

AUTOMOTIVE ENGINEERING SERVICES

Central office,
Moscow
(since 2005)

Engineering office,
Togliatti
(since 2006)

Resident of Technopark
"Zhiguli Valley"
(since 2014)

Office in Czech
(since 2019)

▶ **Quality Management System:** ISO9001 (a certification in 2020)

▶ **Our Team**

- ▶ Staff: 29 specialists (also 4 PhD, 2 postdocs)
- ▶ Design experience in the automotive industry: more than 25 years
- ▶ Experience in the CAE: more than 17 years

▶ **Qualifications of engineers, work experience**

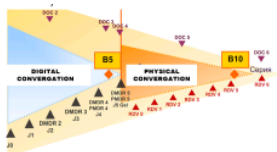
- ▶ CAD: CATIA, NX, KOMPAS-3D , E3 Series
- ▶ CAE: LS-Dyna, MSC.Nastran, Ansys, SimulationX, Siemens Amesim, KISSSoft, PRADIS, Ansys CFX, Star CCM, Fluent, Ansa, HyperMesh, OptiStruct, Code-Aster, OpenFoam
- ▶ PLM: Siemens TeamCenter

▶ **Our customers**

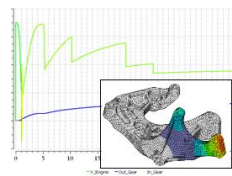




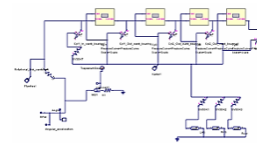
Vehicle Design and Styling



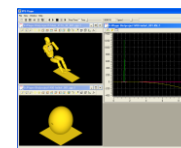
Project Management



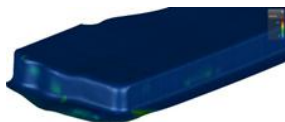
Project Engineering Support



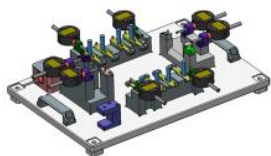
System Engineering



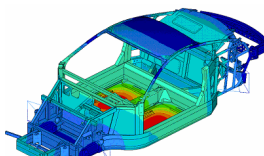
Development of CAE Software



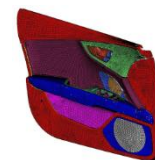
Analysis of MoldFlow and Stamping Processes



Assembly and Measuring Tools



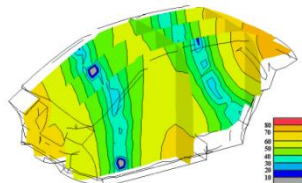
Design of Body-in-White and Cabins



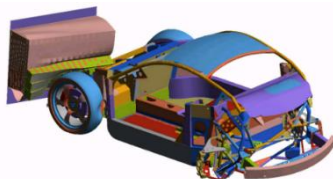
Interior and Exterior



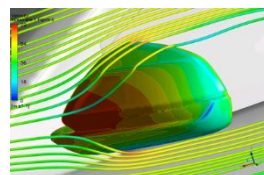
Lighting Engineering



NVH Analysis



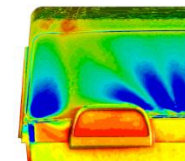
Passive Safety and Pedestrian Safety



Aerodynamics



HVAC



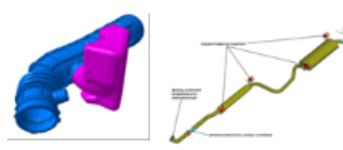
Microclimate and Internal Aerodynamics



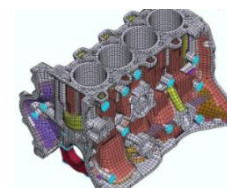
Seats



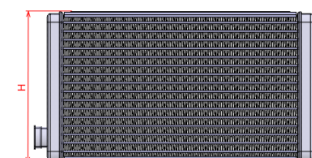
Automotive Components



Intake and Exhaust Systems



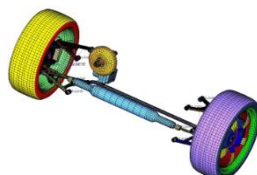
ICE



Heat Exchangers



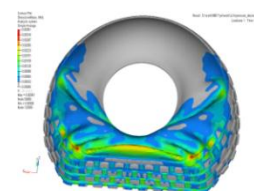
Powertrain



Suspension and Steering



Brake Systems



Rubber Products

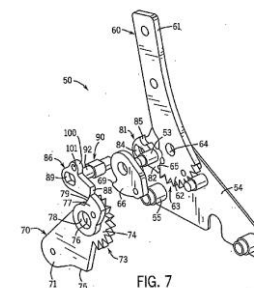
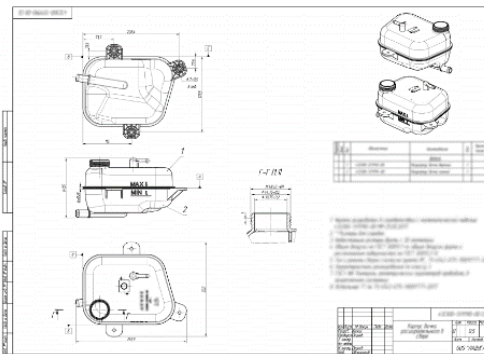
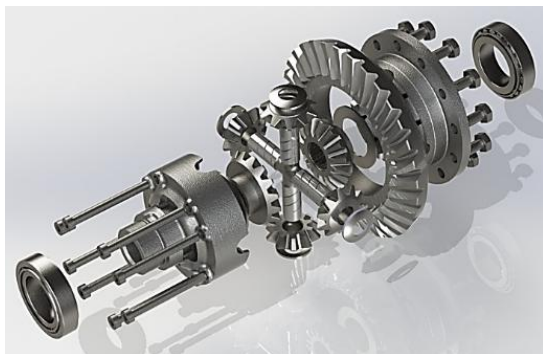
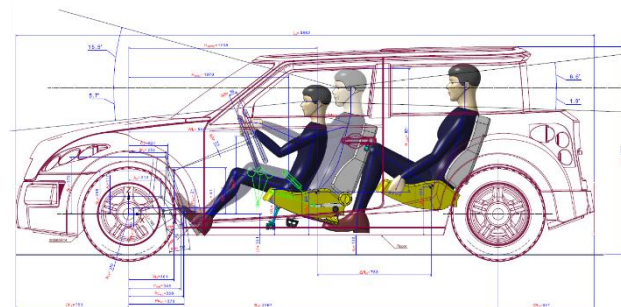


Automotive Electronic Systems (E&E) and ADAS

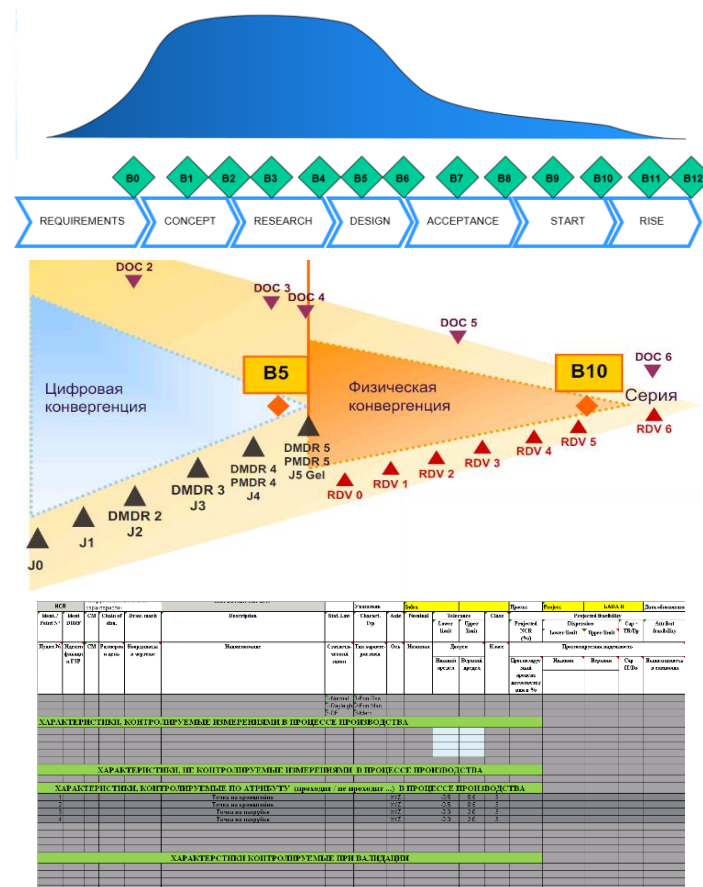
| Type | Software | Own license | Lease license |
|---------|----------------------|-------------------|---------------|
| CAD | CATIA | + | |
| | NX | + | |
| | E3 Series | | + |
| CAE | LS-Dyna | + | HPC Cluster |
| | ANSYS CFX/Mechanical | + | HPC Cluster |
| | MSC.Nastran | | + |
| | MoldFlow/Moldex3D | | + |
| | Altair HyperWorks | | + |
| | OpenFoam | GNU | |
| | Code-Aster | GNU | |
| | PRADIS | Homemade software | |
| | Beta-CAE ANSA | + | |
| PLM/PDM | Siemens TeamCenter | + | |
| | PDM Redmine | GNU | |



- ▶ Designing vehicles, self-propelled machines and components for:
 - ▶ Automotive industry
 - ▶ Agricultural industry
 - ▶ Mining industry
 - ▶ Railway industry
- ▶ Product styling
- ▶ Development of high-quality surfaces (class A)
- ▶ Product concept development
- ▶ 3D visualization for advertisement
- ▶ 3D scanning and reverse engineering
- ▶ Ergonomic analysis
- ▶ Post-project engineering support
- ▶ Product catalog development
- ▶ Development of user's manuals and drawings (ISO, DIN, GOST)



- ▶ Participation and support during of product lifecycle
- ▶ Requirements management
- ▶ Preparation of technical specifications and requirements lists for product's components and systems
- ▶ Using of QMS standards like as ANPQP, VDA 6.3 and others
- ▶ Using of methods for analysis of technical solutions efficiency
- ▶ Failure modes and effects analysis (FMEA)
- ▶ Creating of knowledge database

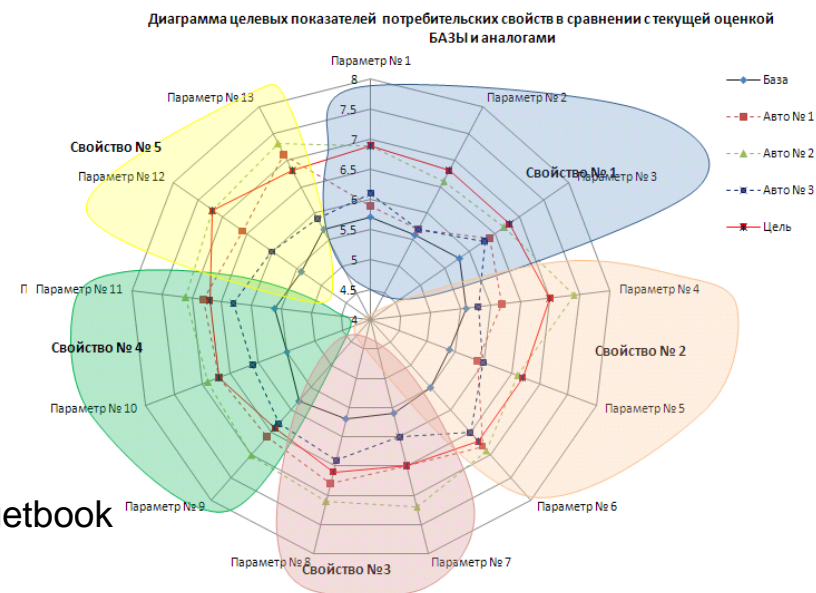


| № п.п | Наименование | Материал | Толщина, мм | Внешний вид |
|-------|---|--|----------------|---|
| 1 | Рамка чехла рычага переключения передач | Композиция полипропиленовая ТТМ 1.96.0779-2006 | 2 |  |
| 2 | Облицовка туннеля пола | Акрилс ПП ТМ 20-ЗУП ТУ2243-013-11378612-2010 | 3 |  |
| 3 | Вставка облицовки туннеля пола | Композиция ПК/АБС ТМ 1.96.0603-2012 | 2 |  |
| | Вставка облицовки туннеля пола | АБС НН 121 ТТМ 1.96.0571-2006 | 2 |  |

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| Объект: г.ОЗС | Отчет № 16 | Дата: 1 июля 2013 |
| Панель приборов 2180-5325012 | | |
| Крышка блока предохранителей 2180-5325322 | | |
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| УТН6 | УТН7 | УТН8 |
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| УТН834 | УТН835 | УТН836 |
| УТН837 | УТН838 | УТН839 |
| УТН840 | УТН841 | УТН842 |
| УТН843 | УТН844 | УТН845 |
| УТН846 | УТН847 | УТН848 |
| УТН849 | УТН850 | УТН851 |
| УТН852 | УТН853 | УТН854 |
| УТН855 | УТН856 | УТН857 |
| УТН858 | УТН859 | УТН860 |
| УТН861 | УТН862</ | |

[illegible]

