DEP

MeshWorks

Revolutionizing CAE for

PRECISION. INTELLIGENCE. PERFORMANCE. SUCCESS.

All New DEP MeshWorks 2025

Your Strategic Advantage in the Ever-Evolving World of Product Development

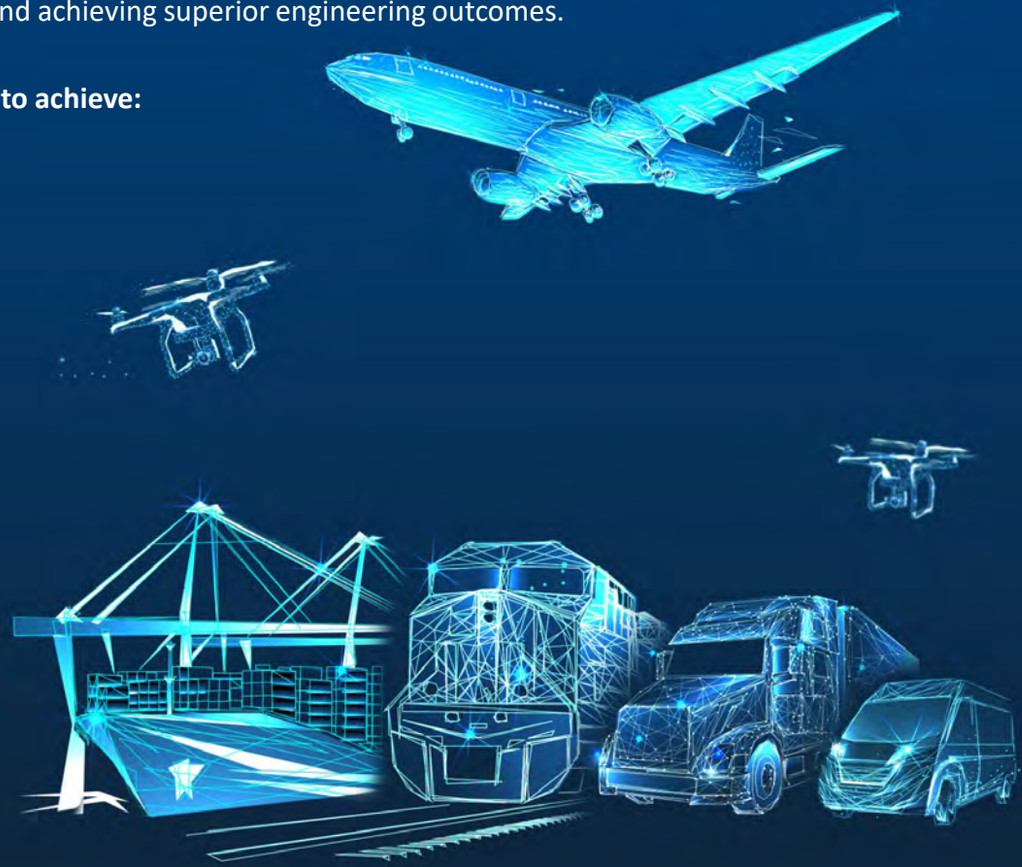
In today's rapidly evolving engineering landscape, staying ahead of the competition is vital. DEP MeshWorks, from Detroit Engineered Products (DEP), is an innovative CAE platform that gives you a competitive edge. With its cutting-edge technology and superior support, MeshWorks is your solution for transforming product development and unlocking new opportunities.

Our latest & feature-rich version, MeshWorks 2025, integrates AI/ML-driven automation, enabling optimized workflows, reduced modelling time, and minimized human error. With lightning-fast concept CAE and CAD model generation, advanced meshing and morphing, and streamlined process automation, MeshWorks accelerates development cycles and ensures faster, more reliable results.

This newer and upgraded MeshWorks leverages advanced algorithms to automate complex tasks, improve simulation accuracy, and drive informed decision-making. AI-powered optimizations enhance product performance, while digital twin technology enables pre-production simulations, reducing costs and enhancing productivity. With DEP MeshWorks, you gain the ultimate solution for accelerating your time to market and achieving superior engineering outcomes.

This enhanced version delivers the full power of CAE directly to your hands, enabling you to achieve:

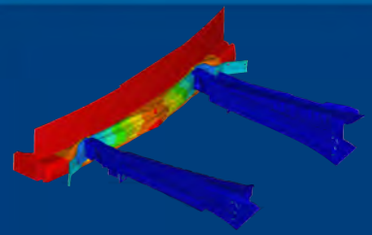
- **Precision:** With DEP MeshWorks, gain precision in product development through advanced meshing, modelling, and AI-driven automated workflows, reducing development time, enhancing accuracy, and minimizing errors.
- **Intelligence:** Leverage AI/ML-driven automation in MeshWorks to optimize workflows, automate tasks, save engineering time, reduce errors, and enhance simulation intelligence, allowing you to focus on innovation.
- **Performance:** Accelerate product development with MeshWorks' advanced meshing, modelling, and simulation, enabling faster decisions, efficient simulations, and agile design adjustments to meet key targets for weight, cost, and performance.
- **Success:** Maximize ROI and profitability with AI-driven optimizations, digital twin technology for pre-production simulations, and eMOD for rapid electrification model creation, ensuring faster time to market and continuous innovation.



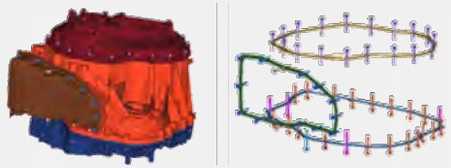
DEP MeshWorks

Unlock the New Features

Manufacturing Solutions

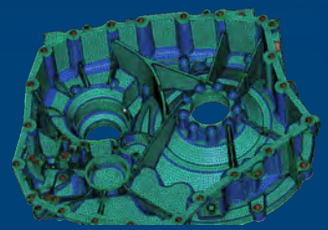


Intelligent AI/ML
CAE Framework

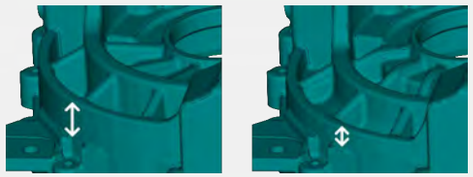


Rapid Model
Building

CAE Parameterization

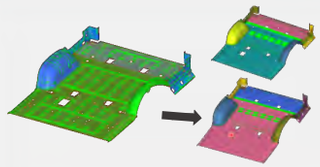


Next-Gen Meshing

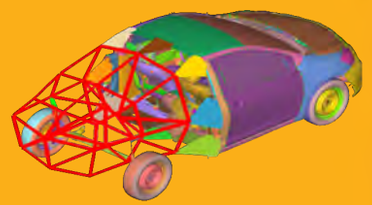


Next generation
CAD/CAE Morphing

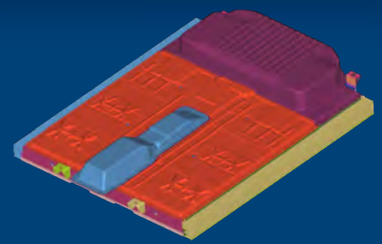
Groundbreaking
Concept Modelling



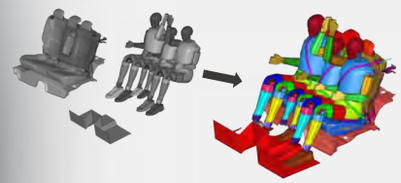
Time Saving MDO



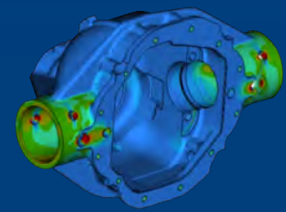
Innovative
ROM Module



Productive
Electrification Module



Highly Automated
Process Workflow



Advanced Post-Processing
Functions

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

Next-Gen Meshing: Automated High-Fidelity Meshes from Complex CAD

AI-Powered Meshing, Hassle-Free Workflow

- *Rapid generation of CAD-conforming finite element meshes*
- *Advanced automation minimizes manual user intervention*
- *Template-based workflows ensure repeatable, high-quality mesh output*
- *Supports 2D, 3D, mid-surface, and hexahedral meshing in a unified environment*

About Meshing

- The meshing module in MeshWorks provides a complete environment for generating high quality finite element meshes.
- It supports tetrahedral, hexahedral and quadrilateral surface meshing in one platform. With AI driven feature recognition and smart templates, it automates workflows, reduces manual effort and stays fully linked to CAD geometry.
- This allows quick mesh updates after design changes, boosting productivity and adaptability throughout the simulation lifecycle.

