Detroit Engineered Products (DEP) is an Engineering Solutions and Product Development company. Since its inception in 1998 in Troy, Michigan, 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.

Rapid time to market of new products across several industry sectors such as automotive, defense, aerospace, energy, oil & gas, consumer products and heavy equipment is a unique value proposition delivered to clients via DEP's world class engineers and the DEP MeshWorks platform.

With nearly 600 sub – system level Multi disciplinary projects for OEMs resulting in significant weight reduction in powertrain, chassis and interior components, we have lightweighting solutions that can rapidly transform your products resulting in about 20% weight reduction in an average. DEP has proven on multiple occasions that right material composition gives a right combination of steel grade with optimized shape, gage and other geometrical parameters, and these steel designs can have a cost and weight efficiency as compared to other alternate materials like aluminum, magnesium or composites.

DEP's experience in working with high strength materials coupled with our advance parametric tools for the mobility industry enables superior light weight solutions. DEP's ability to lightweight, along with performance has been a great enabler for our customers. Our engagements with various raw material suppliers & tier -1 & 2 manufacturers coupled with expertise of handling the material grades based on manufacturing knowledge delivers a superior edge to all customers.

DEP is a leading provider of innovative, value-creating lightweighting solutions, with innovative and upgraded material selection solutions. Appending our design & engineering to an efficient manufacturing process will enable the product development to achieve greater cost efficiency, higher performance and improved sustainability in vehicle system and components.

DEP

Smarter solutions. Realized.

LIGHTWEIGHTING SOLUTIONS

Body Structures

Lightweight Design

Lightweight Engineering

Batteries

Electric Drive Unit

Topology optimization ▶ Load path design ▶ Performance ▶ MDO - 3G(Gauge, Grade and Geometry) Optimization ▶ CAD Design ▶ Manufacturing feasibility ▶ CAE performance ▶ Final Design

OEM
New Model

Meet and Optimize
Target Performance
While reducing Mass

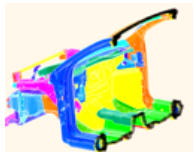
SDO
Single Disciplinary Optimization
- Suspension
- Engine / PT
- Drive line

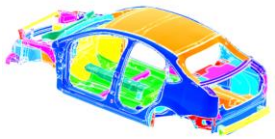
MDO
Multi Disciplinary Optimization
- Crash
- NVH
- Aero drag
- BIW Stiffness and frequency