- ▶ Customer's property testing
 - ▶ Powertrain dynamic
 - ▶ Lateral dynamic
 - ▶ NVH estimation
 - ▶ Thermal management estimation
 - ▶ Ergonomics estimation
 - ▶ Outdoor properties estimation
- ▶ Resource and functional tests
- ▶ NVH natural tests
- ▶ Benchmarking of customer's property
- ▶ Development of customer's property catalog and targetbook

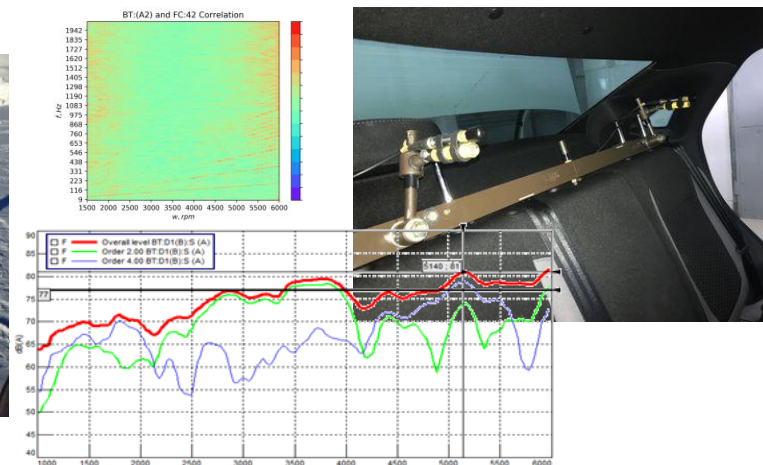


Project examples

1. ADAS System tests

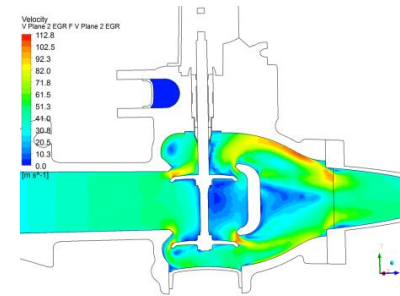
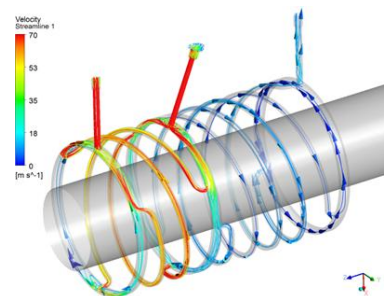
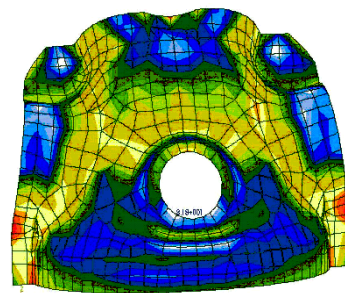
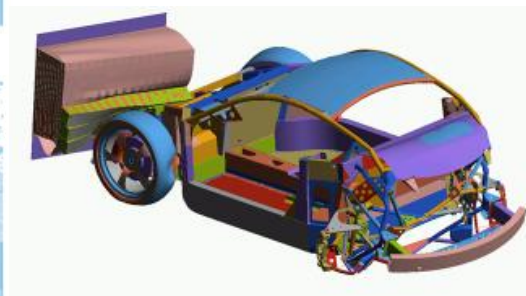
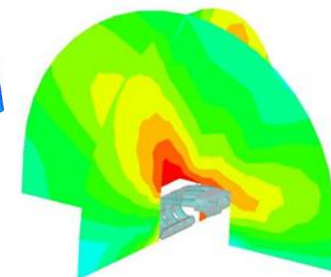
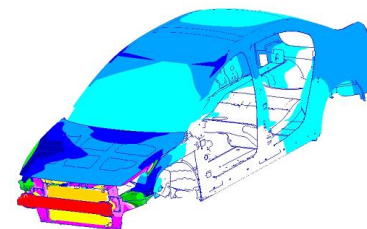
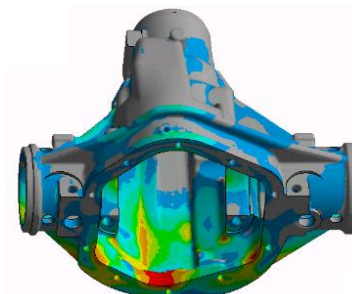
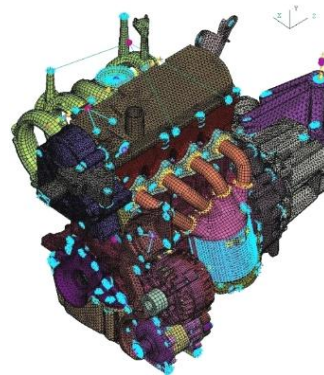


2. NVH tests

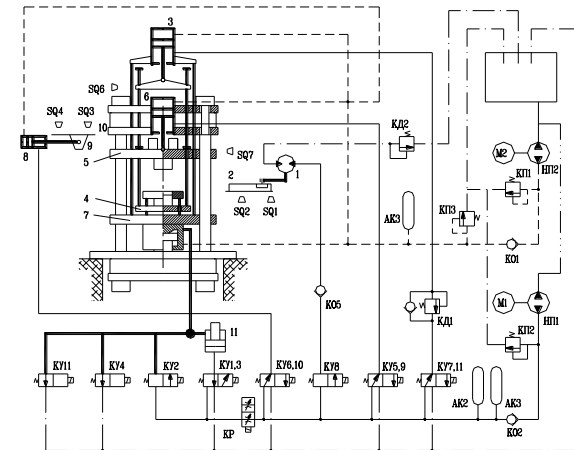
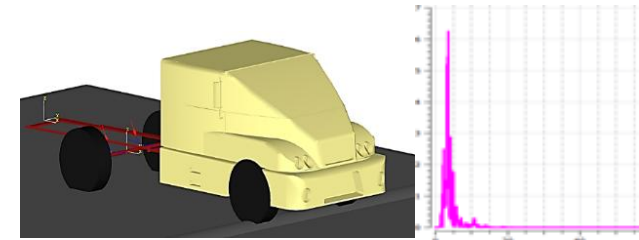


Performing all necessary types of CAE analysis is the most important factor due to which our company always ensures a high quality design.

- ▶ Development of CAE models of any complexity (math models, FE models, systems models etc.)
- ▶ Analysis of multi-body dynamics and kinematics
- ▶ Structural analysis
- ▶ Durability analysis
- ▶ NVH and response dynamic analysis
- ▶ Thermal balance analysis
- ▶ CFD analysis
- ▶ Modeling of multi-physics systems
- ▶ Calculation of highly nonlinear dynamic processes (crash-tests, impacts, explosions etc.)
- ▶ Analysis of safety and reliability

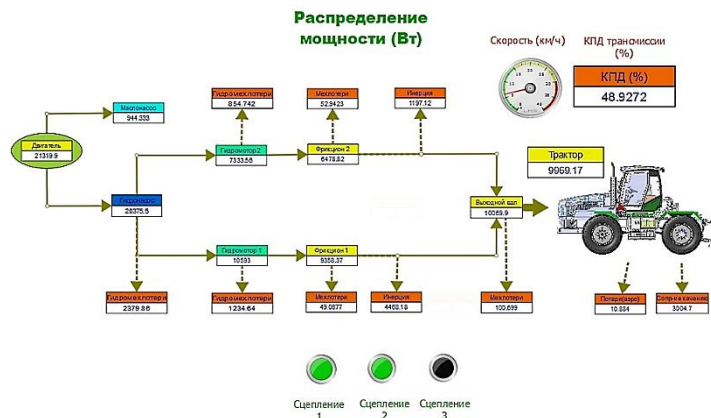


- ▶ Modeling and analysis of systems, that have different physics domains (hydraulic, pneumatic, mechanic, biomechanics, electrical, thermal, electromechanical)
- ▶ Analysis of systems interaction in all levels of product architecture
- ▶ Simulation of working and emergency modes
- ▶ Predictive analysis of transient processes and dynamics
- ▶ Development requirements for components
- ▶ Virtual and hybrid testing (software-in-the-loop testing)
- ▶ Parametric optimization of systems and components

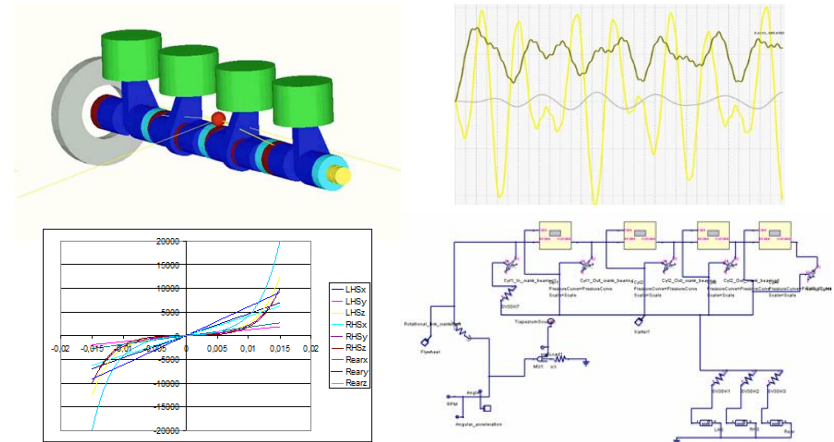


Examples of work performed

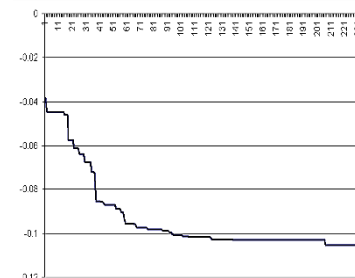
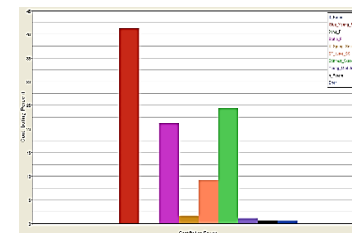
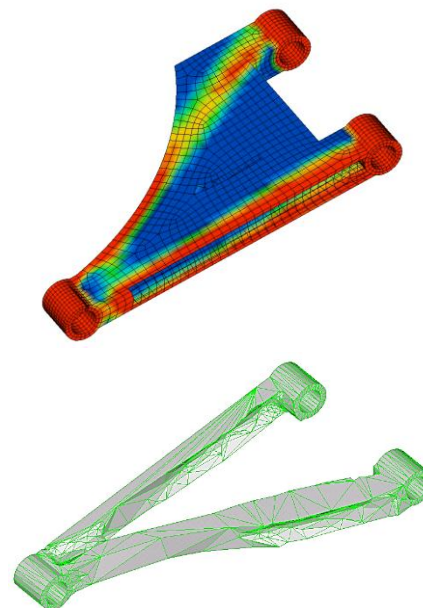
1. Energy efficiency analysis of agricultural tractor



2. Dynamics analysis of ICE's systems

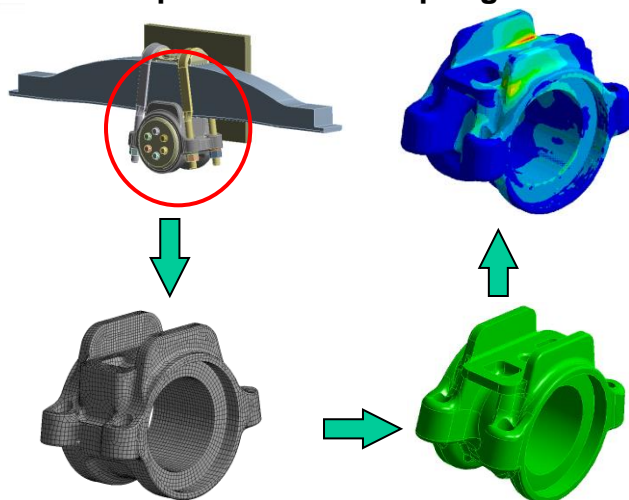


- ▶ Topology optimization of components
 - ▶ Search of optimal design parameters
 - ▶ Mass optimization
 - ▶ Strength optimization
 - ▶ Frequency properties optimization
 - ▶ Buckling properties optimization
- ▶ Material properties optimization
- ▶ Crash test optimization
- ▶ Robust optimization