DEP MeshWorks Value Proposition

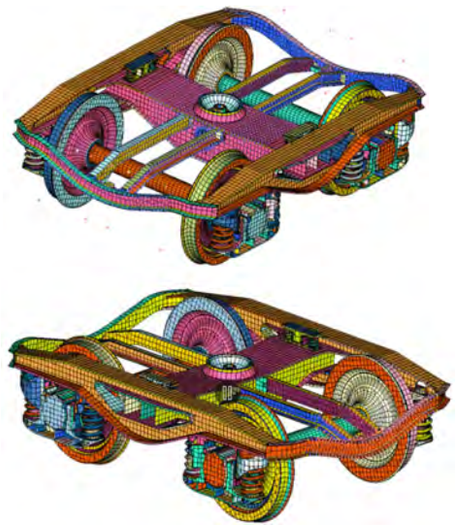
Minimal CAD Cleanup
Mesh directly with minimal CAD preparation, eliminating time-consuming geometry corrections.

High-Speed Mid-Surface Generation
Mid-surface extraction boosts performance by up to 50%, speeding up meshing cycles.

All-in-One Meshing Environment
Supports tetra, hexa, plastics, and sheet metal meshing in a single unified framework.

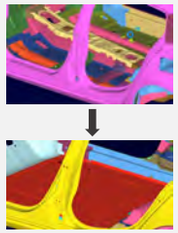
Automated Batch Meshing
Enables system-level meshing via batch processing, ensuring speed and consistency across large assemblies.

Hex Meshing and Parameterization



Features

Advanced CAE Meshing Tools
Quickly create 2D surface and 3D solid meshes (tetrahedral, hexahedral, mid-surface, sheet metal) from complex CAD models.



Automated Mesh Generation
High-level automation reduces dependency on manual CAD cleanup and accelerates mesh creation.

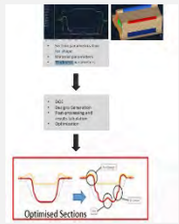
AI-Driven Geometry Recognition
Utilizes AI/ML to maintain geometric fidelity and intelligently handle complex features during meshing

Template-Based Control
Apply predefined mesh settings to features like fillets, chamfers, tubes, and machined faces for consistent output.

Batch Meshing Workflow
Automates meshing for full assemblies and subsystems, delivering fast and accurate results with minimal input.

Mid-Surface Extraction Tools
One-click mid-surface creation with precise feature capture and optimal mesh flow.

Automated Mesh Repair
Identifies and corrects over 50% of common mesh defects in a single pass, improving model readiness.



Flexible Thickness Application
Apply thickness data using automated strategies, including intelligent recognition of ribbed and complex sections.

Streamlined Meshing Workflow
Offers end-to-end meshing efficiency, reducing turnaround time while ensuring mesh quality and consistency.

Reduced CAD Dependency
Minimizes the need for geometry corrections, enabling direct meshing from raw CAD.

High-Quality Element Output
Generates superior mesh quality, enhancing simulation reliability and reducing rework.

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Unified Platform Coverage
Supports all common meshing needs—tetrahedral, hexahedral, mid-plane, plastics, and sheet metal—within a single tool.

Cost and Time Savings
Eliminates the need for multiple meshing tools, lowering overhead and accelerating the development cycle.

DEP MeshWorks Modules

Meshing | **Modelling** | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

Rapid Model Building: Automated Tools for Complex Model Connections

Speed, Precision, Automation

- *Fully automated creation of 1D and 3D bolts across entire assemblies*
- *Interactive definition of connectors including welds, bolts, and adhesives*
- *Automatic contact generation between component interfaces*
- *Rapid assignment of loads and boundary conditions for complete FE models*

About Modelling

- Engineered specifically for CAE users, this module streamlines the assembly of multi-component finite element models with minimal user input and advanced automation.
- It allows for the rapid application of loads, boundary conditions, and connector definitions without the need for manual scripting.
- This approach significantly boosts the efficiency of CAE workflows while maintaining high levels of accuracy and consistency in generating simulation-ready assemblies.

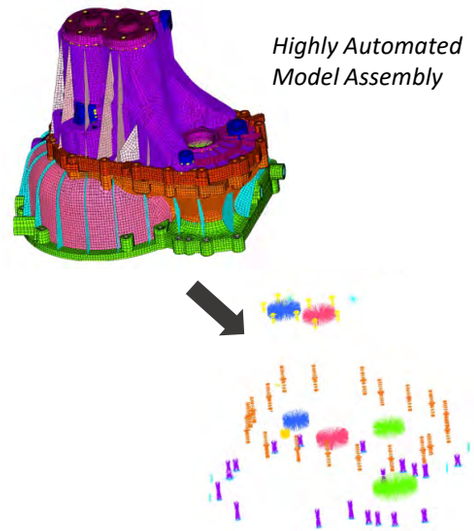
DEP MeshWorks Value Proposition

Unified Assembly Setup
Generate bolts, contacts, and pre-tensions in one workflow to speed-up full-assembly preparation.

Cost-Efficient Connector Optimization
Parametric weld and adhesive control, reduces weld count and material use while maintaining performance.

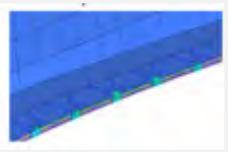
Time-Saving Automation
Achieve up to 60% reduction in modelling time through automated workflows and intuitive user interfaces.

High-Fidelity Connection Modelling
Advanced features like Heat-Affected Zone (HAZ) modelling enable highly accurate structural and crash simulations.

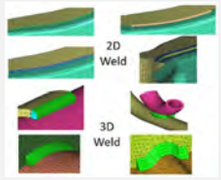


Highly Automated Model Assembly

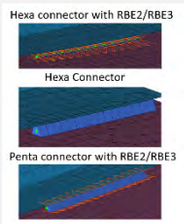
Features



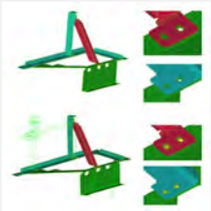
Automated Spot Weld Creation
Generates spot welds with correct material, location, and property definitions for Crash, NVH, and Durability simulations.



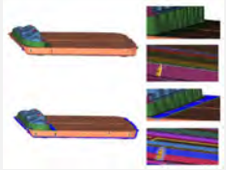
Seam Weld Generation Tools
Supports shell, solid, beam, and hybrid seam weld types with automated placement and alignment.



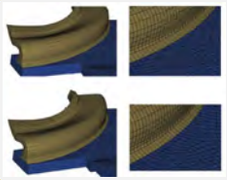
Adhesive Modelling Automation
Defines hexa/penta adhesive connectors using RBE2/RBE3 elements, with auto material and solver setup.



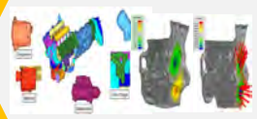
Bolt Modelling Utilities
Quickly creates 1D/3D bolt connectors with automatic pre-tension and contact definition.



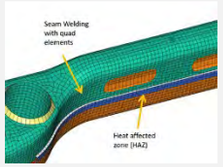
Contact Auto-Detection
Automatically detects contact surfaces and defines contact pairs across complex assemblies.



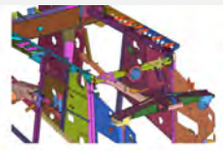
Solid Fuse Functionality
Merges solid components with proper nodal connectivity, ensuring accurate mesh behavior at interfaces.



Discipline-Specific Connector Adaptation
Automatically adjusts connector definitions based on target simulation domains such as Crash or NVH.



HAZ (Heat Affected Zone) Modelling
Enables detailed modelling of thermal effects in weld regions for both sheet metal and solid structures.



Assembly-Level Parameterization
Allows grouped parameter control of connectors, bosses, and associated features for efficient design variation studies.

Automated Bolt Generation Across Assemblies
Quickly generate 3D bolts and associated contact conditions—even when bolt geometry is absent from the CAD model.

Full Assembly Parameterization
Enable parameter-driven modelling of connectors and related features at the assembly level for scalable design studies.

