solute

Multidisciplinary
engineering consultancy

About solute

solute

Multidisciplinary engineering consultancy

+100	20	12
employees in 4 offices	years of experience	areas of knowledge

- **Multidisciplinary**: work in more than 6 industries and 12 areas of knowledge
- **International**: projects and collaborations on a global scale
- **Innovation**: R&D as SOLUTE's backbone

ISO 9001 ISO 27001 ISO 14001 ISO 45001

PYME INNOVADORA

International presence

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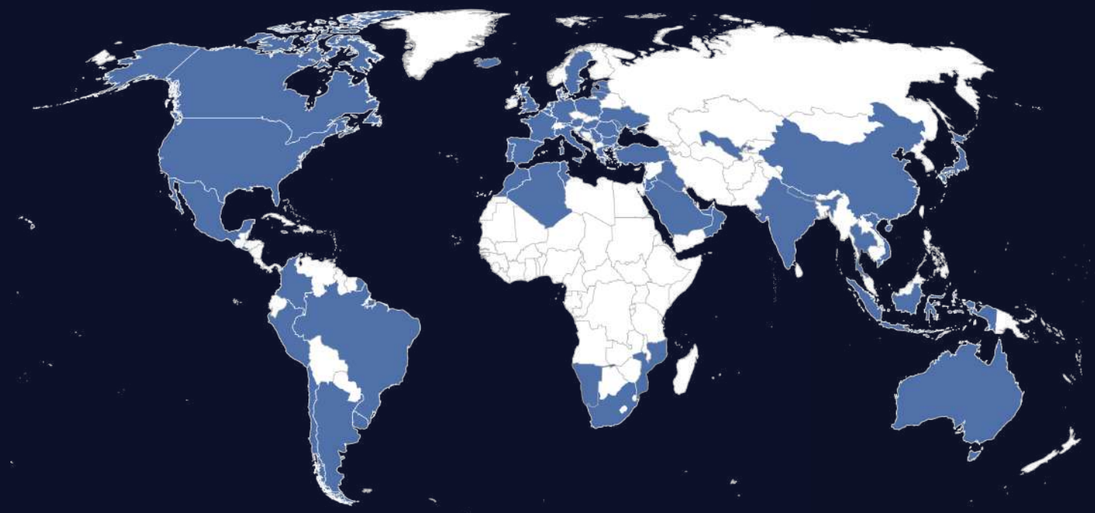

Europe

Portugal	UK	Lithuania	Denmark
Spain	Poland	Serbia	Finland
France	Sweden	Turkey	Austria
Italy	Netherlands	Germany	Greece

Africa

Morocco
South Africa
Tunisia
Tanzania

North & South America

USA	Ecuador	Argentina
Canada	Peru	Chile
Mexico	Brazil	
Colombia	Uruguay	

Asia & Oceania

India	Japan
China	Saudi Arabia
Australia	UAE
Uzbekistan	Jordan

Capabilities and industries

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Industries

Energy
Wind
Solar
Nuclear

Mobility
Automotive
Railway
Aerospace

Meteorology

Heavy industry

Machinery

Areas

Technical

Aeroelasticity

Renewable resource eng.

Operation & maintenance

Structural mechanics eng.

Civil engineering

Meteorological forecasting

Energy forecasting

Fluid dynamics (CFD)

Electrical engineering

Technological

Software engineering

Virtualization

Data science & AI

CAE capabilities portfolio

CAE capabilities

Computer Aided Engineering

Study of structural behavior for the design, validation and optimization of products and systems, applicable across multiple sectors

Main disciplines

- Structural analysis (FEM): static, dynamic, impact, buckling, fatigue, mechanical joints
- CFD (Computational Fluid Dynamics): aerodynamics, thermal, multiphase flow, free-surface, aeroelasticity
- Thermal analysis: conduction, convection, radiation, thermo-mechanical coupling
- Multiphysics: fluid-structure interaction, aeroelasticity, electro-thermo-mechanical
- Acoustic and vibrations: NVH, wave propagation, vibro-acoustics
- Optimization and DOE: topological optimization, robust design, sensitivity studies

Complementary services

- Design and manufacturing support
- Correlation with testing and monitoring
- Technical and expert reports (RCA)