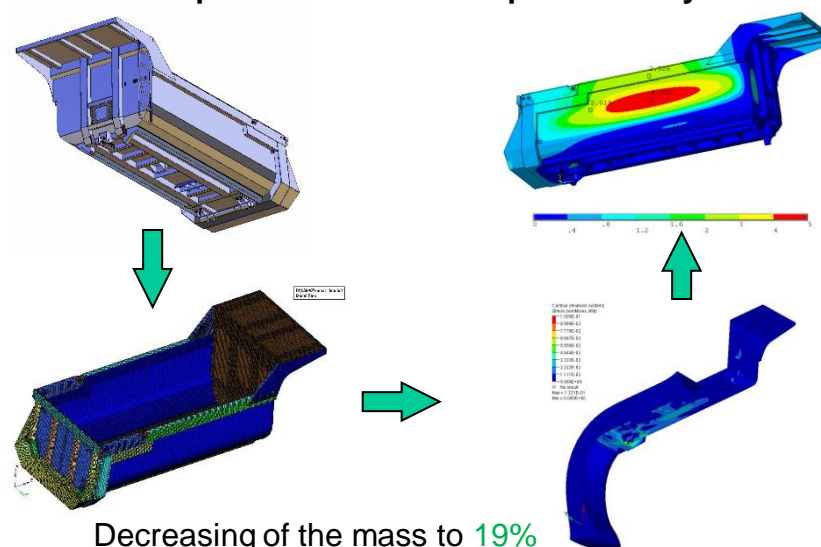
Examples of work performed

1. Optimization of a spring seat



Decreasing of the mass to **23%**

2. Optimization of a dump truck body

































Decreasing of the mass to **19%**

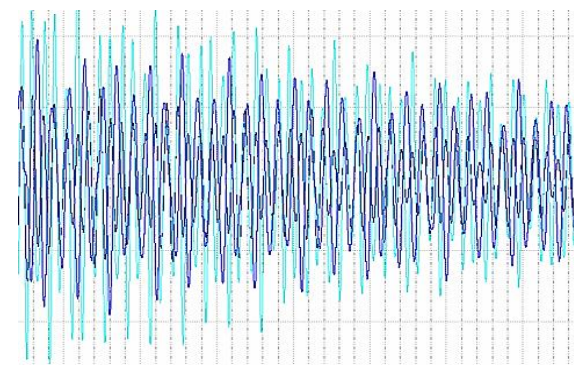
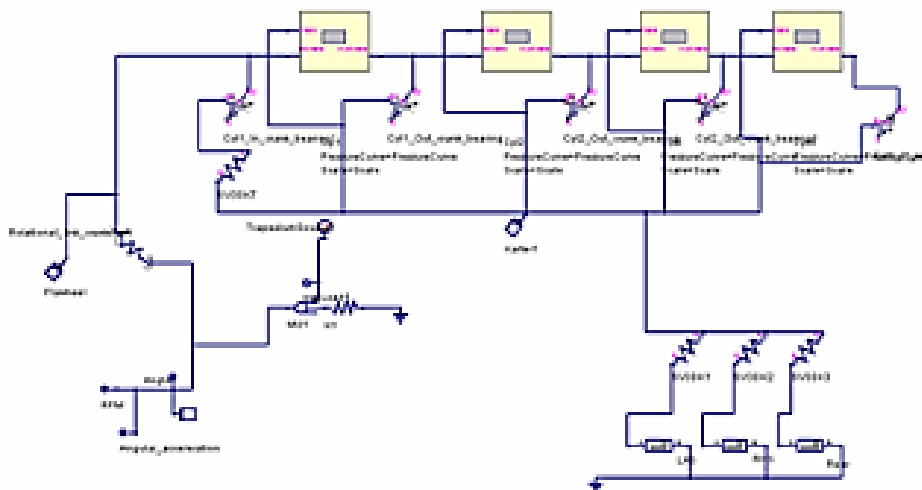
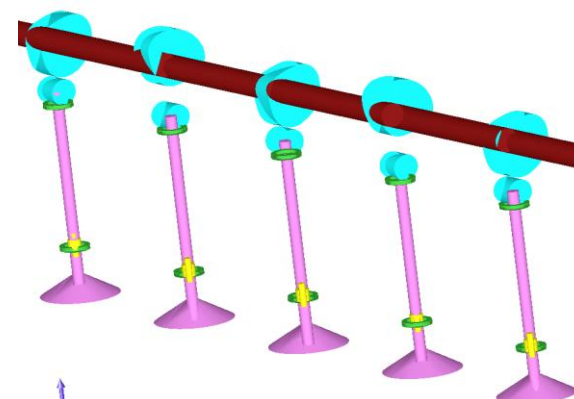
LADUGA LLC is the developer of the systems engineering software «PRADIS». This software is intended for analysis of dynamic systems of different physical domains. It is a free analogue of such programs, as Siemens Amesim, SimulationX and Matlab Simulink.

«PRADIS» features are:

- ▶ Modeling and analysis of systems, that have different physics domains - hydraulic, pneumatic, mechanic, biomechanics, electrical, thermal, electromechanical
- ▶ Large library of models of different physical systems and devices
- ▶ Ability to simulate dummies, dummy elements, car passive safety systems
- ▶ Co-Simulation of lumped bodies and finite element (FE)

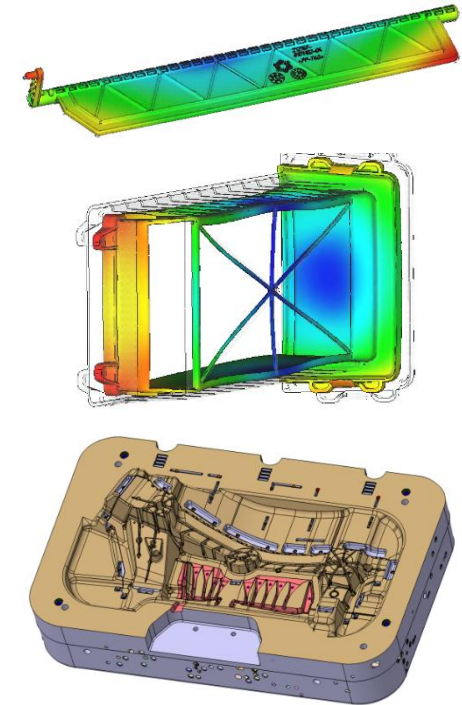
Модели комплекса

| | | | | | |
|---|---|---|---|---|--|
|  Сила |  Стержень 2D |  Зубчатая передача |  Насос гидравлический |  Дроссель гидравлический |  Упругий КЭ 2D |
|  Масса |  Балка 2D |  Кулачковый механизм |  Распределитель гидравлический 2/2 |  Гидравлический цилиндр |  Электродвигатель |
|  Упругость |  Стержень 3D |  Выпуклый механизм |  Клапан дросселирования гидравлический |  Распределитель пневматический 3/2 |  Функциональный выключатель |
|  Вязкое трение |  Шарнир 2D |  Направляющие 2D |  Аккумулятор гидравлический |  Обратный клапан гидравлический |  Конечный выключатель |
|  Зазор |  Подпятник |  Тепловая нагрузка |  Гидравлический трубопровод |  Участок линейки КЭ 3D |  Электрический элемент 2D |



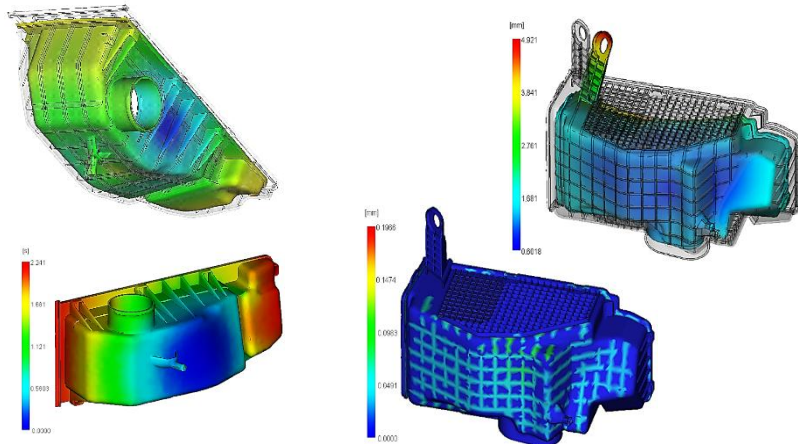
ANALYSIS OF MOLDFLOW AND STAMPING PROCESSES

- ▶ Analysis of plastic casting processes:
 - ▶ Designing plastic components
 - ▶ CAE analysis of moldflow process
 - ▶ Prediction and preventing of possible warping, spikes and other defects
 - ▶ Determination the optimal injection placement
 - ▶ Optimization of plastic parts for different design parameters
- ▶ Analysis of stamping processes:
 - ▶ Stampability analysis
 - ▶ Prediction and prevention of possible defects
 - ▶ Optimization of stamping process

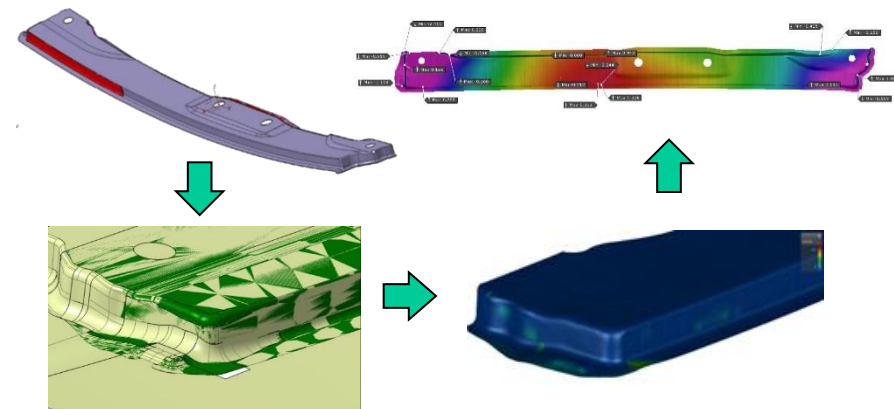


Examples of work performed

1. Analysis of warping in casting the air filter housing

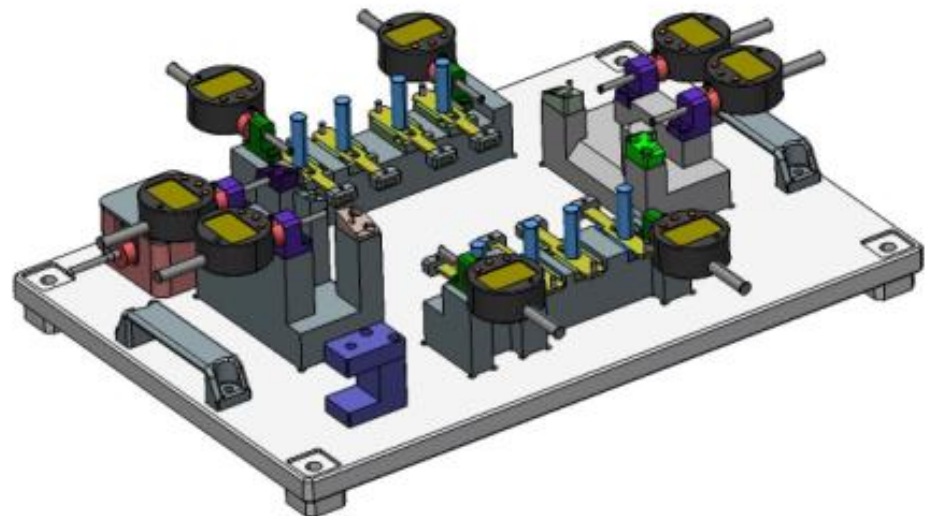
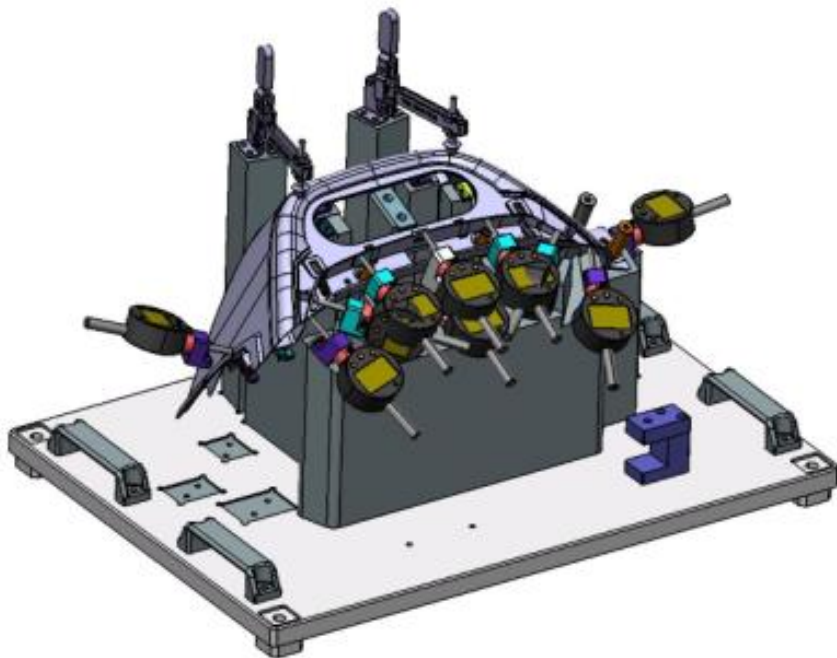