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Discipline-Aware Conversion
Automatically switch connector configurations based on simulation type (Crash, NVH, etc.) to maintain accuracy.

Advanced Connector Modelling Capabilities
Incorporates detailed connection features such as HAZ and fused solids to support high-resolution simulation requirements.

DEP MeshWorks Modules

Meshing | Modelling | **AI/ML** | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

AI/ML CAE framework: Data-Driven Prediction with Physics-Based Reliability

Smarter Designs Through AI and ML Integration

- *Adaptive algorithms trained on customer-specific datasets*
- *Physics-informed models governed by physical laws*
- *Auto-parameterization links geometry with performance targets*
- *Generative AI produces feasible designs within defined constraints*

About AI/ML Framework

- MeshWorks AI/ML module is a flexible framework combining neural networks (CNN, PINN, UNET, GNN), encoders/decoders, genetic algorithms, and approximation models.
- These models can be continuously trained using customer-specific datasets to generate rapid, reliable, and customized design insights.
- The system blends data-driven intelligence with physics-based constraints to deliver actionable outcomes tailored to real-world engineering challenges.

DEP MeshWorks Value Proposition

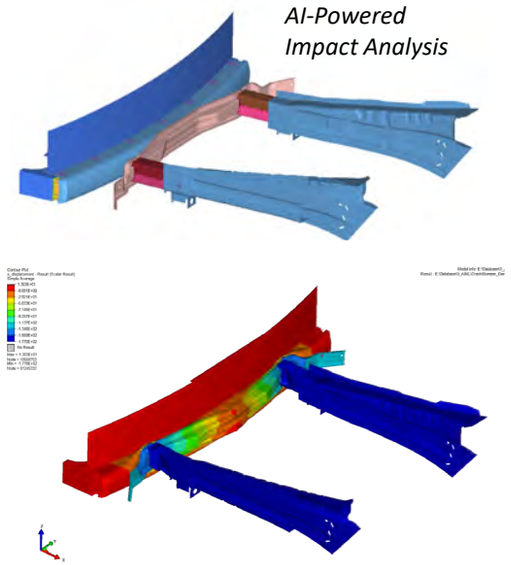
AI-Guided Early-Stage Design
MeshWorks' AI advisors aid concept design, boosting efficiency and decisions.

High Predictive Accuracy
AI/ML models improve reliability across simulations.

Augmented Dataset Creation
CAE integration generates large datasets for data-scarce cases.

Accelerated Iterations Cycles
AI cuts design cycles, enabling faster optimized solutions.

AI-Powered Impact Analysis

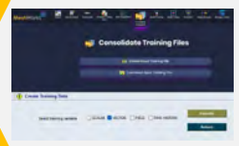


Features

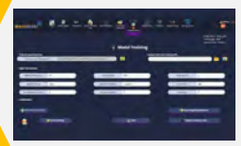
AI/ML Project Setup
Supports the creation of new or existing projects using a range of neural network architectures including CNN and GNN.

Multi-Set Management
Allows users to generate and manage multiple model sets to support comparative learning and testing.

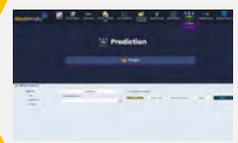
Training Data Preparation
Automates the creation of essential MeshWorks input files (ET, EL, MWPLOT) required for AI/ML training.



Training File Consolidation
Merges multiple input files into a unified dataset, streamlining the training process.



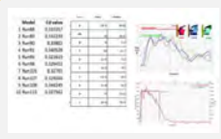
Model Training Utility
Utilizes consolidated files and input hyperparameters to train selected AI/ML models efficiently.



Predictive Capability
Post-training, the model accurately forecasts simulation results for the design under evaluation.

Parameter Library Generation
Automatically captures and stores component-wise model parameters for quick reference and reuse.

Generative Geometry Creation
AI algorithms synthesize production-ready geometries from initial design inputs, supporting rapid concept development.



Comprehensive Output Prediction
Delivers predictions across scalar, vector, tensor, temporal, and matrix data, enabling full-spectrum CAE insights.

Physics-Integrated Machine Learning
Combines traditional ML with physics-based modelling to improve the realism and reliability of predictions.

Rapid Design Evaluation
Enables quick assessments and informed decision-making during time-constrained development cycles.

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Model-to-Task Matching
Selects and applies the most suitable AI/ML architecture based on the specific application or domain objective.

Production-Ready Design Output
Transforms early-stage concepts into manufacturable designs, guided by AI-generated geometry and performance constraints

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | **Digital Twin** | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

Digital Twin: Efficient Manufacturing Solutions

Effective transfer of scan data into a 3D model

- *AI-driven mesh generation from scanned or digitized data*
- *Applied across the entire product lifecycle using intelligent automation*
- *Morphs mesh to scan data with auto-alignment of geometric features*
- *Generates midsurface and volume meshes with enhanced mesh quality*

About Digital Twin

- The morphing module in MeshWorks enables engineers to rapidly reshape and adapt existing FE and CFD models using feature-based deformation techniques.
- It eliminates the need for manual setup of morphing zones, offering intuitive region selection for localized or full-system adjustments.
- Globally recognized in CAE morphing, MeshWorks delivers efficient, precise solutions that streamline design updates while maintaining performance and mesh quality.

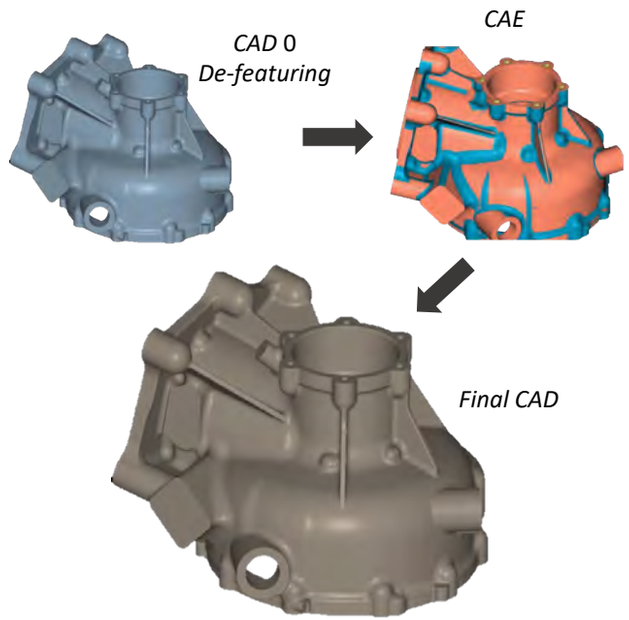
DEP MeshWorks Value Proposition

Manufacturing-Focused Design Optimization
Optimize parts, tools, and workflows for manufacturability and assembly.

Automated Deformation Compensation
Correct warpage and spring-back issues automatically.

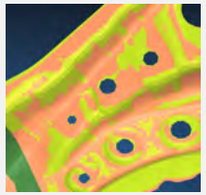
Instant AI-Powered Simulation
Apply real-time AI simulation updates after design changes.

Intelligent Morphing Capabilities
Convert scans into accurate models using AI-guided morphing.

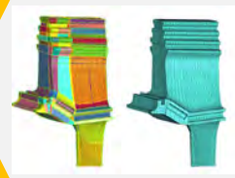


Features

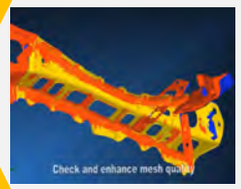
Scan-to-Mesh Conversion
Converts digitized scan data into mesh-ready models using robust morphing tools.



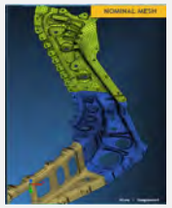
Automated Feature Alignment
AI algorithms automatically align scanned geometry with nominal CAD or mesh models.



Midsurface and Solid Mesh Generation
Generates both midsurface and 3D volume meshes with precision for downstream analysis.



Mesh Quality Enhancement
Improves element quality and mesh fidelity, increasing simulation accuracy and reliability.

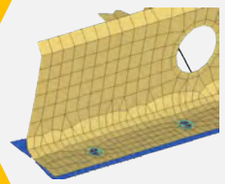


Nominal vs Actual Model Comparison
Enables direct comparison of scanned and nominal models to evaluate manufacturing deviations.

Deformation Compensation Tools
Adjusts FE models for anticipated warpage and spring-back in forming or tooling processes.

