Detroit Engineered products (DEP), is an engineering services, product development, software development, consulting and talent acquisition company. Since its inception in 1998 in Troy, USA, DEP is now a global company with footprints in Europe, China, Korea, Japan, and India. DEP uses the accelerated and transformed product development process, accomplished by utilizing our proprietary platform, DEP MeshWorks, which rapidly reduces the development time of products for all segments. The MeshWorks platform delivers tool sets that accelerate virtual validation activities associated with powertrain development across all stages for both convnetional and electric powertrain.

Several tools in MeshWorks have been created with deeper understanding of the needs in a powertrain engineering team. Tools like rib addition, feature removal, model checker, fuse welding, wall thickness reduction options, design space building tools and other model assembly tools have accelerated the way engineers perform model changes for what if studies and optimization.

DEP's IC sensor (In-Cylinder) offers comprehensive portfolio of combustion analysis to the engine design and testing teams in terms of real-time gathered data and make decisions considering emissions, combustion, timing, pressure pattern and performance parameters. This is applicable for single and multiple fuel engines.

The DEP TRIO of IC Sensor, MeshWorks tools and proven technological processes like MDO can significantly add value to Powertrain Engineering.

DEP
Smarter solutions. Realized.

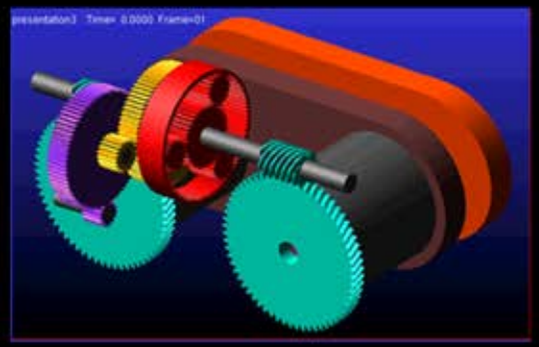
ELECTRONIC PARKING BRAKE

Introduction:

Parking brakes is one of the vital vehicle systems that has been truly appreciated in the critical situations. Failure to develop robust and reliable systems can lead to consumer threat and danger. In an era of increasingly automated vehicles configuration with electronic assisted systems being popular and effective, manufacturers are finding ways to make the parking system work in a highly robust manner.

Working Principle:

It begins with the activation of a switch, which sends a command to Electronic Brake Module (EBM) which senses the parking brakes that are required to be operated. Later this module commands the actuators installed in the brake callipers to operate. Due to the use of electronic components , the operation is quite instantaneous and efficient. On top of this it also enhances the reliability of operation because of the absence of mechanical connections. This braking automatically deactivates when the driver presses the acceleration pedal.



Challenges:

DEP offers a comprehensive platform for design and analysis of the EPB system . In the course of this work, many challenges have been encountered in order to satisfy the requisites pertaining to improved performance of the brake actuator used in the heavy duty vehicle of 1 ton Gross weight

- Quicker response time (approximately 1.2 seconds after the application of brakes)
- Torque requirements
- Voltage and Current requirements

Design variables :

- Gear ratio – Overall gear ratio is constrained at various stages
- Screw efficiency.

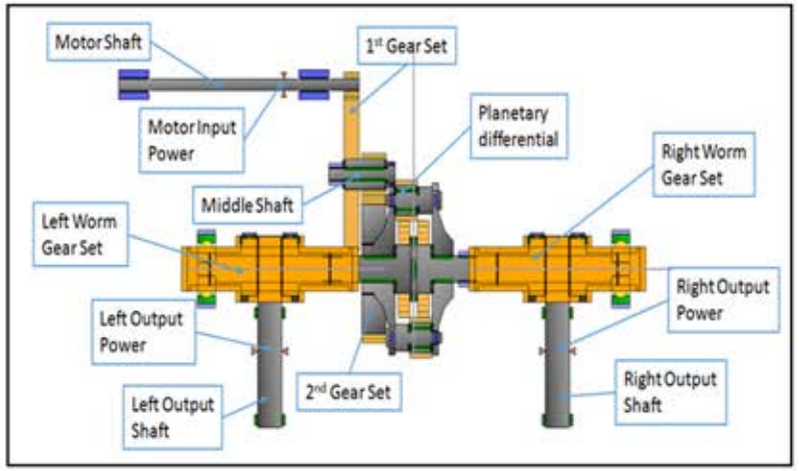
Optimization setup :

- With the above design variables, DOE samples have been generated.
- The objective here is to optimize the response timing irrespective of the conditions.