2. Stampability analysis of body parts

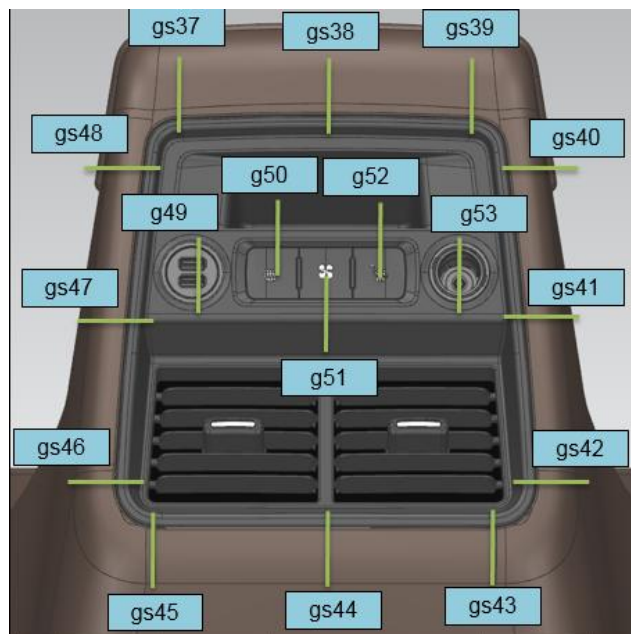


ASSEMBLY AND MEASURING TOOLS DESIGN

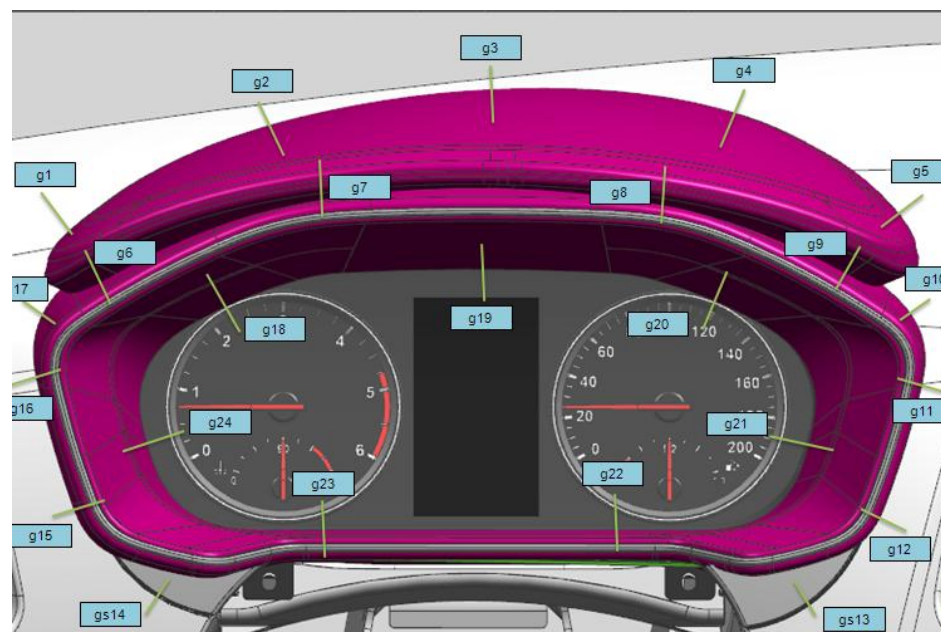
- ▶ Design of assembly tools
- ▶ Design of plug gauges
- ▶ Design of checking tools
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)



GEOMETRIC CONTROL MEASURE SCHEME DESIGN



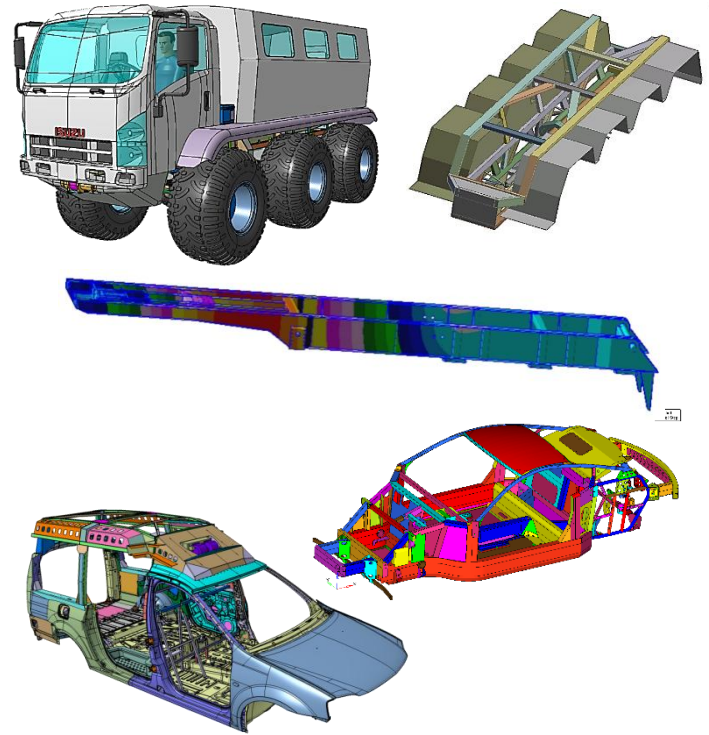
| | | | | | | |
|------|---------|------------------------|-----------------------|---------|---|-----|
| gs48 | перепад | облицовка туннеля пола | накладка туннеля пола | -1±0,3 | Z | 478 |
| g49 | зазор | накладка туннеля пола | розетка usb | 0±0,2 | Y | -65 |
| g50 | зазор | накладка туннеля пола | выключатель | 0,3±0,2 | Y | -27 |
| g51 | зазор | накладка туннеля пола | выключатель | 0,3±0,2 | Y | 0 |
| g52 | зазор | накладка туннеля пола | выключатель | 0,3±0,2 | Y | 27 |
| g53 | зазор | накладка туннеля пола | розетка 12В | 0±0,2 | Y | 65 |



| № точки | Требование | Наименование | | Значения | Ось | Координата |
|---------|------------|----------------------|-------------------------|----------|-----|------------|
| g1 | зазор | панель приборов | козырек панели приборов | 0,5±0,5 | Y | -567 |
| g2 | зазор | панель приборов | козырек панели приборов | 0,5±0,5 | Y | -491 |
| g3 | зазор | панель приборов | козырек панели приборов | 0,5±0,5 | Y | -404 |
| g4 | зазор | панель приборов | козырек панели приборов | 0,5±0,5 | Y | -317 |
| g5 | зазор | панель приборов | козырек панели приборов | 0,5±0,5 | Y | -246 |
| g6 | зазор | облицовка комбинации | козырек панели приборов | 0,5±0,5 | Y | -561 |
| g7 | зазор | облицовка комбинации | козырек панели приборов | 0,5±0,5 | Y | -472 |
| g8 | зазор | облицовка комбинации | козырек панели приборов | 0,5±0,5 | Y | -348 |
| g9 | зазор | облицовка комбинации | козырек панели приборов | 0,5±0,5 | Y | -259 |

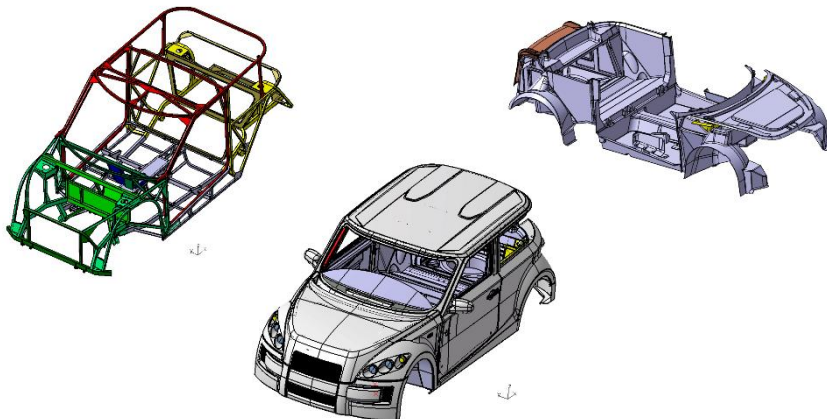
DESIGN OF FRAMES, BODY-IN-WHITE AND CABINS

- ▶ Designing frames, bodies-in-white (BiW) and cabins for automotive, agricultural, mining and construction vehicles
- ▶ BiW and cabin styling
- ▶ All necessary types of CAE analysis: structural, NVH, crash-tests, internal aerodynamics, thermal, vehicle visibility
- ▶ Passive safety analysis
- ▶ Optimization of mass, stiffness and shape
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

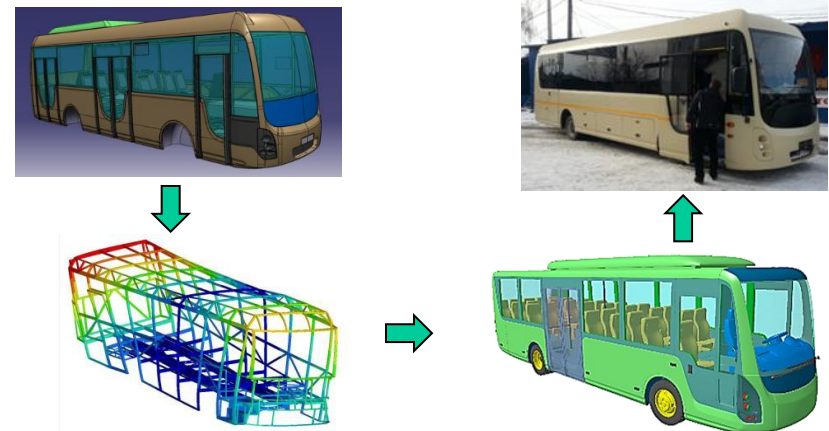


Examples of work performed

1. Design of frame and body of the car



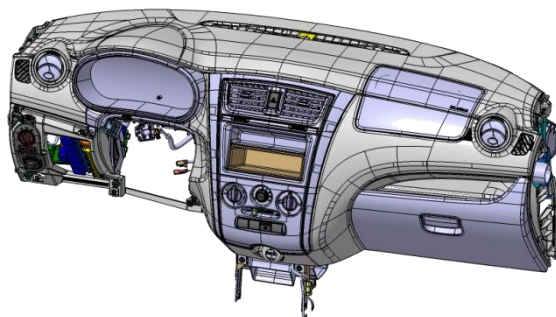
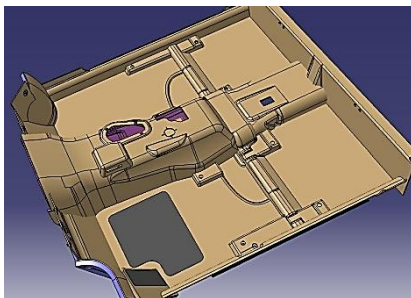
2. Design of frame, body and exterior of the bus



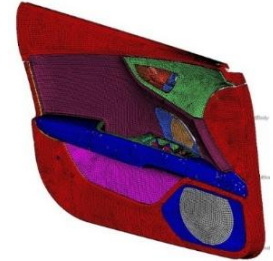
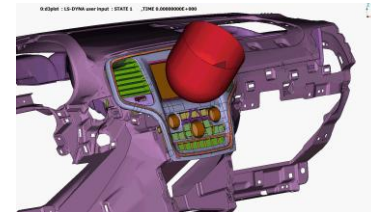
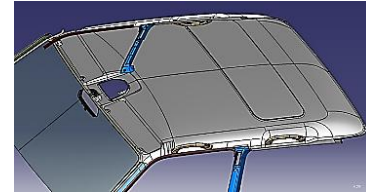
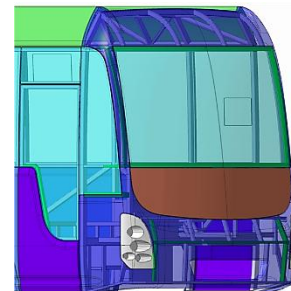
- ▶ Exterior design (bumpers, fenders, side walls, kit, etc.)
- ▶ Interior design (dashboard, trims, doors and roof panels design)
- ▶ Design of interior elements (handles, levers, plafonds, mats, cover plates, sound-proofing)
- ▶ All necessary types of CAE analysis: structural, NVH, crash-tests, internal aerodynamics, thermal
- ▶ Passive safety analysis
- ▶ Optimization of mass, stiffness and Eigen-frequencies
- ▶ Release of design documentation and drawings (ISO, GOST)
- ▶ FMEA and requirements management

Examples of work performed

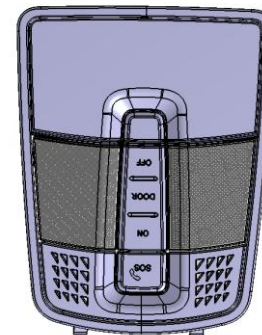
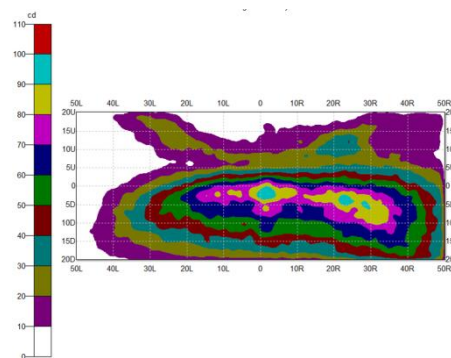
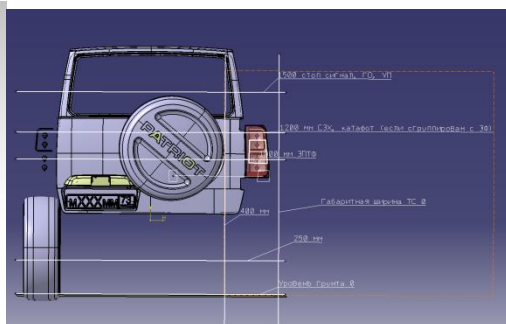
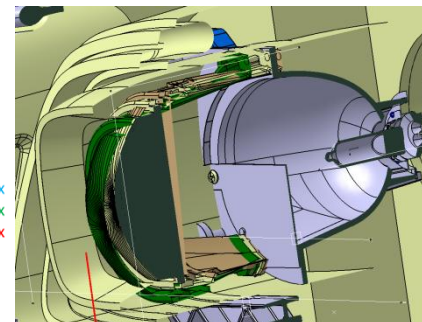
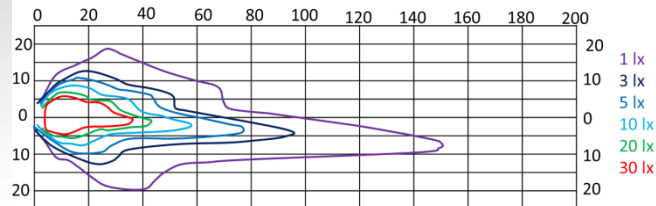
1. Designing the car interior parts



