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 of products for all segments.

DEP MeshWorks, a CAE platform helps leading companies around the globe transform their product development process, reduce their development time, and get to market faster, thus saving considerable time and money. MeshWorks is a CAE driven integrated platform for pre and post processing, involving rapid concept CAE and CAD model generation. With in-built features of advanced meshing, process automation, concept modeling and CAD/CAE morphing, MeshWorks is now an industry standard tool for faster & smarter parameterization and optimization. Since its release in 2001, MeshWorks has been simplifying tedious time consuming processes associated with design changes, and helping engineers develop future-ready products across industries.

Reduced order models (ROMs) are high-fidelity, complex models that have been simplified. They capture the behaviour of source models so that engineers can quickly investigate the dominant effects of a system with minimal computational resources. Because of market demands for shorter design cycles that produce higher quality products, ROM process have grown in popularity in the product development industry. DEP's highly automated Reduced Order Modeling techniques promote simplified model updating processes which in-turn drastically reduce the run-time, accelerated by fast design iterations.

DEP
Smarter solutions. Realized.

# REDUCED ORDER MODELING (ROM)

- 3D to 1D Beam Creation
- Topo ISO – Surface to 1D
- Rapid design iterations & Accelerated optimizations
- Optimize sections to Concept models (1d To 3d)
- Section synthesizer to optimize linear and non-linear load cases
- Customizable workflows for Vehicle Development process

# BIW Architecture Development – ROM approach

3D FE Model (Joint & Section definitions input) - > ROM BIW Creation (Updated Joints & Panels) - > Linear- optimization - > Non-linear-optimization - > Optimized beam BIW to 3D Model

Topology Results (ISO Surface) - > 1D Beam-model (Section, Positions & Joints Configured) - > Linear - optimization - > Non-linear-optimization (Optimization for Section properties) - > 3D Concept Shell model Creation using ConceptWorks (Subsequent Parametrization & Optimization possible)
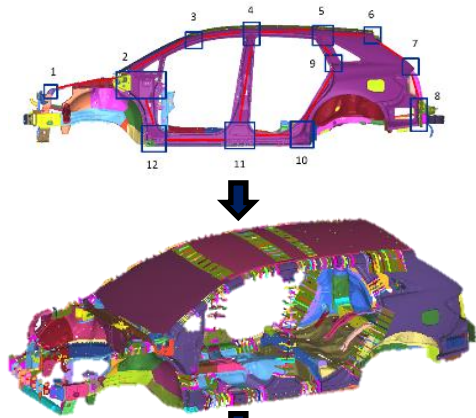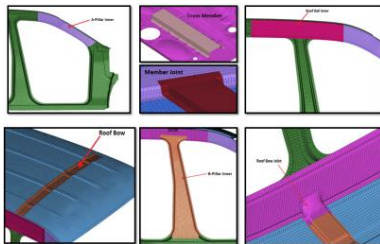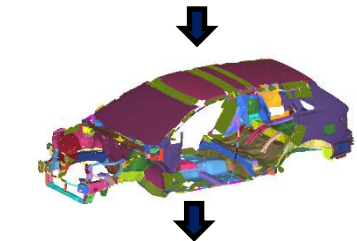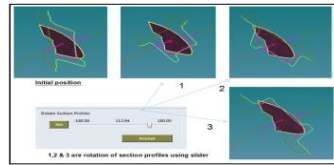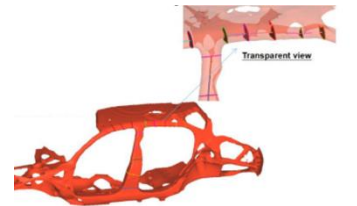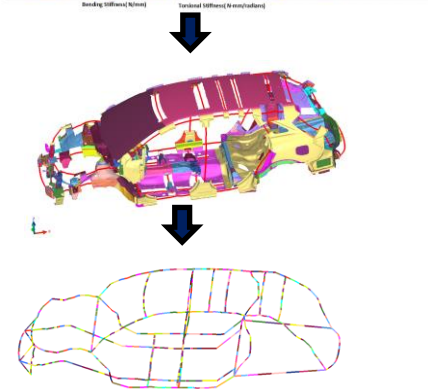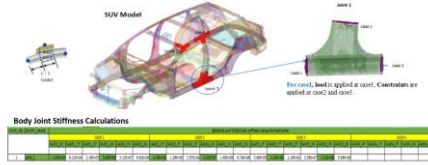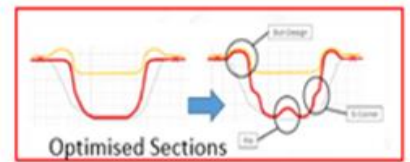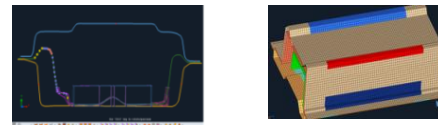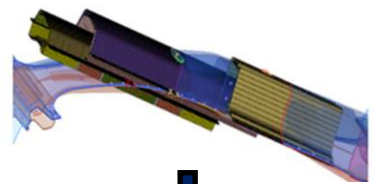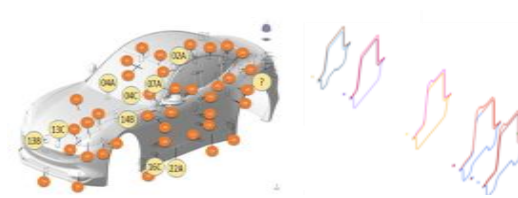
Section Optimization: Linear and Non linear

Input Sections (criterion section from library or base FE references) - > Extrude sections & analysis - > Parametrization of sections - > DoE and optimization - > Optimized section generation

ROM Building & Optimization Tool kit from MeshWorks

- Highly automated 3D to 1D beam creation
- Highly automated Joint creation a) beam, b) spring
- Auto Parametrization of ROM models
- Designer Tool using ROM models
- Highly automated Topo Iso surface to beam models
- Section synthesizer for non-linear load cases
- Automated 1D to 3D member creation (sections to members)
- Joining members to create joints
- ConceptWorks applications for: Topo Iso-surface to Concept Shell model

ROM Approach–Advantages of using MeshWorks

- Automated conversion of complex 3D model to beams
- Drastic reduction of Analysis run-time without compromising the detailed model build
- Lots of design iteration at rapid rate & subsequent optimization at lightening speed
- ROM bulid & update duration is between 1 to 3 days based on level of complexity
- Eliminates tedious design cycle of remeshing, morphing & CAD update for 3D models
- CAE team can benefit from auto parameterization & optimization option for the complete family of ROMs & cross sections to create concept models
- Section synthesizers available for all 20 standard section elements to study various load cases
- ROM build are parametrized for fast optimization & create equivalent Std.manufacturable sections.
- 1D optimized cross section to 3D FE & CAD Model conversion with less efforts & at reduced time
- At early stage of vehicle development, designer team can focus on customizing models for performance & lightweighting