DOE-Based Optimization Support
Integrates Design of Experiments (DOE) techniques for systematic part and tool improvements

AI/ML Integration
Interfaces with MeshWorks AI/ML modules to enable predictive corrections and learning-based optimization.



Support for Assembly Components
Capable of handling entire assemblies in morphing workflows.

Automated Morphing of Scan Data
Automatically morphs full FE models to align with scanned part data, minimizing manual intervention.

Intelligent Surface Detection
Recognizes target surfaces accurately—even in the presence of scan noise or surface irregularities.

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Assembly Morphing with Gap Preservation
Maintains precise part spacing and stack-up order during full-assembly morphing operations.

Feature-Aware Mesh Alignment
Detects and aligns slots, holes, and circular features based on their center geometry, ensuring high-precision morphing.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | **CAE Parameterization** | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

CAE Parameterization: Streamlined Modelling for Rapid Design Changes

Robust parameters enable fast & easy design modifications

- *Enables comprehensive CAE model parameterization for rapid design iteration*
- *Automates the creation of parametric CAE models across disciplines*
- *Integrates with AI/ML and Reduced Order Modelling (ROM) workflows*
- *Supports seamless connectivity with Multi-Disciplinary Optimization (MDO) processes*

About CAE Parameterization

- MeshWorks provides a powerful platform for full-spectrum CAE model parameterization, enabling engineers to convert conventional FE/CFD models into flexible, intelligent parametric models.
- Supporting crash, NVH, durability, and more, the module empowers users to run optimization studies, manage configuration changes, and accelerate virtual validation.
- The platform integrates directly with ROM and AI/ML frameworks to streamline optimization and design space exploration.

DEP MeshWorks Value Proposition

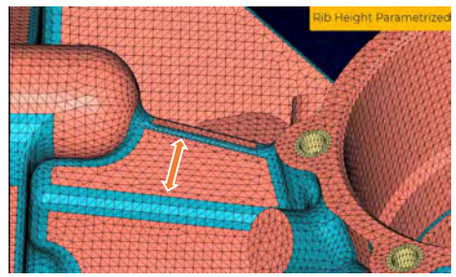
Broadened Design Exploration
MeshWorks' wide parameterization options enable deeper cross-domain design trade-off studies.

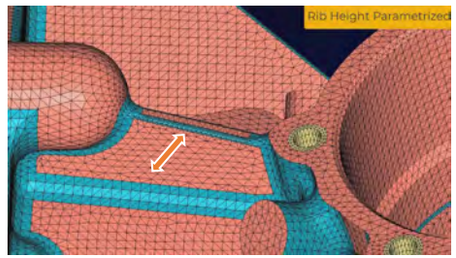
Optimized Weight Reduction
Improves weight and performance by combining geometry tuning with multi-objective optimization.

ROM-Accelerated Optimization
Integrates parametric Reduced Order Models to cut iteration time without losing accuracy.

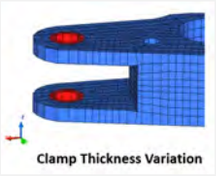
Fast, Scalable Iterations
Quickly apply design updates with easy parameter setup and automated mesh regeneration.

Parameterization





Features

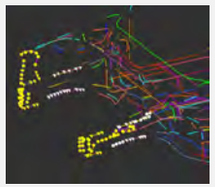


Gauge Parameters
Control material thickness variations across components for lightweighting and structural tuning.

Shape & Section Parameters
Adjust beam profiles, cross-sectional dimensions, and contour curves for geometry-driven performance changes.

Feature-Based Parameters
Manage locations and counts of design features like ribs, holes, slots, and stiffeners.

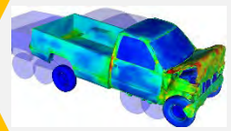
Topology Parameterization
Modify part topology, relocate members, and apply structural layout changes automatically.



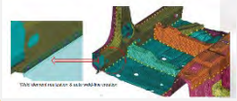
Connector & Weld Parameters
Parameterize seam spacing, pitch, adhesive lengths, and spot locations for detailed joint optimization.

Mesh Rebuild Automation
Automatically remesh affected areas after parameter changes while maintaining mesh quality constraints.

Part Toggle Parameters
Enable toggling of parts, foam, or design alternates for configuration and variant studies.



Multi-Domain Parameterization
Simultaneously manage parameters across crash, NVH, safety, and durability for cohesive system optimization.



Tailor Weld Line Control
Define cut-line location for tailor-welded blanks, controlling material distribution at a localized level.

Extensive Parameter Coverage
Offers the broadest parameter library in CAE, supporting geometry, connections, topology, and part toggling.

Rapid Parameter Creation
Intuitive tools simplify the definition and editing of parameters, even in large models.

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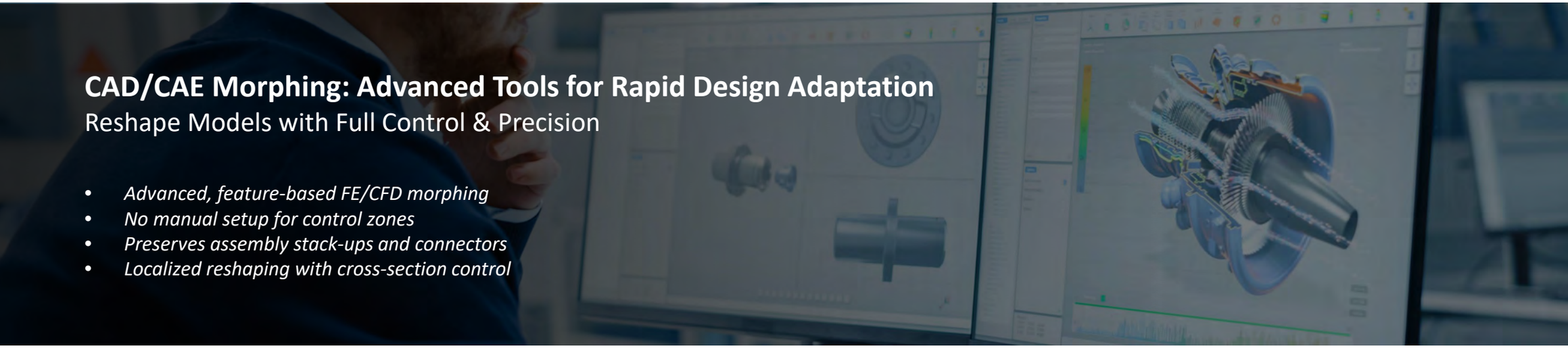
Detail-Oriented Parametric Control
Supports stack-ups, weld sequencing, and complex interdependencies for high-fidelity modelling.

Integrated Multi-Domain Optimization
Links parameters across simulations for accurate and synchronized design studies across full product systems.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | **CAD/CAE Morphing**

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing



CAD/CAE Morphing: Advanced Tools for Rapid Design Adaptation

Reshape Models with Full Control & Precision

- *Advanced, feature-based FE/CFD morphing*
- *No manual setup for control zones*
- *Preserves assembly stack-ups and connectors*
- *Localized reshaping with cross-section control*

About CAD/CAE Morphing

- The morphing module in MeshWorks enables engineers to rapidly reshape and adapt existing FE and CFD models using feature-based deformation techniques.
- It eliminates the need for manual setup of morphing zones, offering intuitive region selection for localized or full-system adjustments.
- Globally recognized in CAE morphing, MeshWorks delivers efficient, precise solutions that streamline design updates while maintaining performance and mesh quality.

DEP MeshWorks Value Proposition

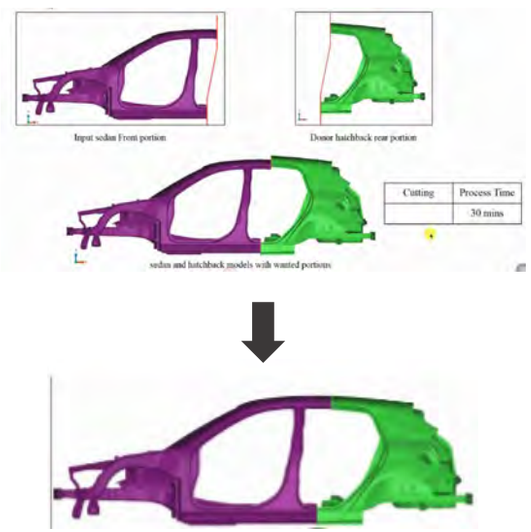
Intuitive, Clay-Like Flexibility
Sculpt models freely with fast, intuitive iterations.

