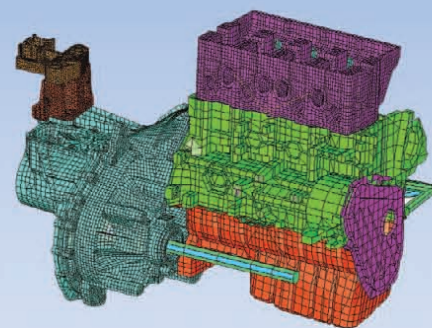
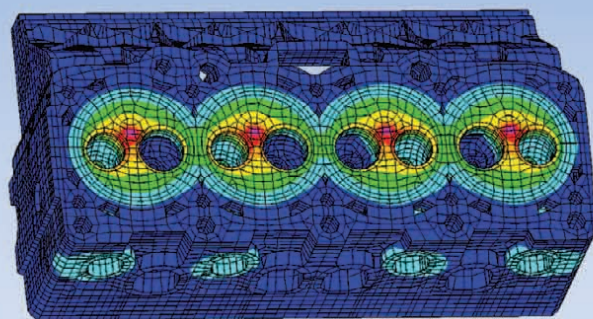
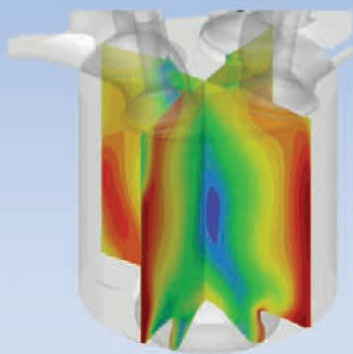


Powertrain Computation/Simulation



Structural Mechanics

Strength/Stiffness

- ▶ Stresses
- ▶ Deformations
- ▶ Contact analysis
- ▶ Fatigue strength/durability

Thermo Mechanics

- ▶ Temperature distribution
- ▶ Thermal flows
- ▶ Creep
- ▶ TMF/HCF

Material

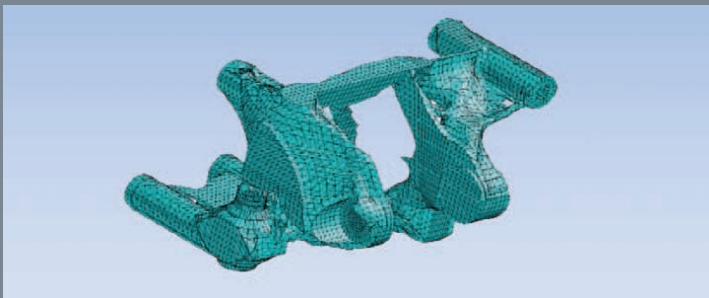
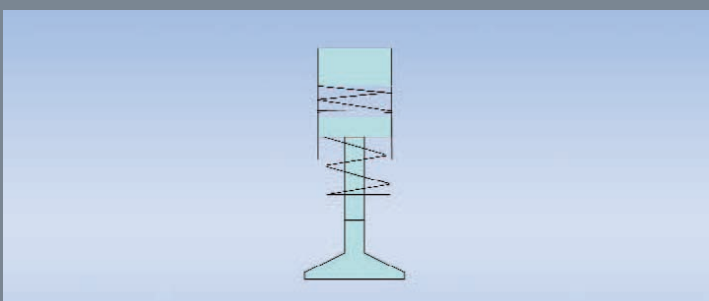
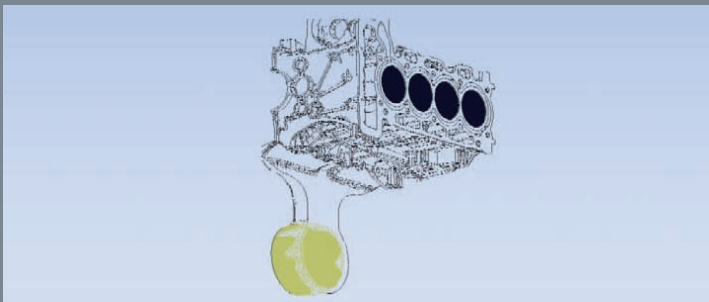
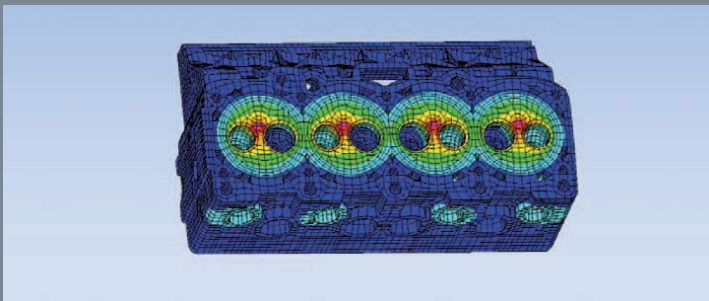
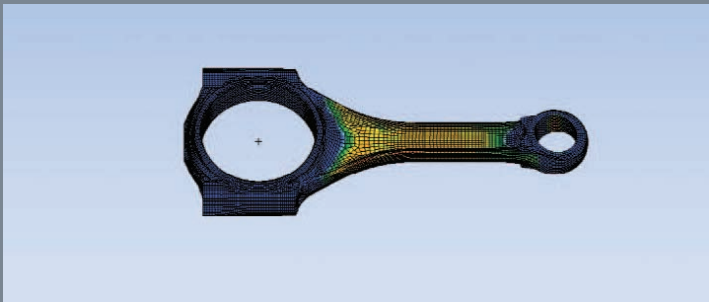
- ▶ Material properties
- ▶ Material selection
- ▶ Determination of characteristic values
- ▶ Casting simulation/Process simulation