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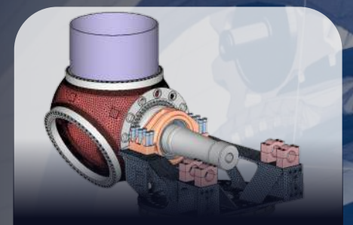
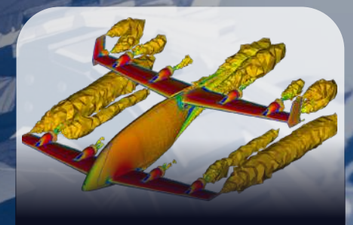
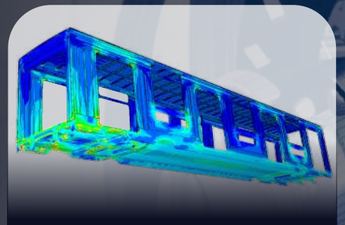
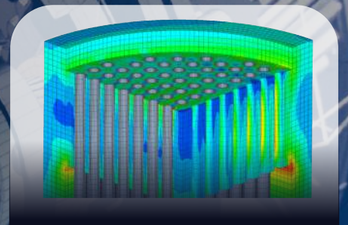
Industries


Automotive


Wind & solar


Aerospace


Railway


Nuclear

Software & hardware

ESI · ALTAIR · python · Ansys · ANSA PRE PROCESSOR · META POST PROCESSOR · ABAQUS · MSC Nastran

1 TB RAM DDR4

144 CPUs

Structural-mechanics (FEM)

Structural analysis capabilities

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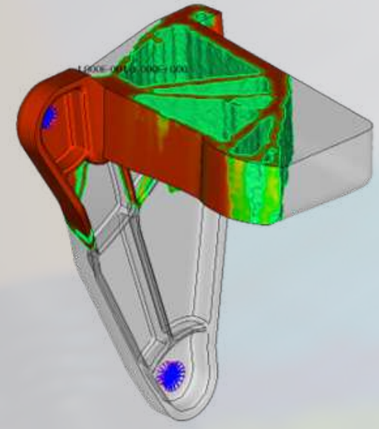
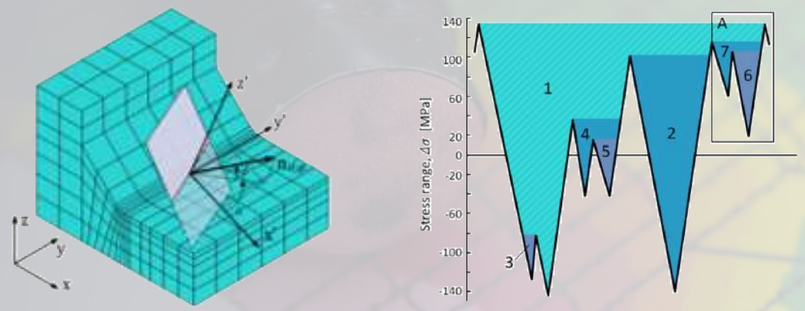
- FEM – Global models and detailed submodels
- Implicit/explicit linear and nonlinear analyses
- Fatigue under constant and random loads (PSD, critical plane, Miner's rule)
- Buckling and post-buckling evaluation
- Impact and energy absorption capability
- Modal and vibrational analysis
- Evaluation of mechanical joints under different codes and standards: welds (Eurocode EC3, IWS) and bolts (VDI2230, Eurocode)
- Structural optimization: topological and parametric
- Test correlation and corrective measures definition
- Advanced modeling techniques: mesh morphing without CAD



FEM analysis and modeling



Fatigue analysis

Fluid dynamics

CFD analysis capabilities

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Vehicle aerodynamics
- Aerodynamic analysis and optimization of cars, aircraft…