No Setup Required
Perform complex morphs instantly—no predefined zones required.

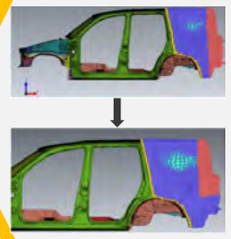
High-Fidelity Transformation
Achieve up to 0.01 mm accuracy for perfect alignment.

Streamlined User Experience
Simple UI enables quick learning and high productivity.

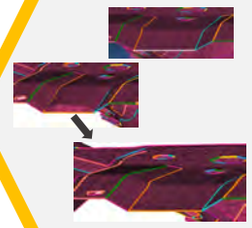
Morphing Technology



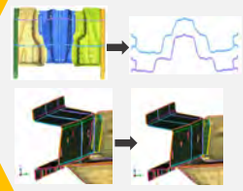
Features



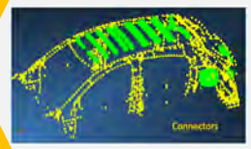
Control Block Morphing
Apply both low- and high-order deformation blocks to modify local or global shapes efficiently.



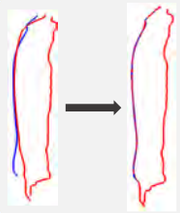
Freeform Morphing
Sculpt surfaces and features directly at the mesh level for advanced shape control without CAD.



Pattern & Section Morphing
Replicate deformations across symmetric sections or repeated features for consistent updates.



Connector Preservation
Automatically maintains bolts, welds, and adhesives during mesh deformation to retain assembly integrity.

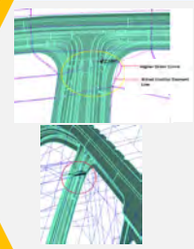


Precision Matching
Aligns model geometry to scanned or target shapes with accuracy within hundredths of a millimeter.

Automated Remeshing and Rewelding
Meshes morphed regions and regenerates connections like spot welds, bolts, and adhesives automatically.

Feature-Based Morphing
Morph using only key feature lines and surfaces for localized, constraint-driven deformation.

CAD/CAE Interoperability
Supports both mesh- and CAD-based morphing; also enables reverse CAD generation from mesh data.



Constraint-Controlled Deformation
Maintains part features such as hole diameters, beam straightness, and part outlines during shape changes.

Zero-Zone Setup
Morph models directly without defining fixed or deformable zones, significantly reducing prep time.

Direct Region Morphing
Users can intuitively select and deform specific regions while maintaining design constraints.

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Preservation of Key Features
Retains cross-sections, hole sizes, and assembly-level stack-up during morphing operations.

Micron-Level Precision
Delivers unmatched deformation accuracy up to 0.01 mm for high-fidelity results.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | Post Processing

ConceptWorks: Simplified CAE Design with Minimal Training

Directly Create Concept FE Model Without CAD

- *Enables direct CAE model creation without reliance on CAD*
- *Incorporates manufacturing feasibility into early-stage concept models*
- *Automates 1D-to-3D structural model generation*
- *Powered by patented technology ensuring unique capabilities*

About ConceptWorks

- ConceptWorks, a specialized module within MeshWorks, empowers CAE engineers—regardless of CAD expertise—to rapidly develop and refine structural design concepts directly at the mesh level.
- By eliminating the dependency on traditional CAD workflows, ConceptWorks accelerates early-phase design iterations, allowing users to model and optimize structural members, joints, and components quickly and efficiently, ultimately reducing development time and cost.

DEP MeshWorks Value Proposition

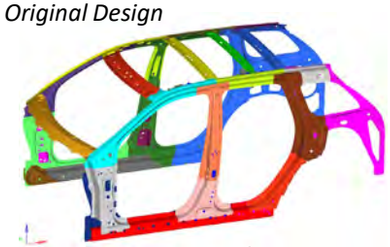
Accelerated Concept Design
Enable quick design changes in CAE with reduced CAD dependency.

Integrated Design & Analysis
Seamlessly connect ideation to simulation for faster development.

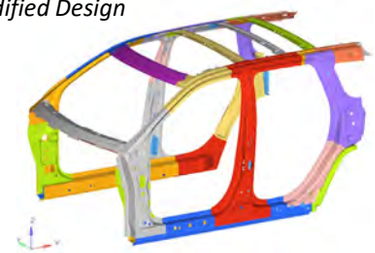
Time & Cost Reduction
Cut modelling time by up to 70%, reducing lead time.

Multi-Domain Applicability
Supports sheet metal, castings, plastics, and more across industries.

Original Design

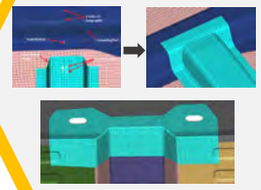


Modified Design



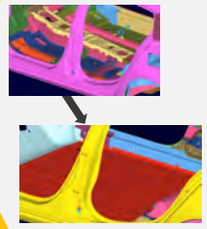
Features

Parametric Member Creation
Generates structural members using predefined or custom sections with full parametric control for quick adaptability.

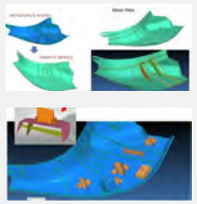


Automated Joint Modelling
Creates standard or custom joints with minimal user input, ensuring mesh continuity and compatibility.

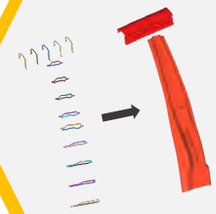
Internal Structures Generation
Automates the creation of components like roof rails and cross-members with accurate, mesh-ready geometry.



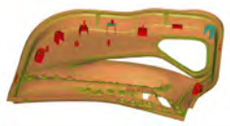
IC to EV Model Transformation
Supports full model conversion from internal combustion to electric vehicle architectures without CAD dependency.



CAD-Free Mesh Editing Tools
Enables direct editing of meshes for processes such as forming, casting, molding, extrusion, and additive manufacturing.

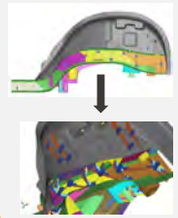


Topology-Based Sketching
Utilizes 1D parametric sketches to quickly generate structural layouts, removing the need for CAD-driven sketches.



Auto Feature Integration
Automatically inserts design features like fillets, ribs, and holes to enhance model fidelity with minimal input.

Assembly-Level Concept Modelling
Supports full assemblies with part interaction definitions, connectors, and interface modelling at the concept stage.



Direct FE Model Creation
Builds finite element models using inputs like sections and trajectories, bypassing traditional CAD-based workflows.

CAD-Free Finite Element Modelling
Allows complete FE model creation and editing without the need for CAD input—a groundbreaking industry innovation.

Built-In Manufacturing Feasibility
Supports downstream processes such as casting, sheet metal forming, molding, extrusion, and additive manufacturing.

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— Uniqueness —

Patented Innovation Status
Backed by proprietary, patented methods—offering unique and unmatched modelling capabilities.

Accelerated Full Vehicle Modelling
Enables the creation of complete vehicle FE models up to five times faster than conventional workflows.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | **MDO** | ROM | eMOD | Process Automation | Post Processing

Multi-Disciplinary Optimization: Streamlined Design via Parametric DOE Studies

Time & Weight Reduced Through Minimalistic Design

- *Automates design and simulation using parametric modelling*
- *DOE-based workflows manage complex, multi-physics simulations*
- *Scalable 'batch mode' supports high-throughput CAE processing*
- *Integrates with leading solver platforms easily*

About MDO

- The Multi-Disciplinary Optimization (MDO) module in MeshWorks enables engineers to evaluate and optimize design alternatives across multiple domains using integrated parametric and non-parametric modelling.
- MeshWorks automates the optimization process, from solver execution and post-processing to seamless integration with third-party tools. With built-in support for DoE, ROM, and automated model updates, it enables efficient multi-objective decision-making across the design space.

