Gigacasting & Structural Modularization

Re-Engineering Vehicle Production Through Integrated Structural Innovation

Automotive manufacturers are under increasing pressure to reduce vehicle weight, simplify production, and improve cost efficiency—while maintaining structural integrity and safety. Traditional body-in-white (BIW) assembly relies on hundreds of individual components and complex welding processes. A forward-thinking OEM recognized that the next leap in manufacturing performance would come from radically simplifying vehicle architecture through gigacasting and modular structural design.

From fragmented assemblies to unified structural systems.

100s→1

Part Count

Hundreds of components consolidated into single cast modules

↓

Assembly Complexity

Dramatically lowered through structural integration

↓

Factory Footprint

Reduced through streamlined multi-step production

↓

Production Costs

Decreased via simplified manufacturing workflows

Fortis & Peak
Shaping What's Next

The Strategic Challenge

The organization had advanced production capabilities—but lacked structural simplification and integration at scale. Traditional body-in-white manufacturing created compounding inefficiencies across every layer of the operation, from the factory floor to the supply chain.

Complex Body Structures

Hundreds of welded components required to construct each vehicle body, driving up tooling investment and process variability.

High Labor Intensity

Extensive assembly time and labor requirements across multi-step production processes increased operational costs significantly.

Large Factory Footprint

Multi-step production processes demanded expansive floor space, limiting flexibility and increasing facility overhead.

Supply Chain Complexity

Numerous part dependencies created fragile supply chains vulnerable to disruption and difficult to manage at scale.

Gigacasting Scalability

Significant engineering challenges existed in scaling gigacasting technologies reliably across full vehicle platform production.

⚠ **The core problem: engineering complexity was being managed rather than eliminated—a fundamental structural inefficiency requiring a new paradigm.**

Transformation Powered by 3D&S + TECHNEXIS™

Fortis & Peak deployed its proprietary TECHNEXIS™ engineering platform within the 3D&S execution framework to diagnose, architect, deploy, and sustain a full gigacasting transformation. Each phase built upon the last, creating a unified path from structural complexity to integrated simplicity.

1

DEFINE

Mapped component-level complexity across vehicle structures. Quantified cost, time, and variability. Assessed welding operations, tooling, and production flow constraints. Identified supply chain dependencies and gigacasting readiness.

2

DESIGN

Redesigned vehicle architecture into large integrated cast components. Engineered thermal, material, and structural performance models. Developed modular sub-assemblies for scalability and aligned design, engineering, and manufacturing workflows.

3

DELIVER

Installed and calibrated gigacasting equipment. Optimized casting processes for quality and consistency. Integrated casting outputs into downstream assembly with real-time structural quality monitoring.

4

SUSTAIN

Continuously refined casting processes and materials. Expanded modular design across vehicle platforms. Built organizational capability in advanced manufacturing engineering for long-term scalability.

Each phase outcome: Clear visibility into inefficiencies → Integrated structural systems → Simplified production → A scalable, high-performance manufacturing model.

Core Platforms in Action

Two proprietary platforms form the backbone of this transformation: TECHNEXIS™ serves as the engineering and manufacturing engine, while 3D&S provides the execution framework that drives results from diagnosis through sustained optimization.

TECHNEXIS™ — Engineering Engine

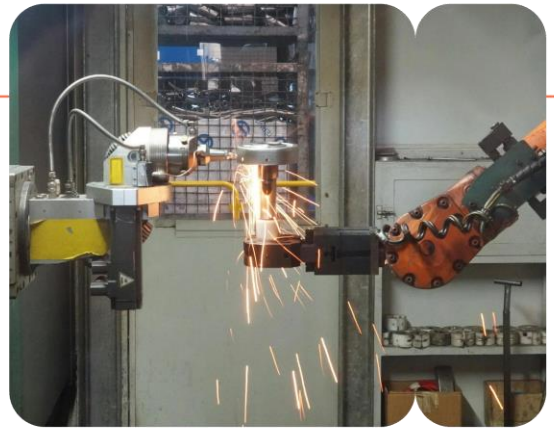
Integrates advanced manufacturing technologies including gigacasting and automation. Ensures precision across thermal, structural, and material performance dimensions. Aligns engineering design directly with production execution to eliminate gaps between intent and output.

3D&S — Execution Framework

- Define: Identify structural and production inefficiencies
- Design: Architect gigacasting and modular systems
- Deliver: Deploy advanced manufacturing technologies
- Sustain: Optimize and scale structural innovation

Traditional Model

Multiple components, welding, and complex assembly



Gigacasting Model

Single cast structures and integrated simplified production

The transformation architecture illustrates the fundamental shift from fragmented, multi-step traditional production to a streamlined gigacasting model—where engineering innovation at the material science, thermal, structural, and automation layers eliminates complexity rather than managing it.

Measurable Impact & Strategic Positioning

The gigacasting and structural modularization program delivered measurable improvements across every dimension of manufacturing performance—from the factory floor to the supply chain. The results validate the core thesis: structural simplification is the future of automotive manufacturing.

Part Count & Complexity

Significant reduction in part count and assembly complexity, consolidating hundreds of components into unified structural modules.

Cost & Labor

Lower manufacturing costs and reduced labor intensity through streamlined production workflows and fewer assembly operations.

Factory & Flow

Reduced factory footprint and streamlined production flow, enabling greater operational flexibility and lower facility overhead.

Structural Performance

Improved structural integrity and vehicle weight optimization through precision-engineered cast components replacing welded assemblies.

Supply Chain

Simplified and more resilient supply chain with fewer part dependencies and reduced exposure to disruption.

> The future of automotive manufacturing lies in structural simplification—where engineering innovation eliminates complexity rather than managing it.

This engagement positions Fortis & Peak as the creator of TECHNEXIS™, owner of the 3D&S methodology, and a firm that integrates design, engineering, and production into unified systems—establishing clear leadership in next-generation automotive manufacturing innovation.

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