Engine cooling analysis
- Internal aerodynamics, reduced-order simulation

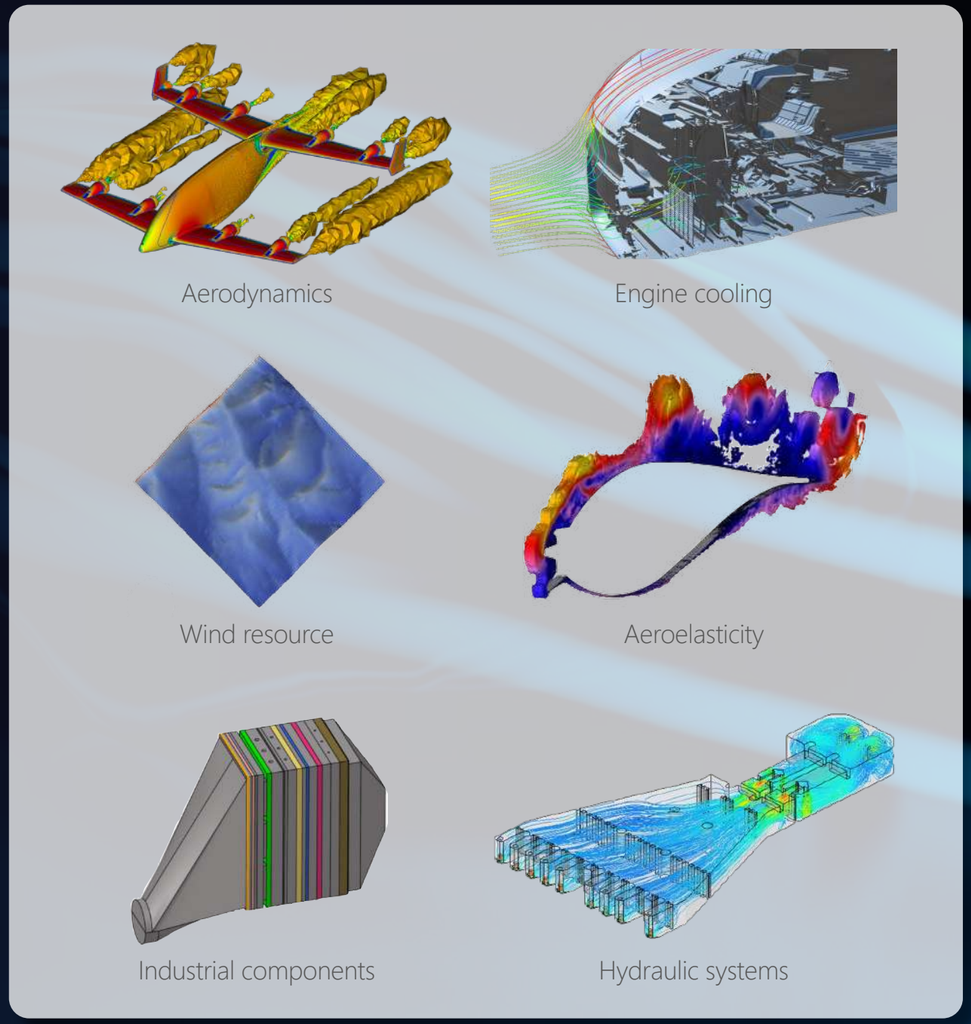
CFD for wind resource assessment
- Higher accuracy compared to linear calculations

Climate and work safety systems
- HVAC and occupational safety systems for industrial environments with suspended particle flows

Aeroelastic phenomena
- Modeling and validation, wind impact on structures

Hydraulic systems calculation
- Flows under load or free-surface conditions

Industrial components analysis
- Heat exchangers, reactors, tanks…



Industries overview

Automotive

Structural optimization of a vehicle’s design

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Structural and aerodynamic development of vehicles and their components through numerical simulation, with specialization in the various disciplines involved in their design

Results

Reduction of development time and costs through the structural validation of the design by means of simulation models

Types of analysis

- Static and dynamic structural analysis (implicit and explicit)
- Impact and energy absorption capability
- Fatigue and durability
- Vibrations and NVH
- Aerodynamics and thermal analysis (CFD)

Analyzed structures

- Body-in-white and chassis
- Add-on elements (doors, hood, trunk)
- Interior components (dashboard, consoles, panels, trim)
- Exterior components (bumpers, headlights, hood, fenders)
- Sensors and electronic components
- Cooling and HVAC systems