2. Designing the bus exterior

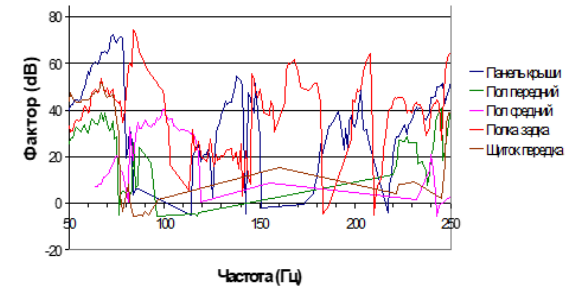
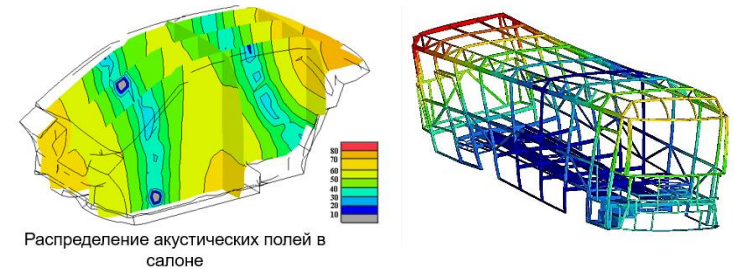


1. Design of exterior and interior lighting (including LED and light guides)
2. Design and support of project from styling and concept to SOP
3. Checking for legal requirements (UNO ECE, TR, EU)
4. Benchmarking;
5. Optical scheme design
6. Customer's property design
7. Feasibility analysis (packaging, electric, thermal and so on)
8. Technical specification development
9. Optical simulation for verification of legal requirements
10. Product design, GD&T, assembling
11. QCDP (quality-cost-design-process) analysis



NOISE, VIBRATION AND HARSHNESS ANALYSIS (NVH)

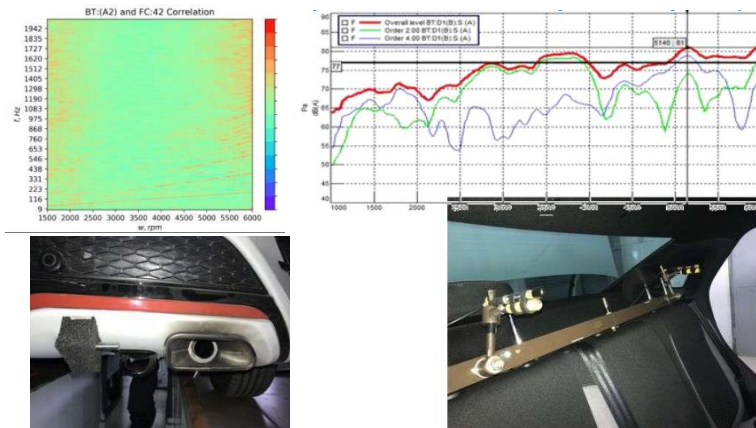
- ▶ NVH measuring (internal and external noise, vibration, sound quality rating and etc.)
- ▶ Modal analysis of the entire structure and parts
- ▶ Using SIMO and MIMO methods for the identification of excitation source
- ▶ Optimization of mass, stiffness and eigen-frequencies. Shape and thickness optimization of panels
- ▶ Design of sound insulation
- ▶ Design of rubber mounts and dampers



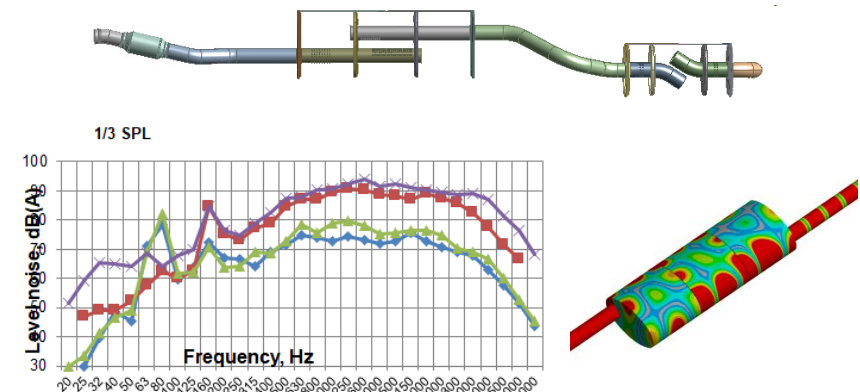
Оценка вклада вибрации панелей кузова

Examples of work performed

1. Reducing noise and vibration in the intake system of a sports car

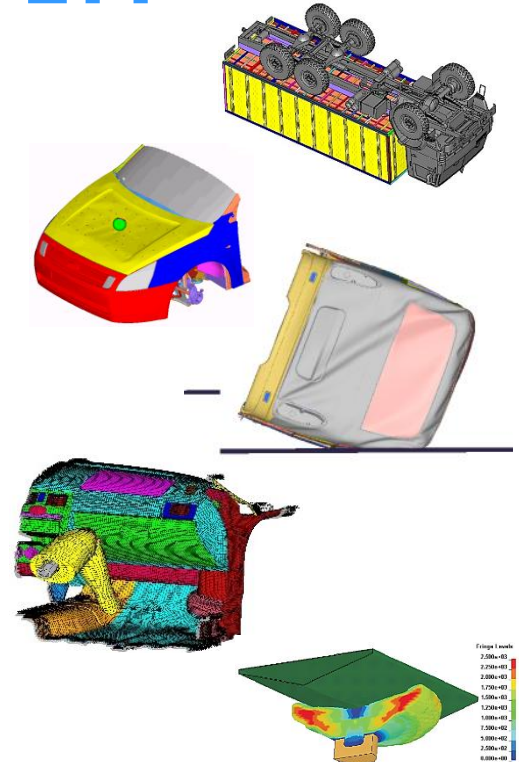


2. Reducing noise in the exhaust system



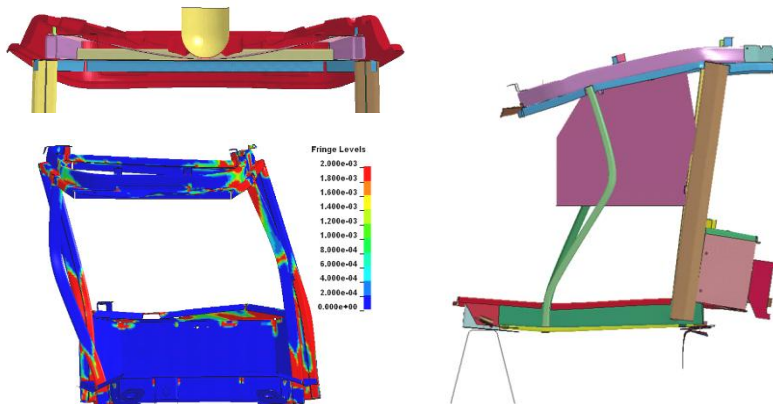
PASSIVE SAFETY AND PEDESTRIAN SAFETY

- ▶ Analysis of the implementation of the rules:
 - ▶ FOPS and ROPS tests for agricultural, construction and mining vehicles
 - ▶ Bus crash-tests (ECE R66, ECE R107)
 - ▶ Bus crash-tests for M2 and M3 classes (ECE R52)
 - ▶ Car crash-tests (ECE R94, EG 96/79, ECE R95, EG 96/27, ECE R42 and EuroNCAP)
 - ▶ Pedestrian safety (EG 03/102, EG 04/90)
 - ▶ Protection levels for light armored vehicles (NATO AEP-55, STANAG 4569)
- ▶ Virtual tests of components:
 - ▶ Belts (ECE R14), Locks (ECE R11)
 - ▶ Seat (ECE R17) and other components
- ▶ CAE support during certification tests

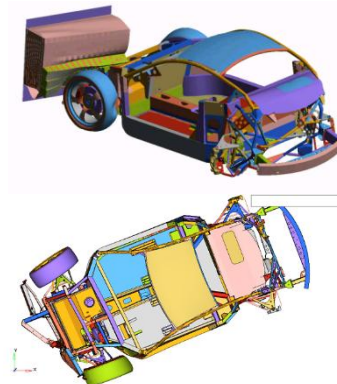


Examples of work performed

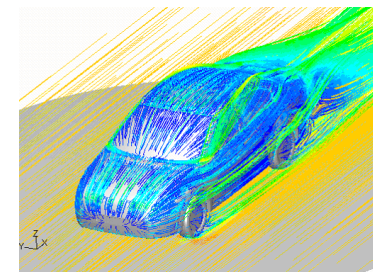
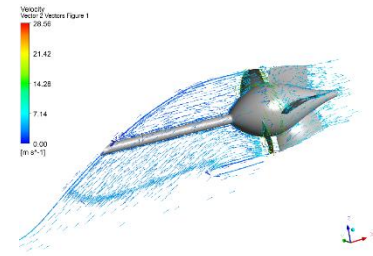
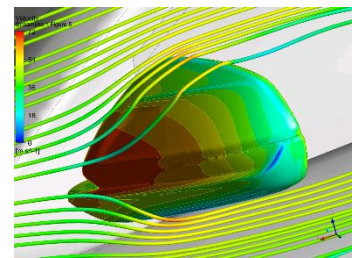
1. Virtual FOPS/ROPS tests of the RSM2375 tractor



2. Virtual crash-tests of the sports car

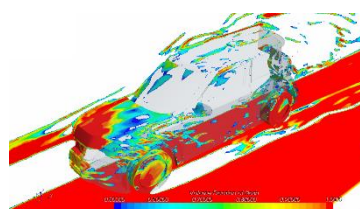
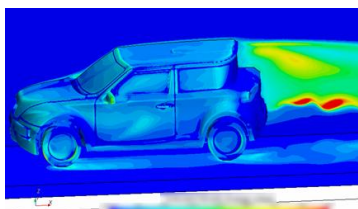
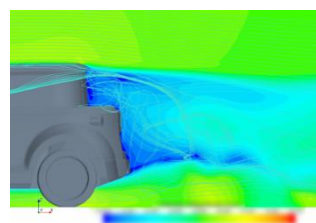
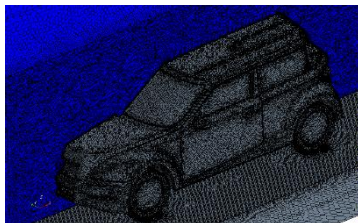


- ▶ Analysis of the aerodynamic characteristics
- ▶ Analysis of vehicle dirt retention
- ▶ Aerodynamic characteristics optimization
- ▶ Position and dimensions of headlights optimization
- ▶ Position of the radiator optimization
- ▶ Air intake position optimization
- ▶ Aeroacoustics evaluation

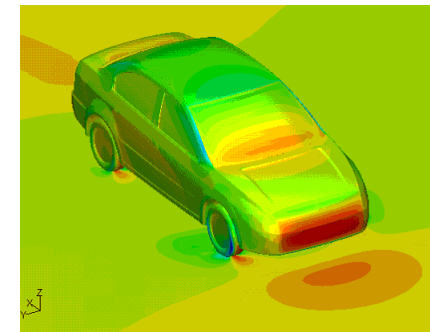
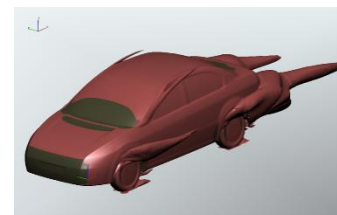


