of the project began with extensive research into different areas of gear manufacturing techniques and materials.
- After the initial research, each technique and material was judged on its ability to replace the current gear manufacturing process and material used by Volvo.
- Elimination of processes and materials that could not meet design criteria.
- Further research on remaining topics.
- During this stage of research, Finite Element Analysis was conducted on several materials of interest to determine stress levels they might experience during use.
- Second elimination of processes and materials that were inadequate or could not meet the design criteria.
- Cost analysis and manufacturing process comparison of remaining topics.
- Selection of the final recommendation and best alternative process as compared to the process currently used by Volvo.

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
- The sponsor will save $198,600/year as a result of this project
- Manufacturing/production costs were reduced by 26% as a result of this project
- The project reduced set up time, tool wear, and material use
- Eliminated traditional hobbing from process