Powertrain Calculation/Simulation
Structural Mechanics

Strength/stiffness
- Stresses
- Deformations
- Durability
- Fatigue strength

Thermo mechanics
- Temperature distribution
- Thermal flows
- Creep
- TMF/HCF

Material
- Material properties
- Material selection
- Determination of characteristic values
- Casting simulation/Process simulation

Contacts
- Contact forces
- Pressure distribution
- Sealing gap vibration
- Deformation

Optimization
- Shape optimization
- Topology optimization
- Parameter optimization
- Multicriterial mathematical optimization
Dynamics/Acoustics

Powertrain dynamics
• Modal analysis
• Forced vibrations
• Elasto-hydrodynamics
• Friction / wear

Powertrain mounting
• Displacement of engine mounts
• Dynamic forces
• Powertrain vibration
• Vehicle body vibrations

Driveline dynamics
• Torsional vibrations
• Vehicle longitudinal behavior
• Load alternation vibrations
• Hybrid driveline behavior

Acoustics
• Noise transfer path analysis
• Psychoacoustics
• Sound pressure
• Sound design

Optimization
• Shape optimization
• Topology optimization
• Parameter optimization
• Multicriterial mathematical optimization
Fluid Mechanics 1D

**Charge-cycle**
- Full load/part load optimization
- Volumetric efficiency
- Valve timing
- Fuel consumption optimization

**Supercharging**
- Supercharging concepts
- Response behavior
- Supercharger calibration
- Geometry design

**Thermodynamics**
- Cycle optimization
- Cylinder specific efficiency
- Heat release rate
- Pollutant balance

**Engine systems**
- Engine cooling system
- Oil circuit
- Hydraulic components
- Crankcase ventilation

**Optimization**
- Design of Experiments (DoE)
- Parameter optimization
- Topology optimization
- Multicriterial mathematical optimization
Fluid Mechanics 3D

Intake/exhaust/cooling system
- Flow characteristics
- Pressure losses
- Even mixture distribution
- Heat-up behavior

Combustion system
- In-nozzle flow
- Fuel injection
- Mixture formation
- Combustion

Exhaust aftertreatment
- AdBlue injection
- Mixing
- Thermolysis, Hydrolysis
- Emissions

Components
- Cooler, Pumps
- Oil separator
- Turbocharger
- Battery

Optimization
- Form optimization
- Topology optimization
- Parameter optimization
- Multicriterial mathematical optimization
CAE Environment

Software:

Pre-/postprocessors
- ICEM Hexa/Tetra
- IC3M
- Pro-Star/Pro-am
- Paramesh
- Sculptor
- Patran
- Medina
- I-DEAS
- Hypermesh
- Interface to all CAD systems

CFD
- STAR CD
- CCM+
- Open FOAM
- ANSYS CFX

1D Simulation
- GT SUITE
- GT POWER
- PROMO
- Flowmaster
- AMESim
- SimulationX
- IAV-V.-ENGINE
- IAV-VENTIL
- IAV-P-CRANK
- IAV-Thermodynamics Simulation®

Optimization
- modeFRONTIER
- IAV-Engineering Toolbox®
- Hyperstudy
- OPTISTRUCT
- NOA

FEM/MBS
- NASTRAN
- ABAQUS
- I-DEAS
- Pro/Mechanica
- EXCITE
- IAV-SBNOISE
- FEMFAT
- ProCast
- ADAMS/Engine
- XKetSim
- Pimo
- SiMPACK
- SimDrive

Hardware:

- Dell Power Edge
- Dell Precision
- HP Compute Server
- Workstations
- PC
- Laptop

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IAV’s engineering analysis specialists with expertise in structural mechanics, fluid mechanics and vibrations/acoustics use modern simulation methods such as FEM, MBS, CFD and BEM to solve your powertrain development tasks.

You can count on us: from concept development to mass production.