Clients

SEAT CUPRA samvardhana motherson

Automotive

Structural optimization of a vehicle's design

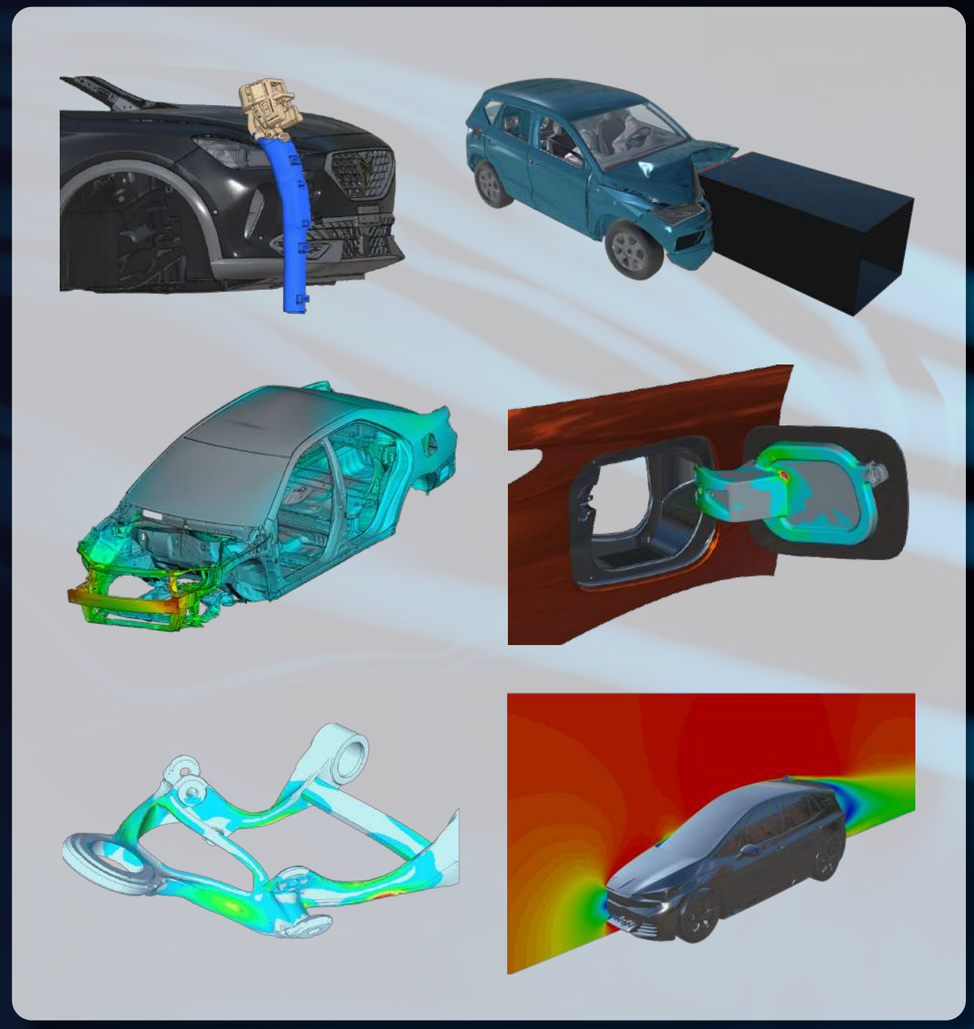
Complete portfolio of CAE services for the automotive industry:

Structural analysis (FEM)

- **Pedestrian protection:** frontal design analysis to reduce the risk of injury in collisions, according to international regulations
- **RCAR / Low-speed crash**: repair costs analysis
- **High-speed crash**: explicit analyses to minimize damage and ensure structural integrity
- **NVH**: reduction of unwanted vibrations to improve structural stiffness and passenger comfort
- **Interior components**: validation of durability and integrity
- **Add-on elements**: structural endurance and optimization of hood, doors, trunk, etc.
- **Sensors**: load scenarios to validate sensor functionality and durability
- **Topological optimization**: components redesign to optimize structural performance and weight

Fluid dynamics (CFD)

- **Aerodynamic analysis**: to reduce fuel/energy consumption and optimize performance
- **HVAC**: to ensure and optimize heating, ventilation and air-conditioning systems
- **Engine cooling**: to ensure and optimize the cooling system performance



Wind and solar

Renewable assets development

solute

Development and certification of components and structures through structural simulation techniques, from pre-design phases to lifetime extension studies

Results

Optimized design of renewable energy assets in compliance with certification requirements and evolving standards, achieving shorter development times; and structural lifetime extension of in-service assets using a deterministic approach

Types of analysis

- Static and dynamic structural analysis (implicit and explicit)
- Deterministic fatigue and damage tolerance assessment
- Linear and nonlinear buckling analysis (post-buckling)
- CFD calculations (thermal and aerodynamic)