Examples of work performed

1. External Aerodynamics and Dirty retention Analysis of a passenger's car



2. External Aerodynamics and Dirty retention Analysis of a passenger's car (LADA)

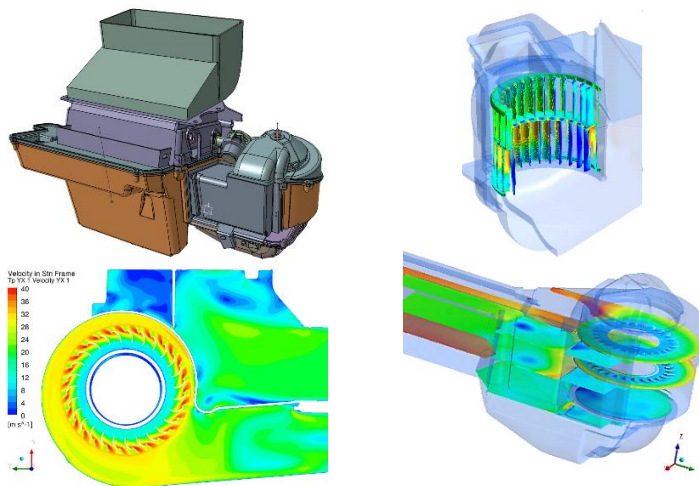


HEATING, VENTILATING AND AIR CONDITIONING (HVAC) SYSTEMS

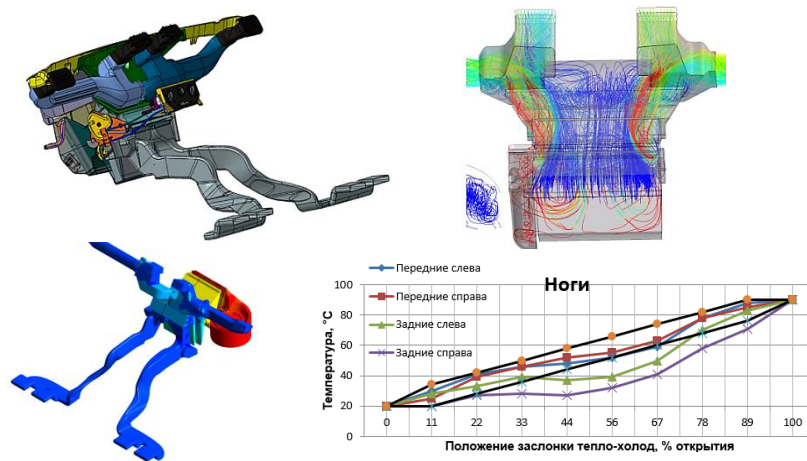
- ▶ Design of HVAC systems and components
- ▶ Calculations of the heating system efficiency (selection of heat exchangers)
- ▶ Calculations of the conditioning system efficiency (selection of evaporator and condenser)
- ▶ Designing climate control systems (mechanics, electronics and programming)
- ▶ Design of air ducts for climate systems
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

Examples of work performed

1. Designing a HVAC system for the “LADA” car

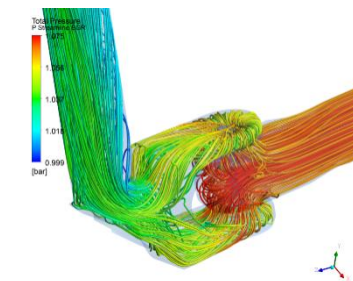
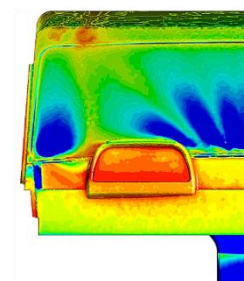


2. Designing a climate system for the “LADA 4x4” car



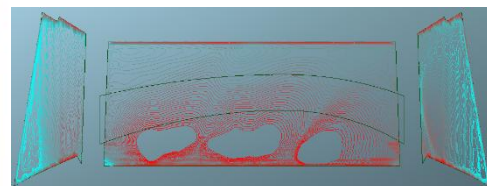
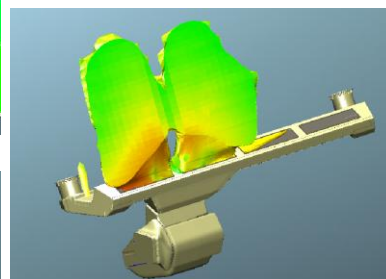
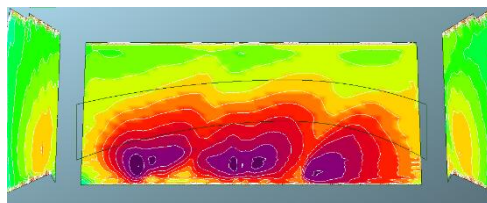
MICROCLIMATE AND INTERNAL AERODYNAMICS

- ▶ Analysis of the microclimate in vehicle's cabins
- ▶ Calculations of defrosting and fogging car glasses
- ▶ Selecting thermal insulation for vehicle cabins
- ▶ Coupled calculations of CFD models and system engineering models
- ▶ Designing and optimizing air ducts and vents
- ▶ Aerodynamics analysis of the engine compartment
- ▶ CFD analysis of pipelines

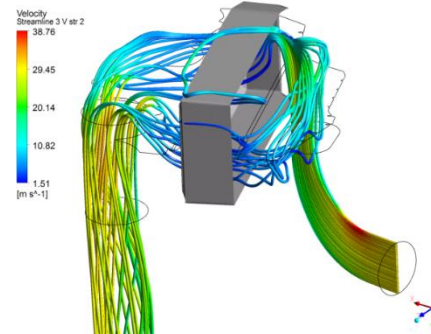
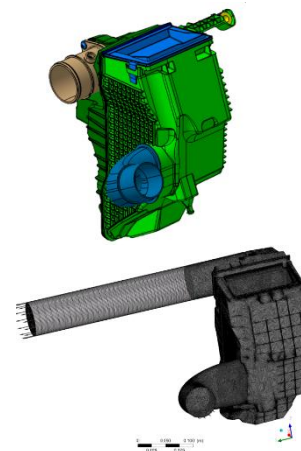


Examples of work performed

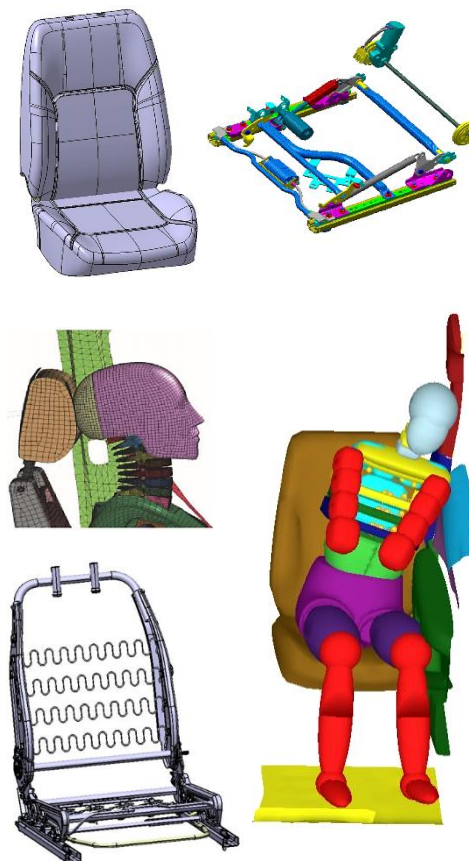
1. Calculations of defrosting and fogging car glasses



2. Internal aerodynamics analysis of the duct in the car's intake system



- ▶ Designing seat frames
- ▶ Designing head rests
- ▶ Designing mechanisms, drive and electrical equipment
- ▶ Designing comfort and safety systems (ventilation, massage, multimedia, airbag layout, etc.)
- ▶ Designing plastic components, padding and upholstery
- ▶ Designing seats for agricultural and military vehicles
- ▶ Development of documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management
- ▶ Calculations:
 - ▶ Structural, NVH and comfort system analysis
 - ▶ Calculation of the optimum padding stiffness
 - ▶ Passive safety analysis (ECE R14, ECE R17 and ECE R80, ISOFIX systems analysis, STANAG 4569)
 - ▶ Kinematic analysis of the seat mechanisms



Examples of work performed

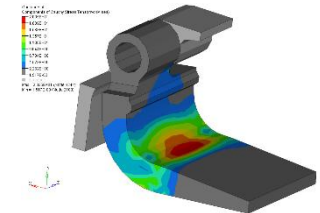
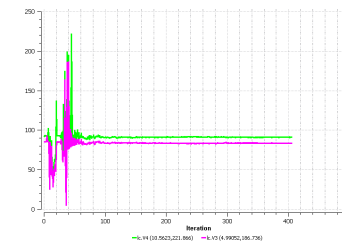
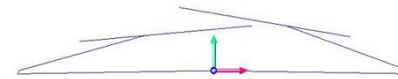
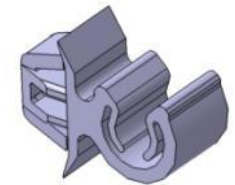
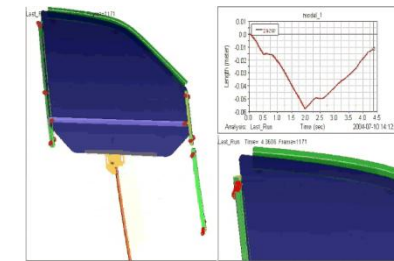
1. Development of a unified range of seats for a commercial vehicle

| | Каркас C-011, | Каркас C-01, | Каркас C-02, | Каркас C-03, | Каркас C-05, | Каркас C-06, | Каркас C11-01 | Каркас Inlap Novis |
|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Общая деталь | | | | | | | | |
| Спинка сиденья | 400 - 740 - 325 | | | | | | | |
| Удобство сиденья (ширина сиденья - ширина спинки), мм | 400 - 740 - 325 | | | | | | | |
| Тип спинки | Нерегулируемая | Регулируемая | Регулируемая | Регулируемая | Регулируемая | Регулируемая | Нерегулируемая | Регулируемая |
| Число поперечных спинок, расположение | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| Регулировка наклона спинки | нет | да | да | да | да | да | нет | да |
| Наличие подлокотника | нет | нет | нет | нет | нет | нет | да | да |
| Крепление подлокотника | нет | | | | | | | |
| Размещение подлокотника, крепление | нет | | | | | | | |
| Основание сиденья, тип, конструкция, размеры, форма | | | | | | | | |
| Укрепление сиденья к полу кузова, наличие отдельной детали | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 | К нижней раме сиденья - 4 болта М8 |
| Крепление сиденья к полу, к боковине и к полу, к боковине | Через подрамник | Через подрамник | Через подрамник | Через подрамник | Через подрамник | Через подрамник | На опоре (размер 360mm) | Через подрамник |

2. Development of seats for a S-class car



- ▶ Designing various automotive components:
 - ▶ Mirrors
 - ▶ Windows wipers and risers
 - ▶ Door stops and hinges
 - ▶ Pedals, levers, locks, handles
 - ▶ And etc.
- ▶ All necessary types of CAE analysis: kinematics, multi-body dynamics, structural analysis and NVH
- ▶ Development of documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

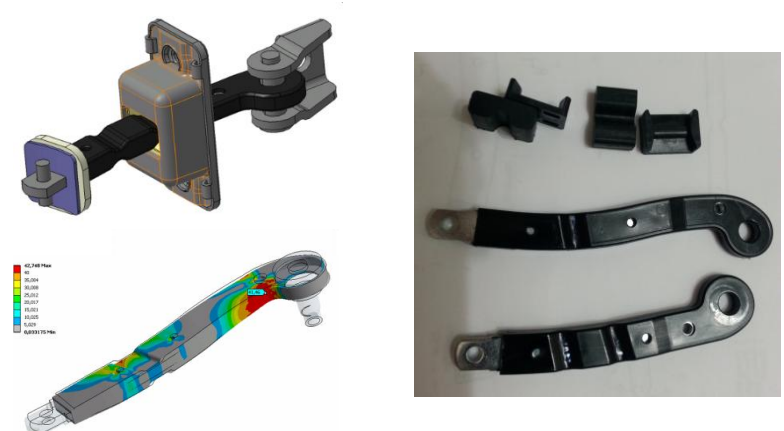


Examples of work performed

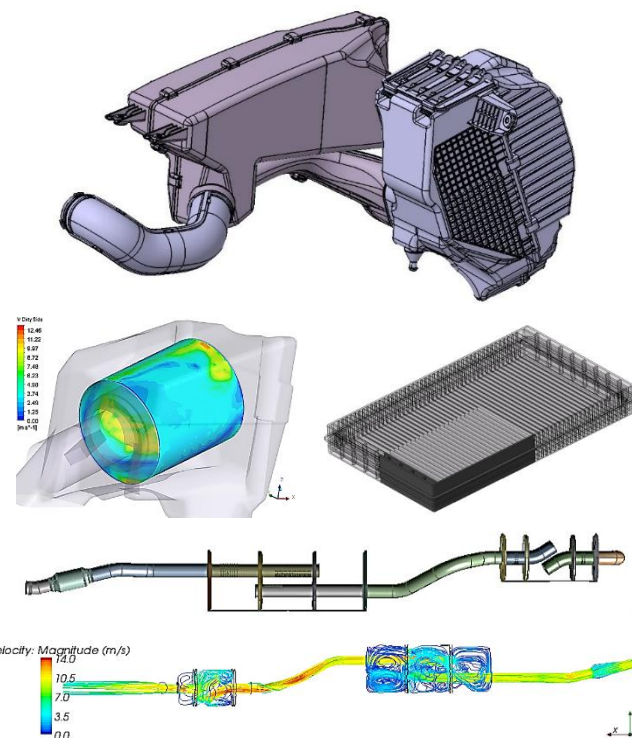
1. Design of wing mirrors for "LADA" passenger's cars