System Analysis

- ▶ Hydraulic mechanical systems
- ▶ Mechatronic systems

Optimization

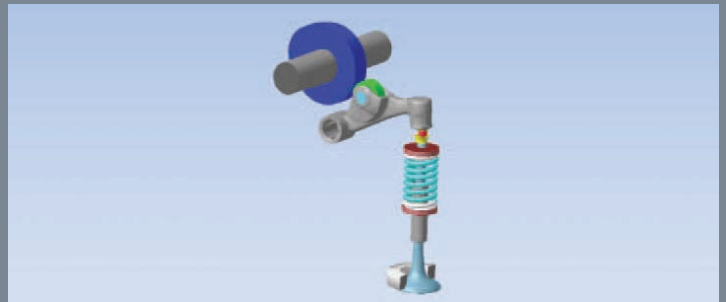
- ▶ Shape optimization
- ▶ Topology optimization
- ▶ Parameter optimization



Dynamics/Acoustics

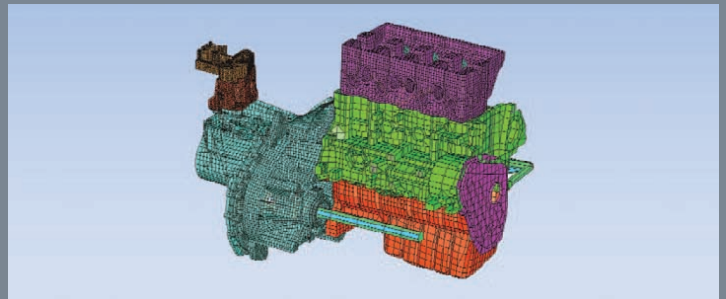
Vibrations

- ▶ Modal analysis
- ▶ Forced vibrations
- ▶ Elasto-hydrodynamics
- ▶ Multi-body simulation



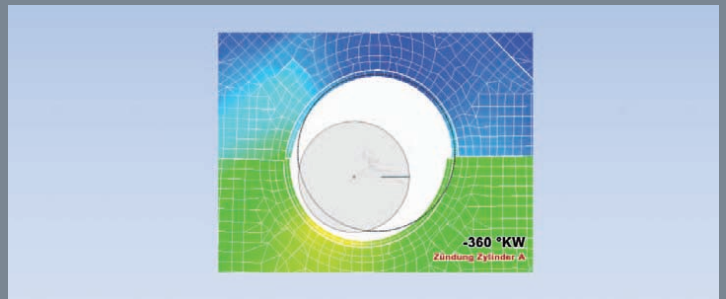
Engine Mounting

- ▶ Displacement of engine mounts
- ▶ Dynamic forces
- ▶ Powertrain vibration
- ▶ Vehicle body vibrations



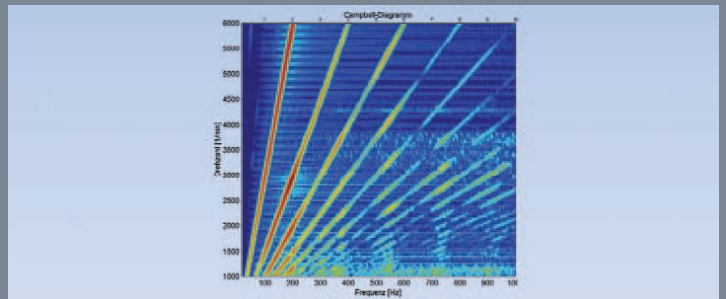
Sound Radiation

- ▶ Noise contribution
- ▶ Sound power
- ▶ Sound pressure
- ▶ Noise transfer analysis