Analyzed structures

- Tower, foundation and nacelle (frames, covers, spinner)
- Rotor & drivetrain: blades, hub, shaft, bearings, gearbox
- Control systems: Yaw and Pitch
- Bolted and welded joints
- Photovoltaic panels and supporting structures (trackers, racks)

Clients

GE, Iberdrola, NORDEX, acciona Windpower

Wind and solar

Renewable assets development

solute

Structural analysis (FEM)

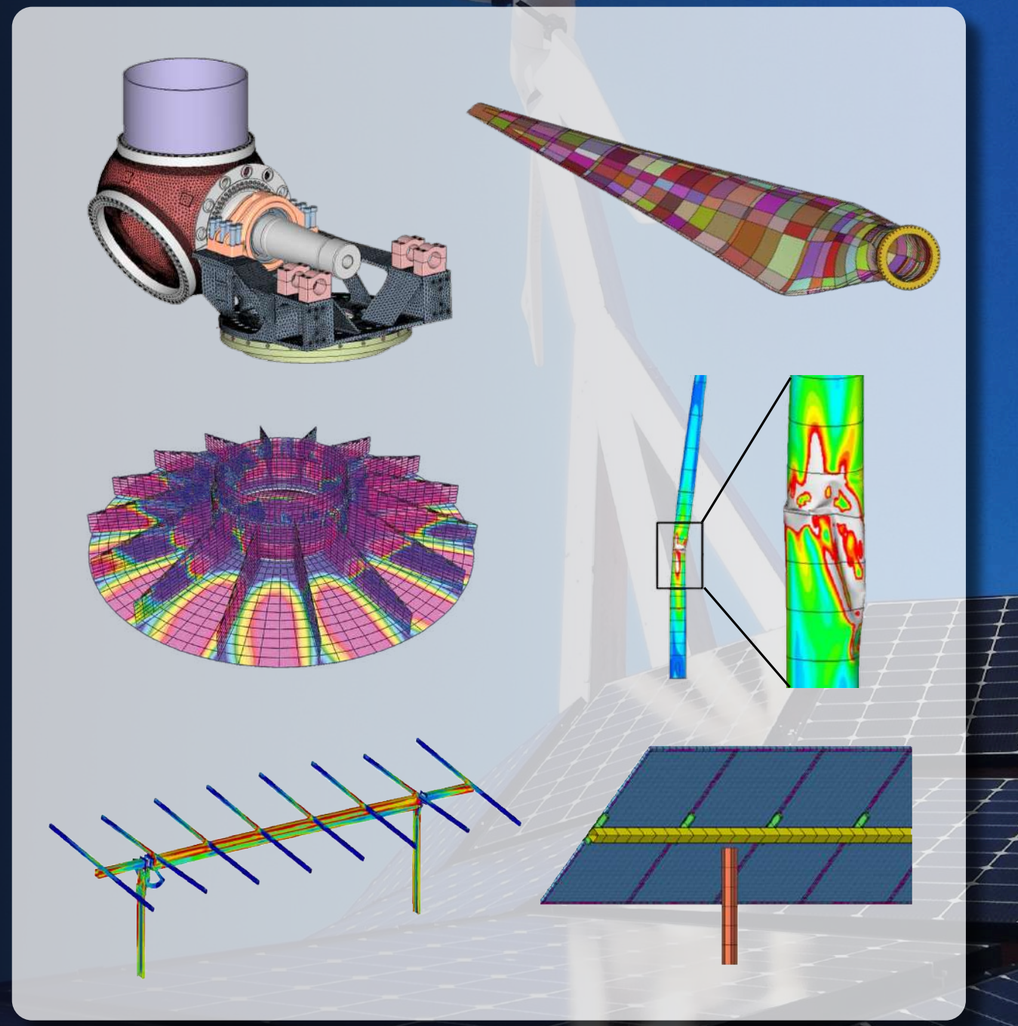
- Evaluation of structural endurance of mechanical components under extreme loads and fatigue damage
- Life-extension studies for equipment, components and machinery
- Modeling and analysis of composite material components: blades, covers
- Design and analysis of foundations and reinforced concrete structures
- Analysis of welded and bolted joints (Eurocode, VDI2230)
- Calculation and implementation of redesigns, modifications, or repairs
- Development of reverse-engineering solutions
- Dynamic studies using multi-body modeling

