Full vehicle parameterization and MDO for an SUV, resulting in a mass saving of 11 kgs

About the Client

The client is a leading Automotive OEM with several products in its portfolio.

Increasing emphasis and high expectation on the fuel economy standards has pushed the automotive OEMs globally to optimize their vehicle platforms irrespective of the vehicle footprints. Fuel economy standards have to be achieved with holistically balancing safety, NVH and durability performance regulation and requirements. With Competitive markets and compressed time to market needs, OEMs are looking for technologies that exactly enable them to cut short their development time or make their current platforms more efficient.

The Challenge

The client was interested in reducing the mass of its existing SUV product lines (substantial amount which can be realized in manufacturing) with minimal packaging and tooling changes without any degradation in performance. The client contacted Detroit Engineered Products (DEP) for value engineering and identified one of the fast growing SUV segment for the same. The objective of the project was to achieve a reasonable amount of weight reduction from the BIW and chassis of the vehicle.

The Solution

The entire value engineering project was divided into three phases by DEP engineers: Baseline evaluation, Parametrization using DEP MeshWorks and Optimization. DEP engineers worked very closely with the client engineers throughout the project. The complete CAE driven Value Engineering Process evolved by the DEP team was new for the client engineers.

A total of 25 design variables(shape and size) were finalized from BIW & Chassis during the first phase and set as targets for the optimization. Finite element parametrization for both crash and durability were separately conducted using DEP MeshWorks platform during the second phase. A total of Seventy six different combinations of input variables were arrived at through Design of Experiment (DOE). CAE models relevant to seventy six combinations were generated using DEP MeshWorks.

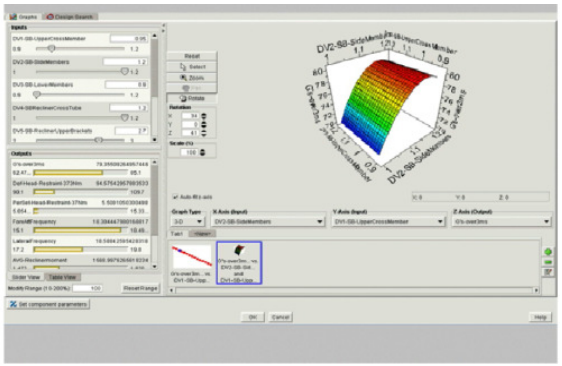
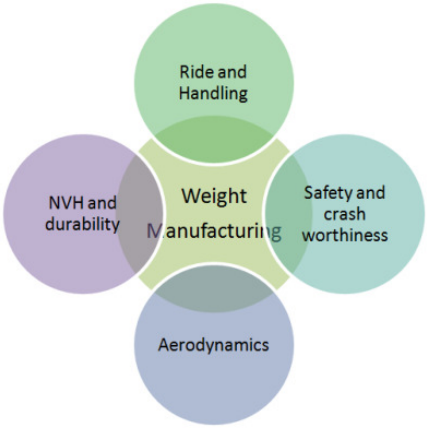


Fig 1. Response Surface



The Result

DEP MeshWorks based MDO approach helped save about 10 kg for the existing SUV platform.

DEP MeshWorks driven MDO approach has been successfully extended beyond full vehicle to various other vehicle sub systems as well.

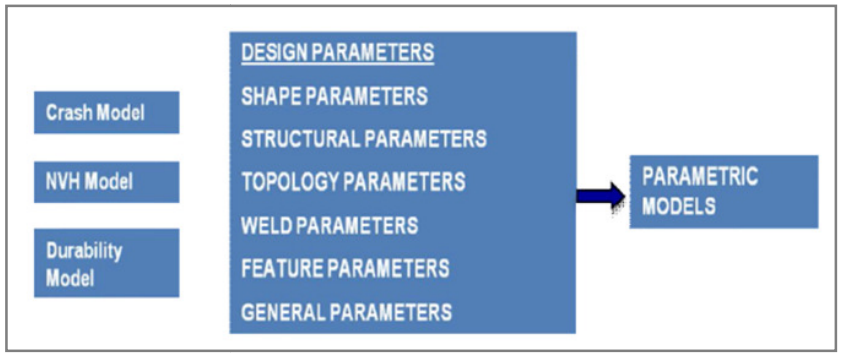


Fig 2. CAE model parameterization for MDO

During the last phase, Design variables v/s Performance table was generated for Crash, NVH, and Durability. The table was used by subsequent optimization process for value engineering. The feasible gages and shapes that were outcome of value engineering were identified and discussed in detail with client engineers. The final optimized feasible design with new gages are evaluated for its performance & results were matching with the targeted performances with minimal changes.

The DEP Edge

The technology of parameterizing complete vehicle CAE models using DEO in DEP MeshWorks and the process of Multi disciplinary Optimization are the key pieces that deliver value. This CAE driven process has been deployed successfully in both early stage vehicle development as well as for optimizing existing platforms.

Read more online at
www.depusa.com