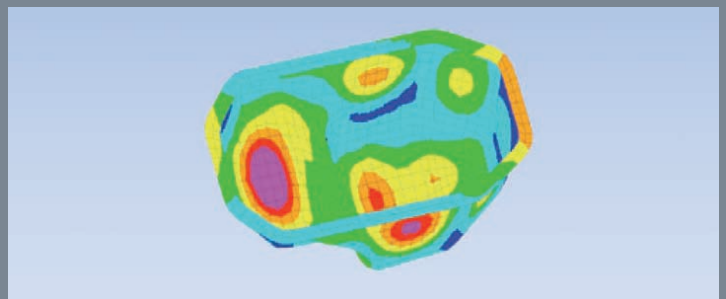
Sound Design

- ▶ Sound engineering
- ▶ Psycho-acoustics
- ▶ Noise comparison



Optimization

- ▶ Shape optimization
- ▶ Topology optimization
- ▶ Parameter 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

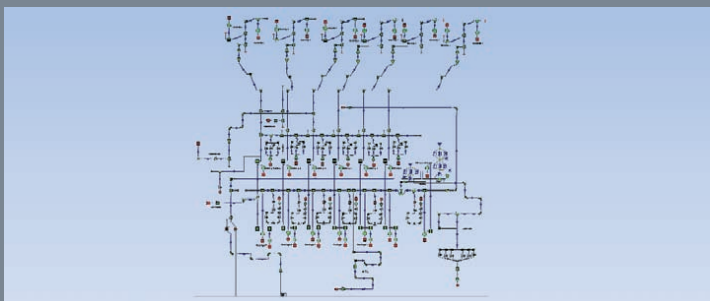
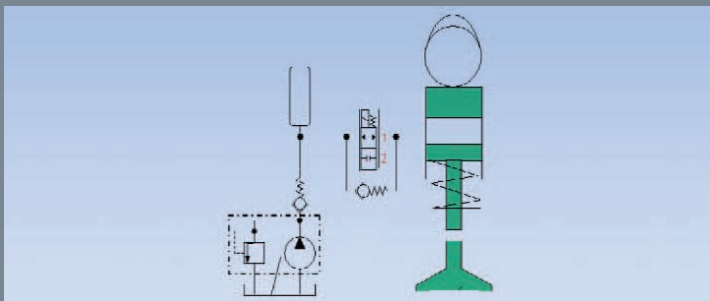
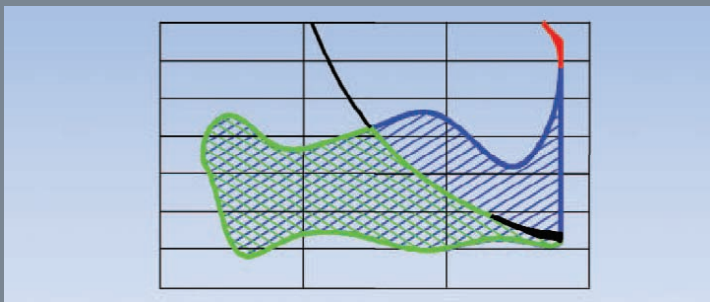
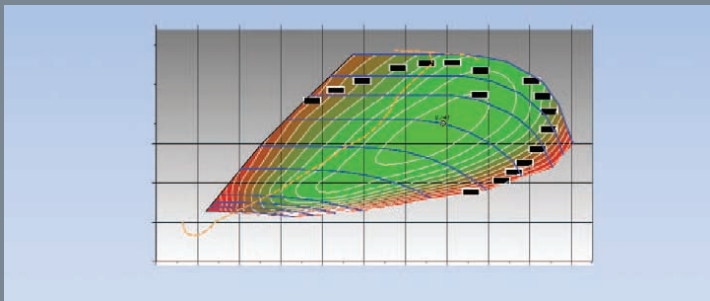
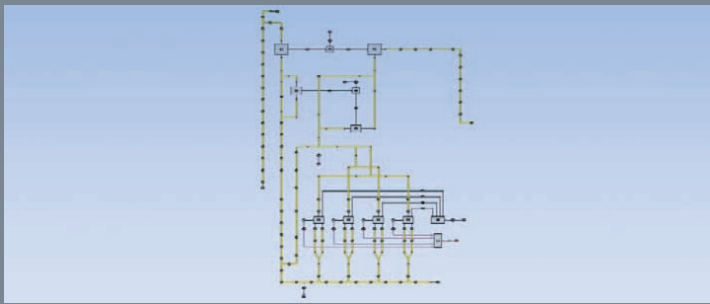
- ▶ Cycle optimization
- ▶ Cylinder specific efficiency
- ▶ Heat release rate
- ▶ Pollutant balance