Aerodynamics and loads analysis

- Determination of mechanical loads (fatigue, ultimate and seismic loads) for the wind farm site-specific conditions
- Aerodynamic evaluation: blade profiles and photovoltaic panels
- Thermal performance under extreme conditions

Certification

- Calculation process oriented toward machine certification by certifying authorities
- Standards: EC61400, DNV guidelines, VDI2230, Eurocode, IIW…



Aerospace

Structural, aerodynamic and thermal simulation

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Structural and CFD simulation for aerospace systems, providing advanced calculation solutions for the design and validation of metallic and composite structures

Results

Optimization of structural, aerodynamic and thermal performance, weight reduction in structural components, safer and more reliable designs, compliance with international standards

Types of analysis

- Linear and non-linear static analysis
- Dynamic analysis: vibration, impact, aeroelasticity
- Fatigue and damage tolerance (F&DT)
- Thermal and thermomechanical analysis
- CFD: external and internal aerodynamics

Analyzed structures

- Fuselage and structural panels
- Wings, rudders and control surfaces
- Landing gear and associated mechanisms
- Pylons, nacelles and engine supports
- Bolted, riveted, or adhesive joints
- Composite panels and reinforcements
- Special projects: satellite structures and ground support equipment

Clients

AIRBUS ALESTIS AEROSPACE AERnnova

Aerospace

Structural, aerodynamic and thermal simulation

solute

Structural analysis (FEM)

- Global and detailed FEM modeling of aeronautical components – static (linear/non-linear), dynamic, post-buckling, vibration and impact analysis
- Sizing and structural assessment of metallic and composite materials
- Fatigue and damage tolerance (F&DT) evaluation and validation of critical structures for certification
- Structural concessions, repair documentation (SRM), and first-flight readiness
- Systems integration: engine mounts, fuel systems, nacelles, vibration isolators
- Verification of fuselage component interfaces and joints
- Design and analysis of composite panels and sections, correlation with physical testing

Fluid dynamics (CFD)

- Thermal analysis under operational and extreme conditions
- Thermomechanical assessment of actuators and structural elements
- Coupled analyses for subsystem performance evaluation
- Aerodynamic optimization: loads for FEM coupling, aeroelasticity, vibration and control-surface performance

Railway

Structural design and certification

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Simulation for the design, validation, and certification of structures and components according to applicable codes and standards or client specifications

Results

Structural optimization of components' and structures' design, reduction of development time and costs

Types of analysis

- Implicit and explicit analysis
- Linear and non-linear buckling
- Static and random fatigue analysis
- Modal and vibration analysis
- Impact and energy absorption capacity

Analyzed structures

- Vehicles: body structures, cabin, chassis
- Rolling components: bogies, suspension systems
- Coupling systems, fairings, obstacle deflector
- Bolted and welded joints
- Interior components
- Composite: fiberglass, carbon fiber
- Auxiliary equipment: battery boxes/chargers, cabinets, fuel tanks, frames, ballast weights, inverters, pneumatic boxes, antennas, etc.