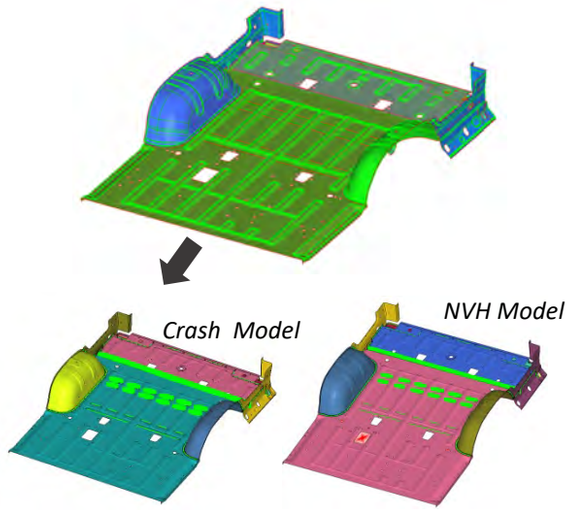
DEP MeshWorks Value Proposition

Balanced Performance Optimization
Reduce weight and cost while preserving structural, thermal, and acoustic performance.

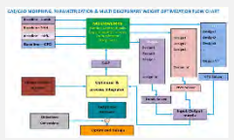
ROM-Enhanced Efficiency
Uses Reduced Order Models to significantly cut simulation and optimization time.

Holistic Design Consideration
Includes manufacturability, ergonomics, packaging, and cost in the optimization loop.

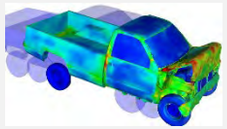
End-to-End Workflow Automation
Streamlines the MDO workflow to speed convergence and enable smarter design decisions.



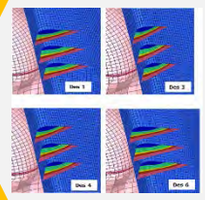
Features



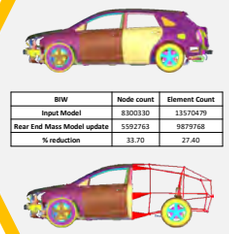
Daily MDO Integration
Seamlessly connects MeshWorks parameters with top optimization engines for continuous, reliable optimization cycles.



Cross-Domain Parameter Reuse
Share and reuse parameters across disciplines like crash, NVH, CFD, and durability to reduce set-up effort.

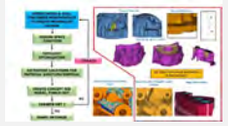


DoE Matrix Automation
Generates and manages DoE datasets to support nominal, robust, and sensitivity-based optimization.

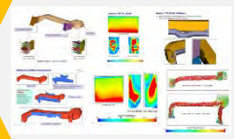


BIW	Node count	Element Count
Input Model	8300330	13570479
Rear End Mass Model update	5592763	9879768
% reduction	33.70	27.40

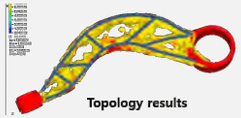
ROM-Based Optimization Acceleration
Employs parametric ROMs to enable rapid evaluation of large design spaces with high accuracy.



Efficient MDO Workflow
Streamlines optimization to meet targets, reduce weight, cut costs, and boost productivity.



Rapid Design Exploration
Integration of ROM approaches allows for fast and accurate optimization studies across large design spaces.



Topology Optimization Support
Functions as both pre- and post-processor in topology workflows, enhancing integration and flexibility.

Geometry Simplification
Automatically de-features ribs, bosses, and other non-critical geometry to speed-up optimization runs.

Automated Morphing Capabilities
Engineers can generate minimalistic, manufacturable designs through automated morphing at both component and full-vehicle levels.

Unified Parameter Framework
Enables consistent parameter definition and transfer across crash, NVH, thermal, and fluid domains.

Seamless Optimization Integration
Directly interfaces with industry-standard optimization & solver tools, eliminating the need for custom scripting or middleware.

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Automated Design Synchronization
Applies design updates across both CAD and CAE environments, ensuring simulation and geometry are always aligned.

Full-System Optimization
Supports coordinated, multi-domain optimization at system and sub-system levels for maximum product performance.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | **ROM** | eMOD | Process Automation | Post Processing

Reduced Order Modelling: Accelerated CAE Workflows for Rapid Product Development

Customization & Optimization at lightning speed

- *Auto-parameterization of linear/non-linear ROM models*
- *Rapid 3D–1D–3D model conversion*
- *Save up to 50% solver time*
- *Super Element ensures closer correlation*

About ROM

- The ROM module in MeshWorks efficiently transforms detailed finite element (FE) models into compact, high-fidelity parametric 1D representations.
- It intelligently reduces complex 3D structural assemblies into equivalent 1D beam models while preserving critical behavioral accuracy across disciplines such as crash, NVH, and more.
- This model reduction significantly accelerates CAE workflows by minimizing solver computational time without compromising predictive capability.

DEP MeshWorks Value Proposition

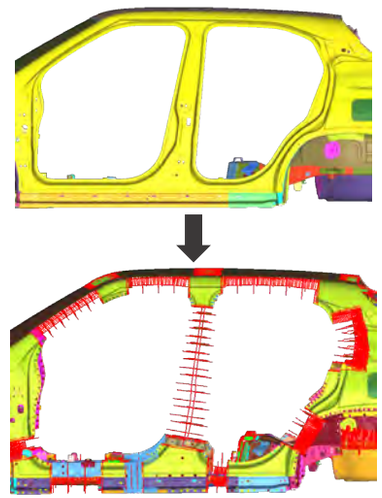
ROM-Driven CAE Acceleration
MeshWorks ROM cuts analysis solver time by up to 50%, speeding up CAE optimization cycles.

Faster Parametric Optimization
Parameterized ROMs significantly reduces development time, speeding-up optimization cycles.

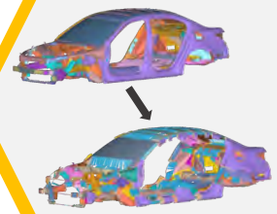
Design-to-Manufacture Efficiency
ROM models enable optimization of cross-sections and shapes for manufacturability.

Automated Topology Modelling
Identifies tubular and joint regions for location-specific ROM modelling.

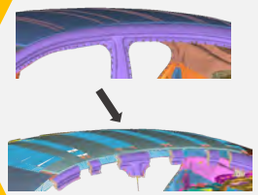
3D to 1D Beam Creation



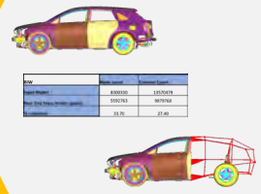
Features



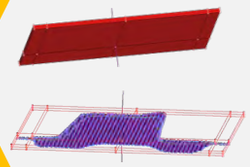
3D to 1D Conversion Tools
Transforms 2D/3D structures into accurate, efficient 1D beam models for high-fidelity simulation.



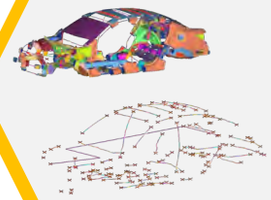
Topology & Cross-Section Recognition
Automatically identifies joints and members for quick cross-sectional synthesis and structural simplifications.



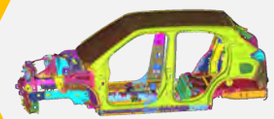
Solver Time Reduction
Fewer elements and nodes reduce complexity, speeding up solver execution time.



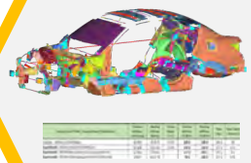
Cross-Section Parameterization
Vary height, width, and other geometry to dynamically update beam properties in the reduced order model.



Super Element Simplification
Simplifies detailed joints into super-elements, cutting complexity while preserving response accuracy.

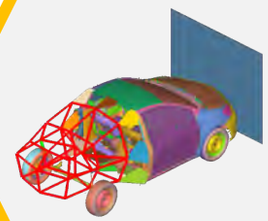


Automated ROM Generation
Converts detailed FE models into simplified, high-fidelity ROMs with minimal manual effort.



Correlated with Full Models
Feature robustness to maintain high fidelity and closely match baseline models for accurate, reliable predictions.

Geometry-Property Integration Automatically ties geometric cross-sections to beam and spring properties for efficient parametric modelling.



Discipline-Specific Tools
Tailored ROM modelling capabilities for different applications like Crash and NVH analysis.

Faster CAE Turnaround MeshWorks ROM cuts solver time by up to 50%, speeding up CAE and product development cycles.

Parametric Model Automation
Automatically links geometry to beam properties for efficient design changes and parametric studies.