Engine Systems

- ▶ Engine cooling system
- ▶ Oil circuit
- ▶ Hydraulic components
- ▶ Crankcase ventilation

Optimization

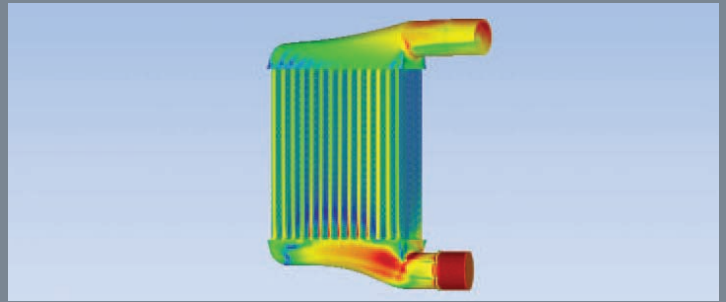
- ▶ Design of Experiments (DoE)
- ▶ Parameter optimization
- ▶ Topology optimization



Fluid Mechanics 3D

Intake/Exhaust System

- ▶ Flow characteristics
- ▶ Pressure losses
- ▶ Even mixture distribution
- ▶ Heat-up behavior



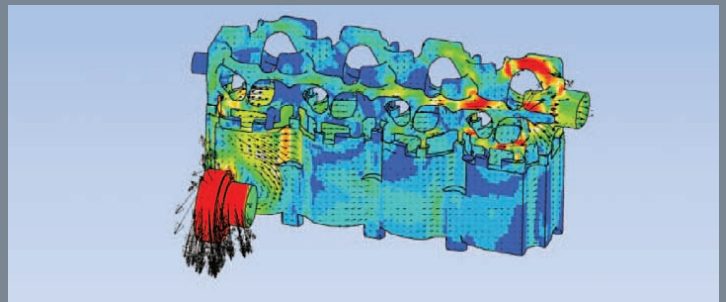
Combustion System

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



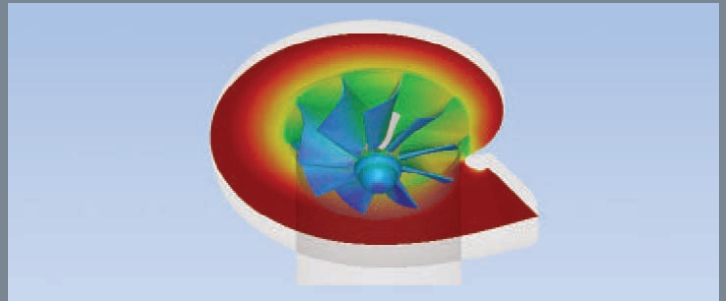
Cooling System

- ▶ Flow characteristics
- ▶ Pressure losses
- ▶ Heat conduction
- ▶ Temperature distribution



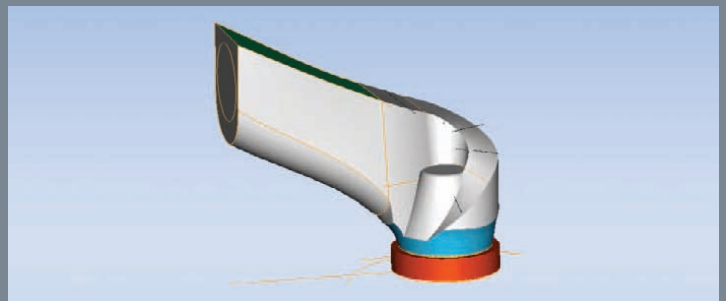
Components

- ▶ Cooler
- ▶ Pumps
- ▶ Oil separator
- ▶ Turbocharger



Optimization

- ▶ Form optimization
- ▶ Topology optimization
- ▶ Parameter 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

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

Hardware:

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



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.

Contact:

dr.bernd.findeisen@iav.de
+49 371 2373-4337