Clients

CAF Talgo ALSTOM

Railway

Structural design and certification

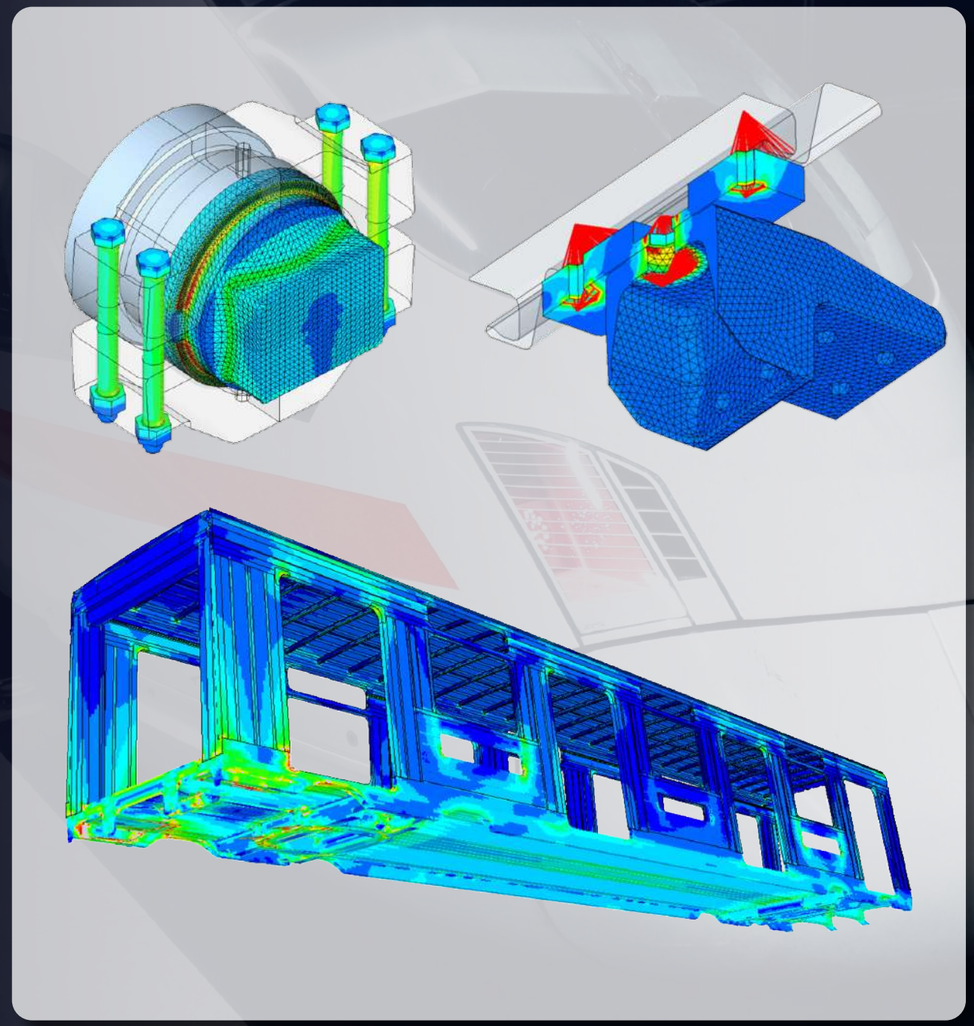
solute

Structural analysis (FEM)

- Modeling and simulation of vehicle structures, cabins, chassis and bogies
- Static analysis, linear and non-linear buckling, modal analysis, crash, and static and random fatigue
- Mechanical joints validation: welds and bolts
- Design and verification of interior components, coupling systems, fairings and obstacle deflector
- Auxiliary equipment simulation: battery boxes, cabinets, fuel tanks, inverters, antennas, ballast weights...
- Integration of composite materials (fiberglass and carbon fiber) in structural analysis

Certification

- Support in the design and verification of structures and components for certification
- Application of industry-specific regulatory standards
- Evaluation of critical subsystems and auxiliary equipment



Nuclear

Structural support through the whole lifecycle

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Comprehensive assessment in design, construction and decommissioning of nuclear plants, applying advanced simulation and sector-specific standards to ensure structural safety and reliability

Results

Compliance with nuclear safety regulations, reduction of risks during construction and operation, full lifecycle support (design, construction, operation and decommissioning)

Types of analysis

- Static and dynamic analyses under operational and seismic loads
- Structural integrity assessment
- Strength and buckling calculations
- Global and local FEM models
- Analysis of embedded plates and anchors

Analyzed structures

- Containment building, auxiliary building, foundations
- Embedded plates, anchors, heavy equipment supports
- Walls, beams, pillars, structural slabs
- Mechanical joints: bolts, welds and critical connections
- Interfaces with mechanical/electrical and main piping systems

Clients

Westinghouse

Nuclear

Structural support through the whole lifecycle

Structural components design and analysis

- Critical structures evaluation to ensure integrity under various operational and seismic conditions
- Nuclear island sizing (containment building, auxiliary building, foundations)
- Design of commercial reactors following U.S. industry standards
- Strenght assessment for different plant areas

Design deviations

- Assessment for the resolution of design deviations during construction
- Proposal of modifications to components original structural design
- Verification of structural drawings