2. Design of a car door opening limiter

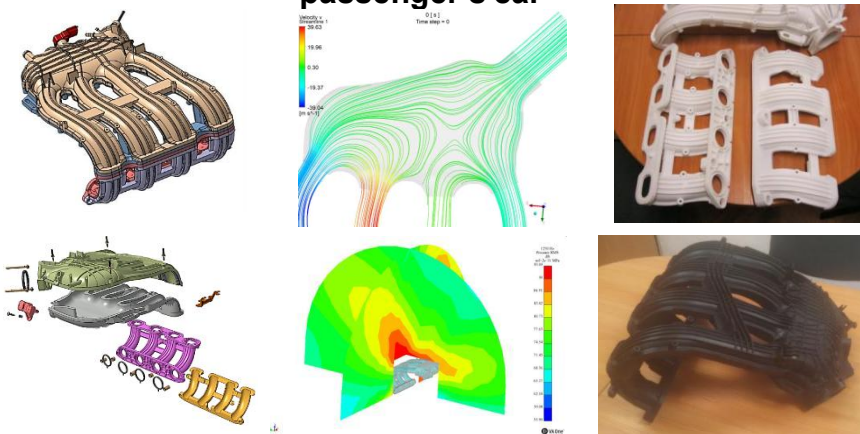


- ▶ Designing air inlet, intake manifold and filter
- ▶ Designing "hot end" and "cold end" parts of the exhaust system
- ▶ CFD analysis of intake and exhaust systems
- ▶ Shape optimization of intake manifold and air inlet
- ▶ Designing acoustic components of intake and exhaust systems (mufflers and resonators design)
- ▶ All necessary types of CAE analysis: CFD, NVH and structural analysis
- ▶ Analysis and optimization of recirculation gas system (EGR)
- ▶ Development of documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

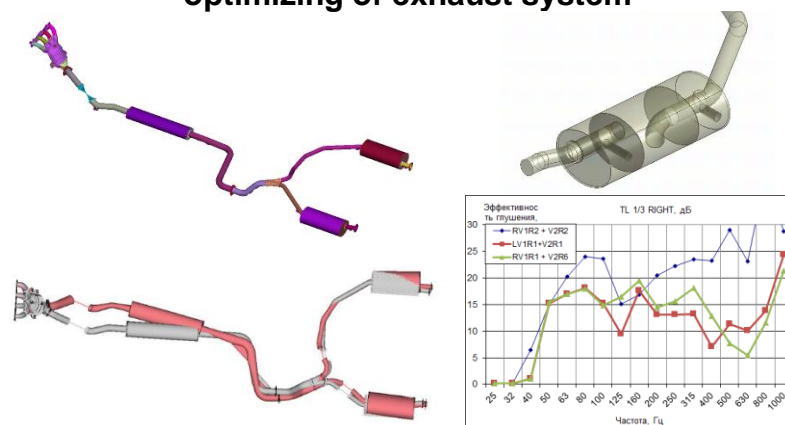


Examples of work performed

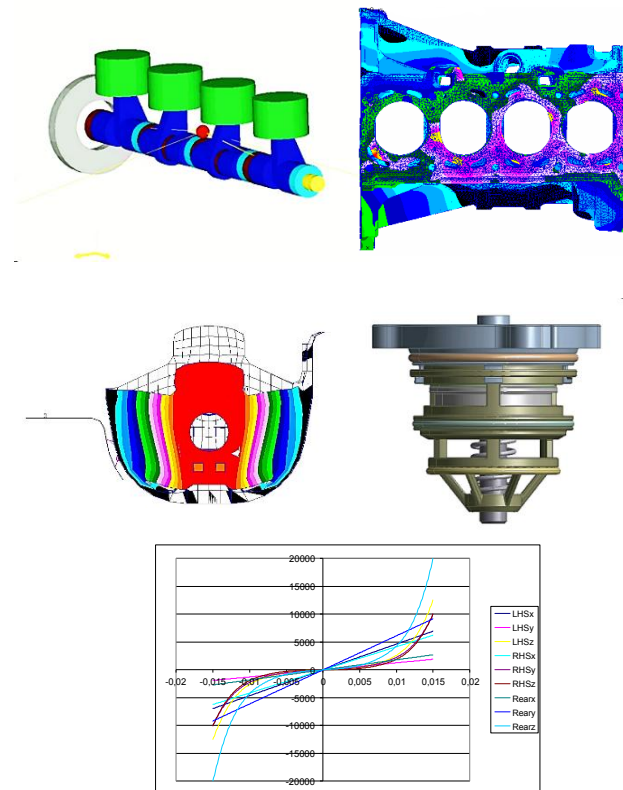
1. Design of intake manifold for the "LADA" passenger's car



2. Noise and back pressure optimizing of exhaust system

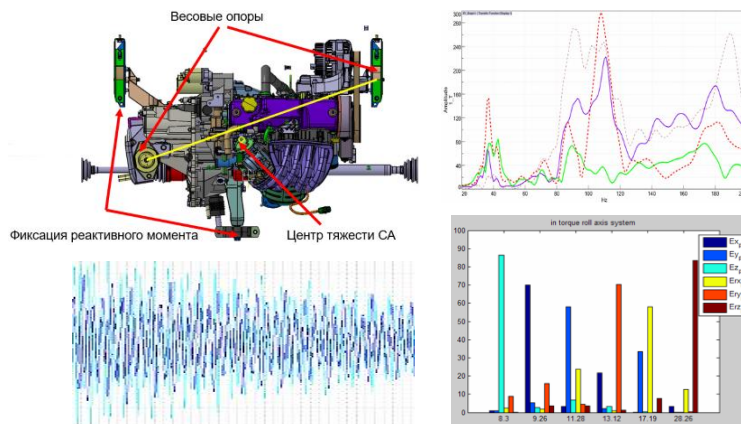


- ▶ Design of engine and elements
- ▶ Designing and optimizing ICE's mounts
- ▶ Analysis and optimization of air ducts and cooling systems
- ▶ Structural analysis of various body parts (cylinder block, housing etc.)
- ▶ Optimizing ICE's body stiffness
- ▶ NVH analysis of ICE
- ▶ Analysis of the fuel supply system
- ▶ Optimizing components of crank and gas distribution mechanisms (connecting rod, piston, crankshaft, camshaft)
- ▶ Optimizing engine performance
- ▶ Simulation of the combustion cycle

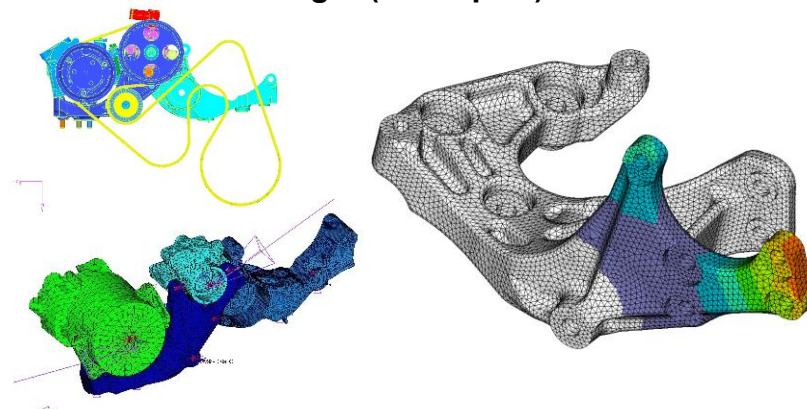


Examples of work performed

1. Optimization of ICE's mounts for "LADA" car

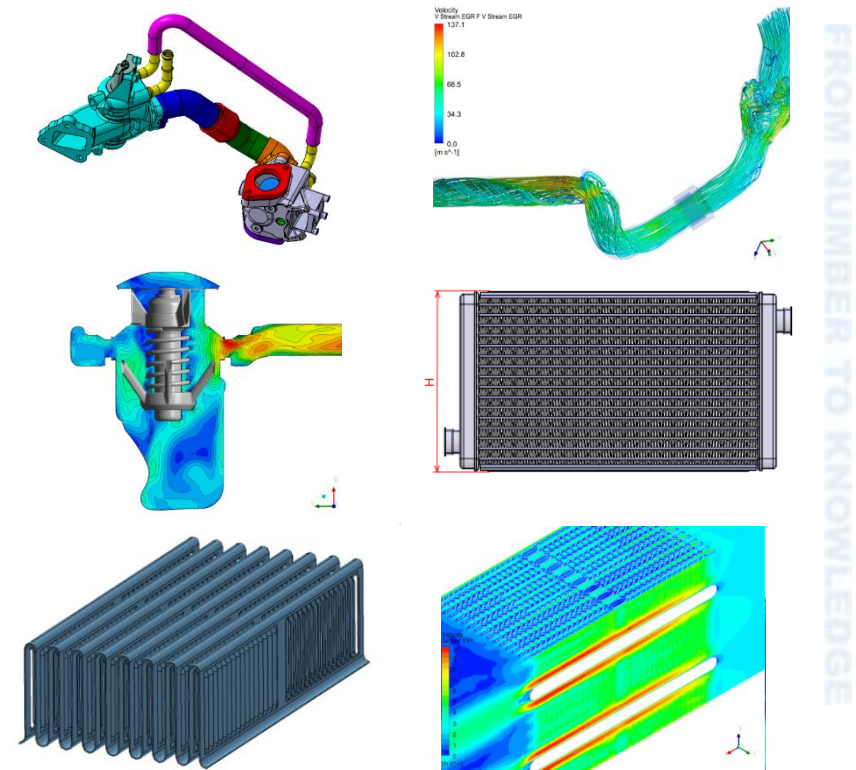


2. Optimizing the bracket of PTO equipment by weight (for "Opel")



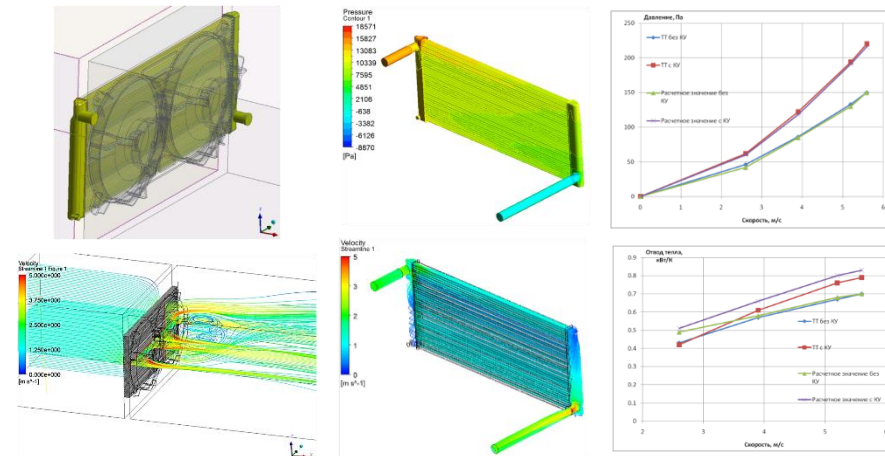
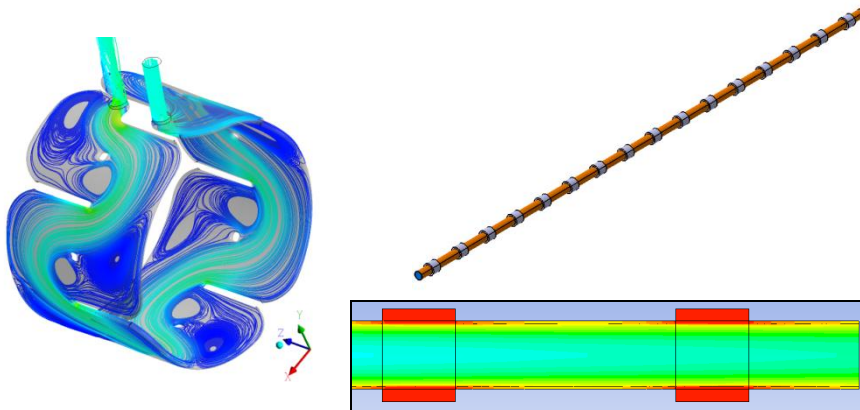
- ▶ Designing vehicle heat exchangers and cooling systems
- ▶ Designing evaporators and air conditioning condensers
- ▶ CAE analysis of radiators and heat exchangers
- ▶ Shape optimization of radiators and heat exchangers
- ▶ Selection of a forced cooling system (fans)
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

Examples of work performed



1. Heatexchangers design

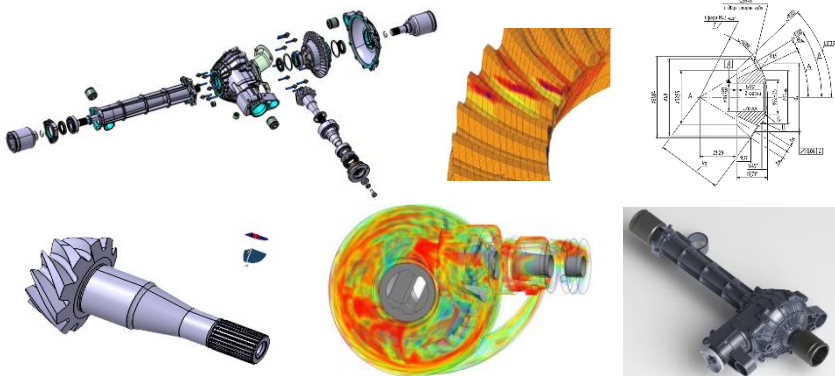
2. Efficiency analysis of the radiator for the “LADA 4x4” car