DEP MeshWorks
— Uniqueness —

Optimized ROM Fidelity
MeshWorks offers domain-specific ROM tools for Crash, NVH, and more, ensuring high fidelity and performance across applications.

Lightweight Modelling
Converts complex 3D assemblies into 1D beam equivalents, streamlining analysis without losing essential behavior.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | **eMOD** | Process Automation | Post Processing

Electrification Module: Solver-Integrated EV Modelling Toolkit

Achieving Range Improvement For EVs With Optimized Design

- *High-frequency noise analysis of Electric Drive Units (EDUs)*
- *Electro-chemical modelling at the battery cell level*
- *Full vehicle-level crash simulations for battery packs*
- *Vehicle weight optimization through parametric design*

About eMDO

- The Electrification Module (eMOD) in MeshWorks is a dedicated suite of tools built for modelling and simulation of electric vehicle (EV) systems and components.
- Covering every stage from system-level evaluation to detailed component-level analysis, eMOD leverages parametric CAE technology combined with automated workflows to deliver rapid, accurate, and efficient results across electrification programs.

DEP MeshWorks Value Proposition

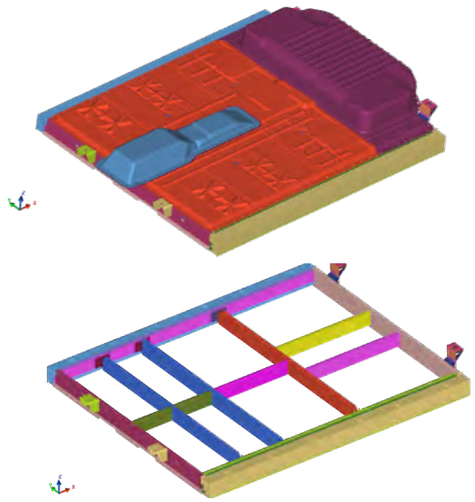
Accelerated CFD Model Creation
MeshWorks cuts CFD model build time by 60%, boosting engineering throughput.

Performance-Driven Optimization
eMOD facilitates with model development that has reduced weight and drag, in-turn improving range and efficiency.

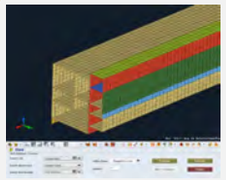
CAD-Independent Optimization
Optimize heat sink sizes/positions directly in MeshWorks, reducing CAD iterations.

Seamless EV Integration
MeshWorks + eMOD enables accurate EV analysis for faster design creation and validation.

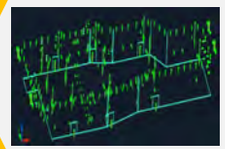
Battery Pack Modelling



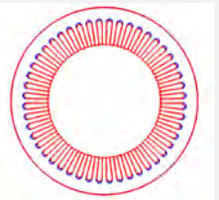
Features



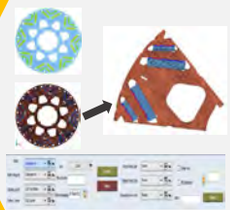
EV-Specific Meshing Tools
Enables detailed meshing at the battery cell, module, and pack levels, including EDUs and inverters.



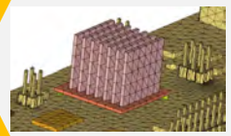
Automated Assembly Connections
Automates contact definitions such as bolt and cell connections, reducing manual setup time in EV assemblies.



Parametric Modelling Capability
Built-in parametric features allows for rapid design updates and efficient optimization workflows.

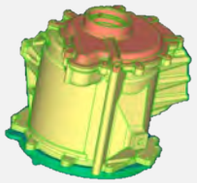


Automation for EV Applications
Integrated tools streamlines CFD analysis, battery pack modelling, and finite element (FE) optimization for electric vehicles.

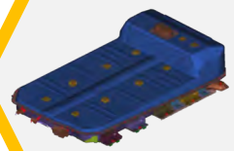


Multi-Disciplinary Support
Enables integrated studies across crash, NVH, durability, thermal, and fluid domains.

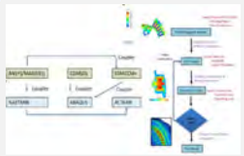
Modelling Speed and Efficiency
Provides fast turnaround times and avoids redundancy across modules, maximizing productivity.



High-Speed Optimization Engine
Supports rapid design variation studies and robust optimization processes.



ICE-to-EV Conversion Automation
Transforms conventional ICE vehicle models into EV models in under a week using ConceptWorks.



Solver Coupling Utilities
Automatically converts models between different solvers to enable integrated electrification simulations.

Dedicated EV Meshing Tools
Supports precise meshing and assembly of all major EV components, including batteries, EDUs, and power electronics.

Fast ICE-to-EV Transformation
Converts traditional ICE models into EV configurations within one week using automated workflows.

DEP MeshWorks
— Uniqueness —

Rapid Parametric Modelling
Enables efficient design updates and high-speed optimization through built-in parametric capabilities.

Integrated Development Platform
Combines modelling, solver integration, and optimization in a single environment to streamline EV development.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | **Process Automation** | Post Processing

Process Automation: Simplifying Repetitive CAE Workflows

Customized Processes Saving Time & Cost

- *No-code workflow capture via intuitive GUI*
- *Custom UI panels for streamlined automation*
- *Drag-and-drop logic linking*
- *Reusable process functions for teams and projects*

About Process Automation

- The Process Automation (PA) capability in MeshWorks enables engineers to record, customize, and execute modelling workflows through a fully visual interface. Using the intuitive Record > Create GUI > Plumb > Publish methodology, users can capture CAE tasks and convert them into reusable automation scripts—without writing a single line of code.
- These automation routines support repeatability, consistency, and reduced modelling time across projects, making PA a powerful tool for standardizing simulation processes across an organization.

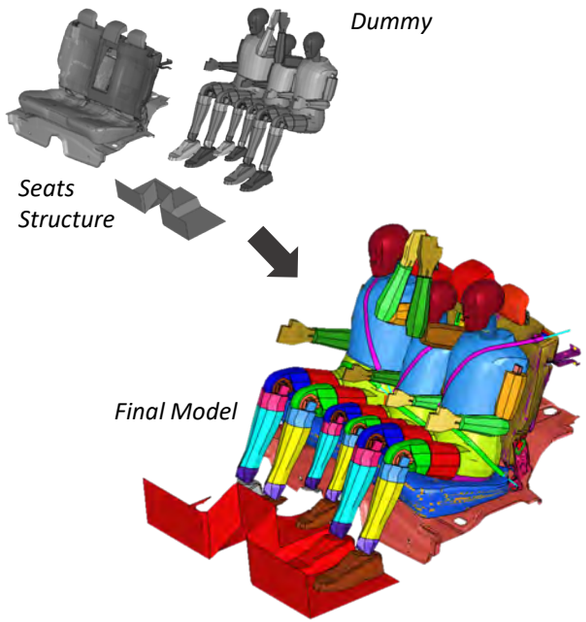
DEP MeshWorks Value Proposition

Time-Efficient Modelling
MeshWorks PA automates workflows, cutting repetitive modelling time.

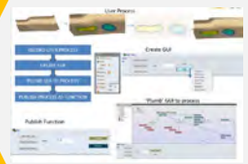
Zero Coding Required
Create automations via a visual interface—no coding needed.

Fast Workflow Setup
Build and deploy automation panels in minutes with drag-and-drop functions.

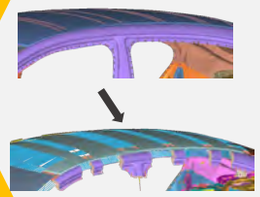
Pre-Built Packages
Ready-to-use automation packages addresses most of the common use case scenarios.



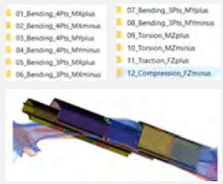
Features



Streamlined Hex Automation
Combines advanced hex modelling tools with rapid process automation to efficiently handle repetitive CAE tasks using the Record > Create-GUI > Plumb > Publish workflow.



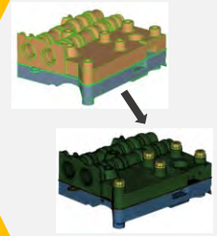
Complexity Handling
Even complex geometry and mesh creation processes can be automated without any scripting or programming expertise.