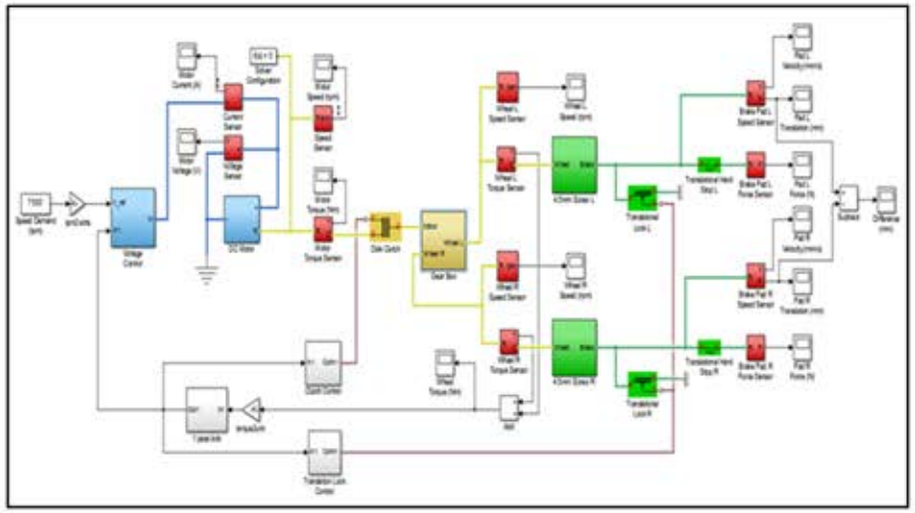
Workflow – Gear Box design

- High level design requisites : Gear ratio , Torque rating , Packaging.
- Data sheets for gear tooth stresses at various operating conditions.
  Initial layout of gear train model : Bearing dimensions , Face width & shaft dimensions.
- Baseline analysis is performed.
- Optimization setup: Setting for optimal gear ratios for appropriate screw efficiencies for the response time.
- Analysis is carried out for predicting stresses in the gear assembly , Loads at all bearing locations , Contact forces and gear life etc.
- Model development for analysing the overall system dynamics that includes locking mechanism as well.
- Numerical FE model development on the other hand is also carried out for ascertaining durability characteristics of the system.
- Output responses: Displacements, stresses in the critical locations , Noise level and frequency.

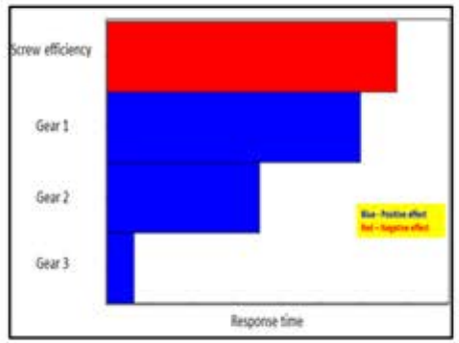
Numerical Model Development

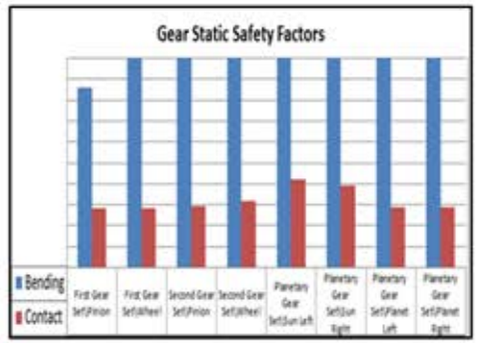


- Duty cycle has been simplified to approximate the specifications.
- Analysis is performed with the inclusion of thermal expansion effects and efficiency.



- The Simulink model developed is set for correlation with the test setup for the optimised gear ratios & screw efficiencies that drives for the faster response time during the application of brakes.





DEP Capabilities:

- Provides high fidelity solutions over a wide range of applications.
- Powertrain sub-system development & simulation solutions.

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