Embedded plates for nuclear island supports

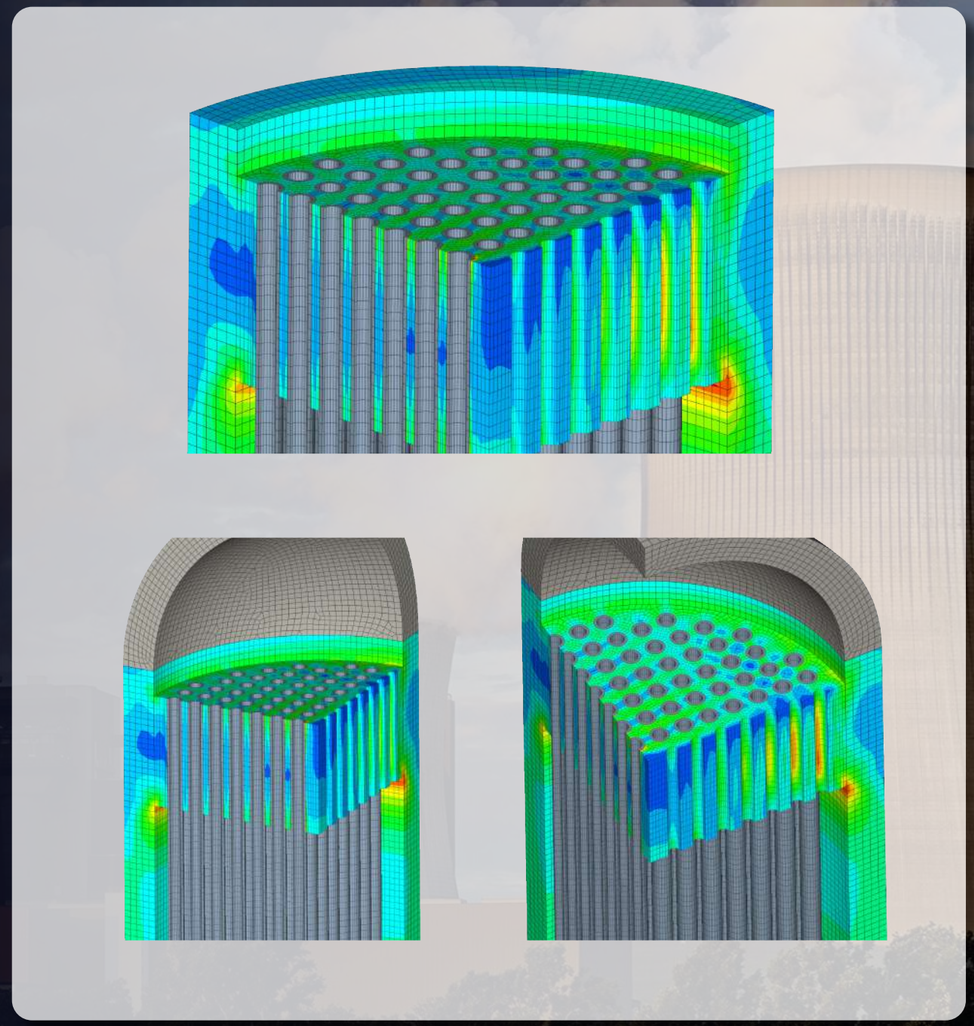
- Structural response evaluation under mechanical loads and deformations
- Anchor calculations & technical documentation verification (drawings, criteria)

Substation design

- 2D/3D modeling and design of electrical systems and supports, cable routing systems according to industry standards

Decommissioning

- Engineering support for decommissioning projects in compliance with regulatory and environmental requirements
- Demolition process analysis, storage facilities structural design...



Defense

CAE simulation over mechanical systems

Structural calculations for the design and validation of defense industry systems and structures

Results

Safer and more reliable designs, contributing to the optimization of equipment, granting regulatory compliance, and ensuring successful testings with fewer design iterations.

Types of analysis

- Static (linear and non-linear), buckling, modal and vibration analyses (sinusoidal and random)
- Explicit analysis (impact and shock)
- Fatigue analysis

Analyzed structures

- Mechanical systems
- Electronic enclosures
- Bolted and welded joints

Defense

CAE simulation over mechanical systems

Structural analysis

- FEM modeling and simulation of defense components and systems
- Evaluation of strength, stiffness and stability of metallic and composite structures
- Dynamic analysis for vibration and transport conditions
- Impact and transient load response studies
- Fatigue life assessment
- Application of MIL-STD-810 standards
- Validation of bolted and welded joints

Experimental validation and correlation

- Test planning support: definition of instrumentation (strain gauges, accelerometers...)
- Correlation between test results and simulations, making adjustments to models for higher accuracy

General inquiries:
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solute.es