Extensive Pre-Packaged Library
MeshWorks includes over 60 specialized, pre-packaged Process Automations(PA) that serve as enabler functions for various tasks.

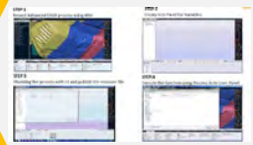
External Script Integration
PA functions are built with flexibility to integrate with external scripts like Python, etc. for extended functionality.

Cross-Platform Compatibility
MeshWorks PAs can be called from external environments such as TCL/TK, enabling complete bi-directional integration.



Visual Creation Interface
PA creation is visual and intuitive, eliminating the need for script-based workflows.

No Scripting Needed
Automation setup requires no programming knowledge, making the process accessible to all users.



Faster Workflow Development
The simplified PA creation process significantly reduces the time required to build automation routines.

Universal Functionality Support
PA functions are general-purpose and adaptable across a wide range of modelling and simulation tasks.

Drag-and-Drop Interface:
Build automation panels quickly using a user-friendly visual environment—no coding required.

Quick Interface Linking
Easily connect interface elements to automation logic using visual plumbing.

DEP MeshWorks
— Uniqueness —

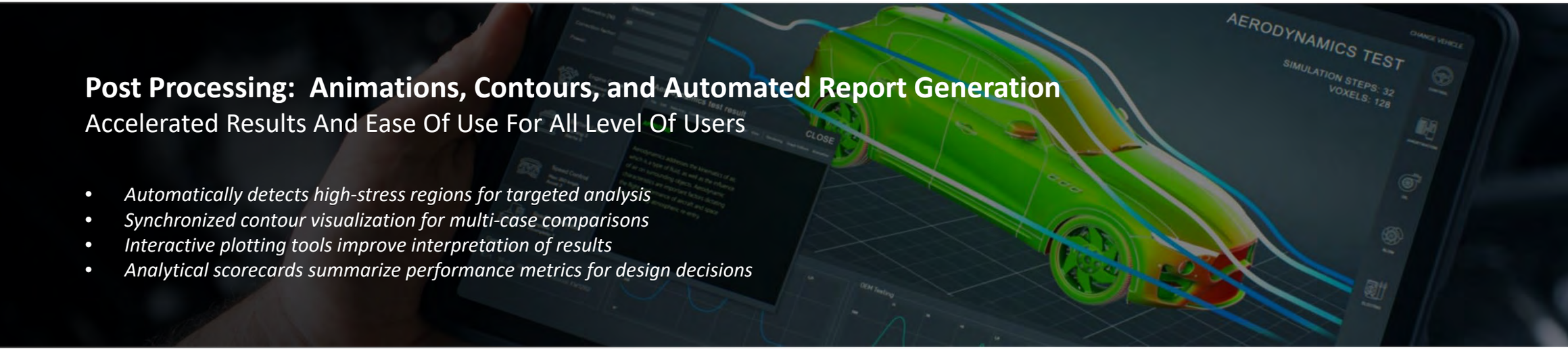
Enterprise-Ready Automation
Deploy repeatable routines organization-wide to promote standardization and efficiency.

Extensive Built-In Library:
Access 60+ specialized automation templates covering a wide range of CAE and simulation tasks.

DEP MeshWorks Modules

Meshing | Modelling | AI/ML | Digital Twin | CAE Parameterization | CAD/CAE Morphing

ConceptWorks | MDO | ROM | eMOD | Process Automation | **Post Processing**



Post Processing: Animations, Contours, and Automated Report Generation

Accelerated Results And Ease Of Use For All Level Of Users

- *Automatically detects high-stress regions for targeted analysis*
- *Synchronized contour visualization for multi-case comparisons*
- *Interactive plotting tools improve interpretation of results*
- *Analytical scorecards summarize performance metrics for design decisions*

About Post Processing

- The Post Processing module in MeshWorks is built to deliver fast, accurate, and visual evaluations of simulation results across disciplines.
- With advanced scripting automation and intelligent visualization tools, it enables users to extract key metrics—such as peak stresses and model responses—across multiple designs or load cases.
- A multi-page, multi-viewport interface supports side-by-side comparisons, while built-in scorecards and database-linked session tracking ensures traceable insights aligned with design improvements.

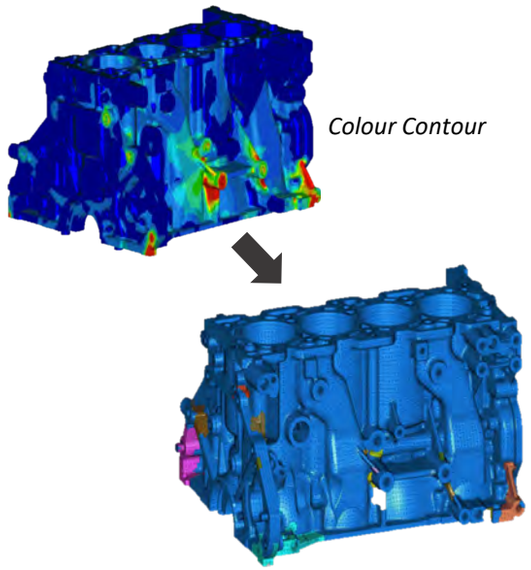
DEP MeshWorks Value Proposition

Informed, Faster Decisions
Automated visualization tools accelerate the transition from simulation output to actionable insights.

Data-Driven Design Feedback
Scorecards and stress mapping connect analysis outcomes directly to targeted design improvements.

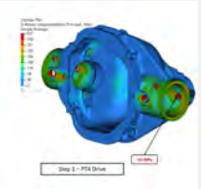
Efficient Result Interpretation
Multi-view layout and scripting minimize manual post-processing efforts.

Seamless Parametric Integration
Natively supports parametric result evaluations across design and optimization studies.

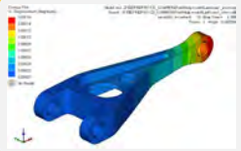


Colour Contour

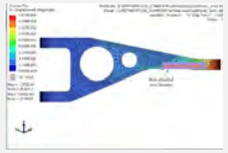
Features



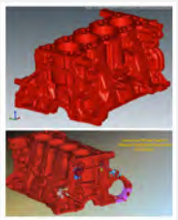
Contour Plotting
Display spatial result distributions with scalar and vector contour plots for instant interpretation.



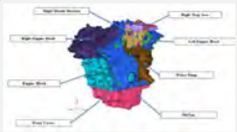
Animation Tools
Visualize modal, linear static, and transient deformations to assess structural responses dynamically.



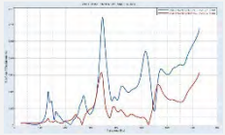
Model Info Panel
View metadata, annotated parts, and track component-specific details for structured documentations.



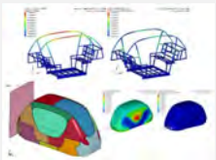
Hotspot Extraction
Automatically detect and isolate high-stress regions for focused design enhancements.



3D HTML Report Generator
Generate interactive web-based reports with embedded 3D model views—no software required for review.

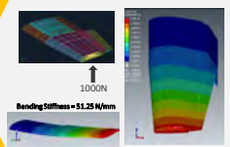


Graphing Utilities
Import results, perform advanced data analysis, and create plots for simulation-attribute correlations.



Multi-Disciplinary Result Viewing
Supports post-processing of results across Crash, NVH, CFD, Durability, and more within a unified environment.

Built-In Design Guidance
Suggests design adjustments based on performance results to support rapid iteration.



Optimization-Aware Feedback
Directly links results to design optimization goals, enabling informed decision-making.

Streamlined User Experience
Delivers high-speed workflows and intuitive tools accessible to both novice and expert users.

Production-Grade Output
Supports design-ready evaluations that feed directly into manufacturing-level decisions.

DEP MeshWorks
— Uniqueness —

FE-Level Design Integration
Enables feedback loops and design changes directly at the FE model level—without CAD intervention.

Accelerated Design Improvement
Highly automated tools, support rapid enhancements from baseline to optimized performance with minimal effort.

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DEP
Smarter Solutions. Realized.

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 footprint 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, electronics, consumer products and heavy equipment is a unique value proposition delivered to clients via DEPs world class engineers and the DEP MeshWorks platform.

Email us: email@depusa.com **I** **Visit our website:** www.depusa.com/meshworks/