Benchmarking target
Vehicle Performance

Generate Baseline
Reference Performance

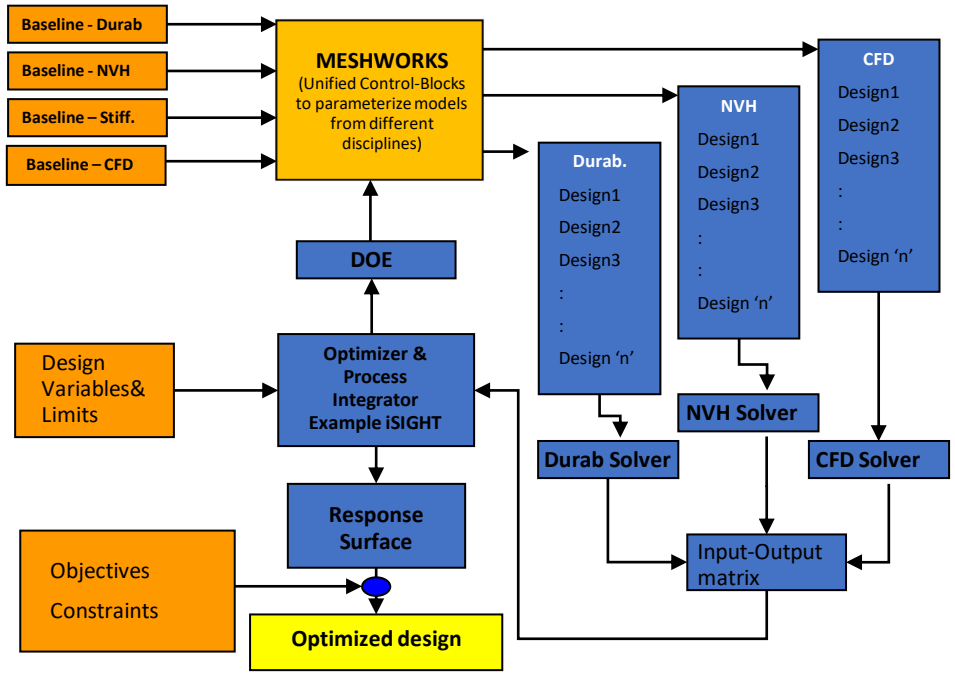
Generate Program
Performance Target





Weight and Performance Optimized Design

CAE/CAD Morphing, Parameterization & Multi- disciplinary Weight Optimization Flow Chart



Transmission housing Weight Optimization & CAD Morphing

Baseline Design (Machined CAD)

Morphing & Parameterization using: DEP MeshWorks

Parametric CAE Model of Machined CAD

CAE based Weight Optimization

Optimized parameters applied on Machined CAD data using DEP-CAD-MORPHER resulting in: Weight Optimized Machined CAD

Optimized parameters applied on Casting CAD data using DEP-CAD-MORPHER resulting in: Weight Optimized Casting CAD

1. Multiple optimization process developed and applied on several engine programs
2. Topology optimization – for NVH and Durability Loadcases. Based on topology results MeshWorks can create enablers on FE models with out any CAD required
3. Shape based optimization – Meshworks can parametrize the FE models and generate multiple designs, these can be run as deterministic runs to understand sensitivity or optimize using DOE.
4. Meshworks had wide variety of design enablers – Auto Rib creation, flange or wall thickness, fillet radius change, boss height parameter, bolt dia, material etc..
5. Using CAD morpher meshwork's can generate optimized CAD model. This will be used for any manufacturability study or hand shake with design team etc.

1.2 Kg Weight savings

Optimized Design Machined CAD to Design/Release group

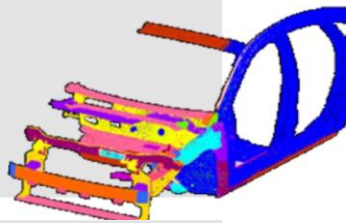
Optimized Design Casting CAD to Manufacturing group

Various Lightweighting Techniques implemented by DEP

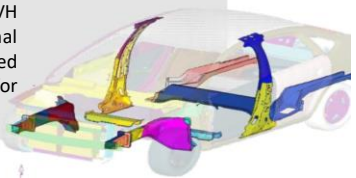
- Topology Optimization
- Section/Shape Optimization
- DOE Studies
- MDO/SDO Studies
- Welding /Adhesive Optimization
- Material Selection and Weight optimization
- RSM (Response Surface Method Analysis)
- Sensitivity Studies
- Rapid 1d Model Creation

Success Stories

A large OEM's current production mid-size sedan was significantly light weighted and weld count reduced by DEP through its MDO process. The OEM's powertrain group has benefitted from DEP's morphing based multi-disciplinary weight optimization process, and transformed its entire virtual analysis procedures embedding DEP's successes on major engine and transmission programs.



DEP's weight optimized ALLSTEELBIW for a very large OEM at 172 Kg is considered an industry first for lightest steel body meeting all crash, NVH & durability targets. The above design has been set as an internal benchmark cum target at the OEM and has been multidiscipline optimized (MDO) by DEP as per OEM load cases, modeling practices and design for manufacturing standards.



DEP performed full vehicle parameterization and MDO for an SUV, resulting in a mass saving of 11 kgs, with minimal packaging and tooling changes and without any degradation in performance. DEP MeshWorks driven MDO approach has been successfully extended beyond full vehicle to various other vehicle sub systems as well.

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