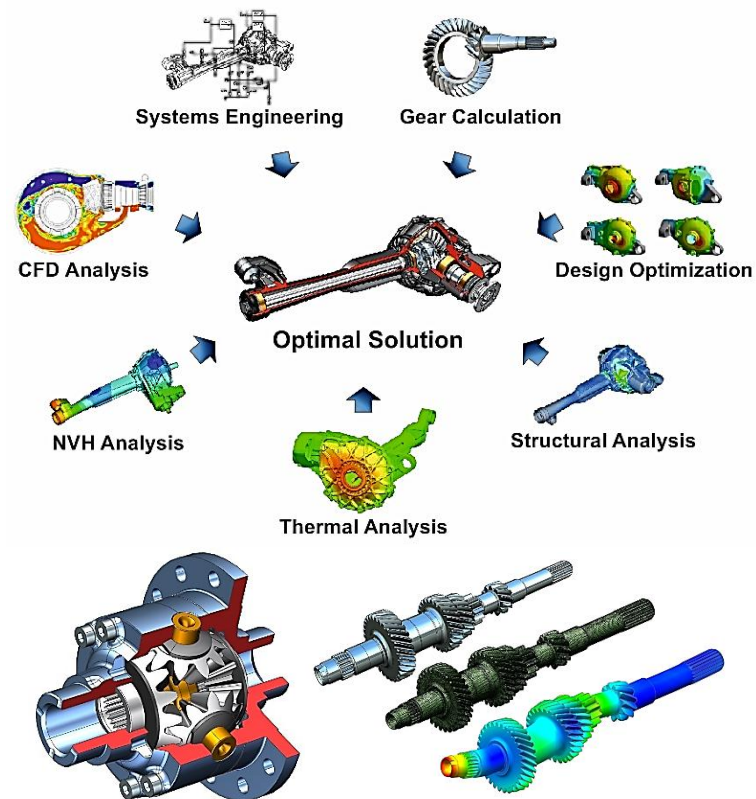
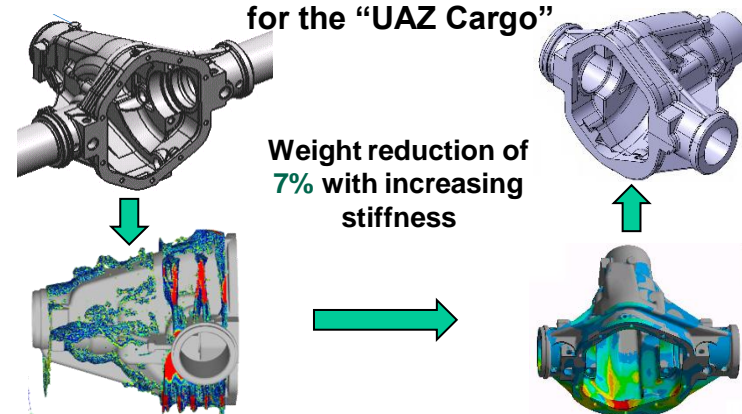
- ▶ Designing drivetrain components (gearboxes, differentials, PTO devices, final drive etc.)
- ▶ Design and calculations of housings, shafts and gears
- ▶ All necessary types of CAE analysis: kinematics, multi-body dynamics, CFD, NVH, structural, thermal and durability
- ▶ Drivetrain optimization including tooth's profile modifications
- ▶ Calculation and selection of bearings, seals and spline joints
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

Examples of work performed

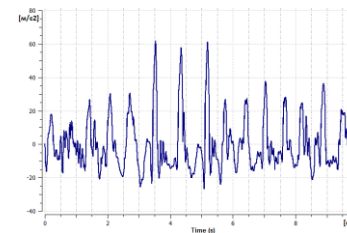
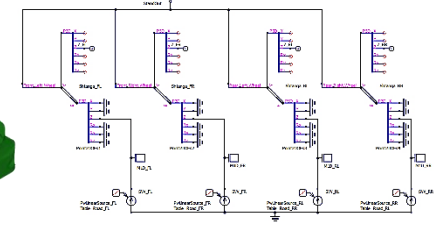
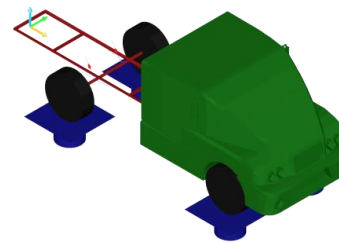
1. Design of front axle gear for the "UAZ-3170" car



2. Optimization of the rear axle gear's housing for the "UAZ Cargo"

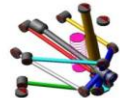
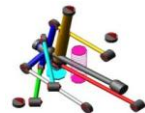
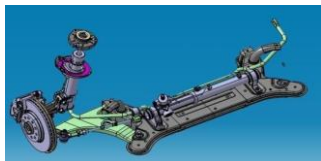


- ▶ Analysis of vehicle stability and steerability
- ▶ Virtual tests of vehicle stability and steerability
- ▶ Calculations of kinematics / elastokinematics suspension and steering
- ▶ Vertical dynamic analysis
- ▶ Optimizing suspension and steering
- ▶ Calculation of load distribution on a vehicle body
- ▶ Designing suspension components
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

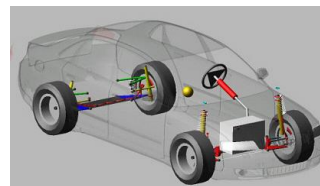
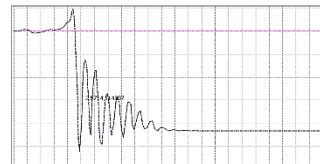


Examples of work performed

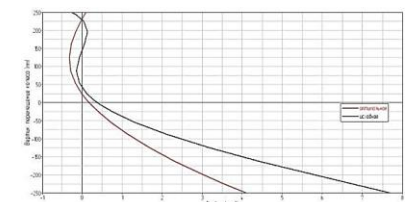
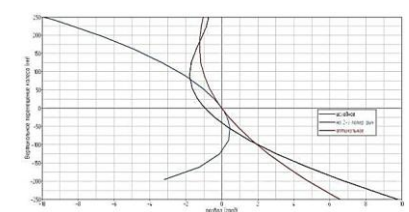
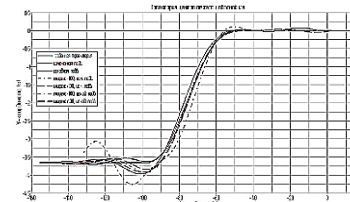
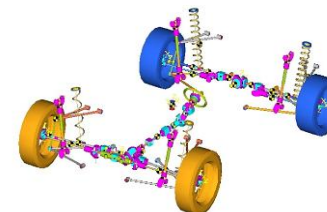
1. Analysis and optimization of the load distribution on the car body from the suspension



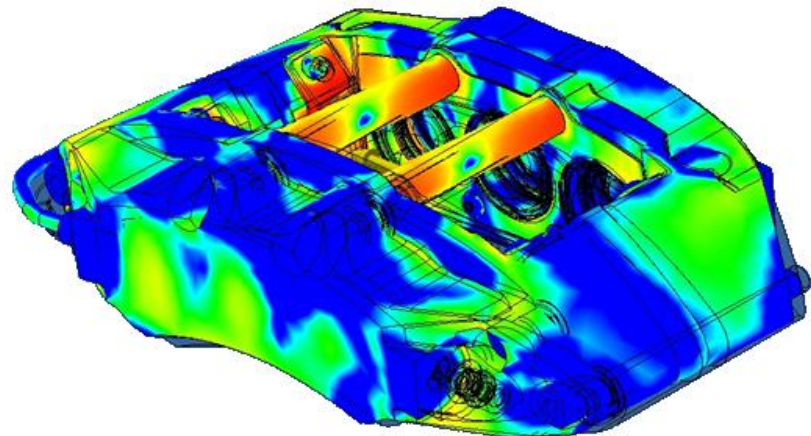
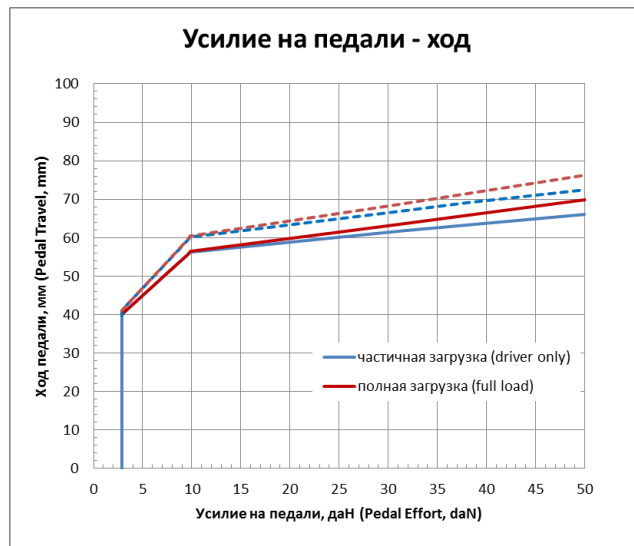
Reducing the peak load on the car body by **50%** (13 load cases)



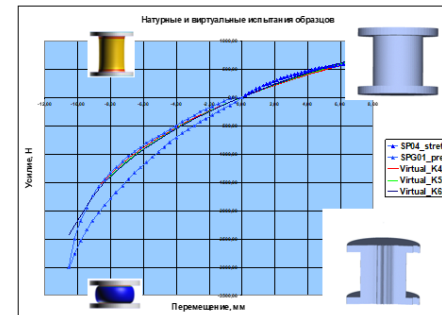
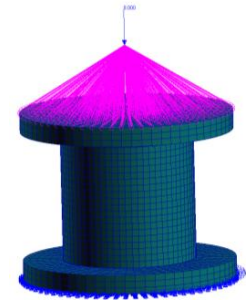
2. Analysis and optimization of the buggy suspension



- ▶ Conceptual design and calculations
- ▶ Forming requirements for brake system
- ▶ Benchmarking and selecting the optimal brake system
- ▶ Calculation of the braking system, taking into account the requirements of ergonomics and efficiency
- ▶ Calculation of braking for two-axle, three-axle and multi-axle vehicles with/without a trailer
- ▶ Selecting and designing brake components

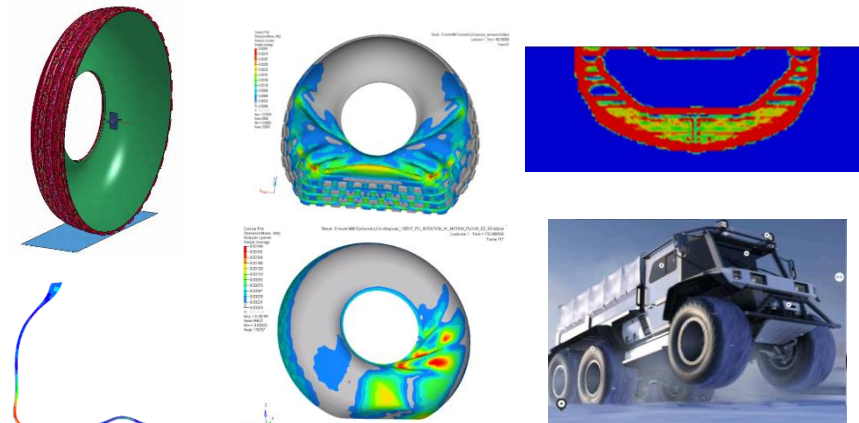


- ▶ Designing automotive rubber products
- ▶ Designing various rubber mounts
- ▶ Selecting elastomers for vibroisolation
- ▶ Designing ultra low pressure tires
- ▶ CAE analysis of rubber products
- ▶ Optimizing rubber products
- ▶ Release of design documentation and drawings (ISO, DIN, GOST)

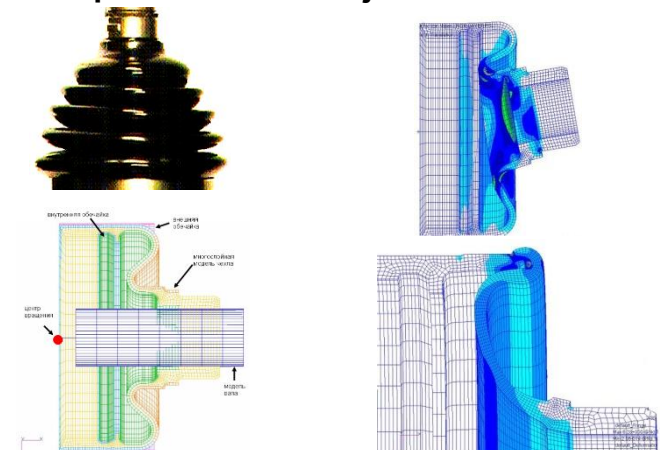


Examples of work performed

1. Design of ultra low pressure tire for ATV

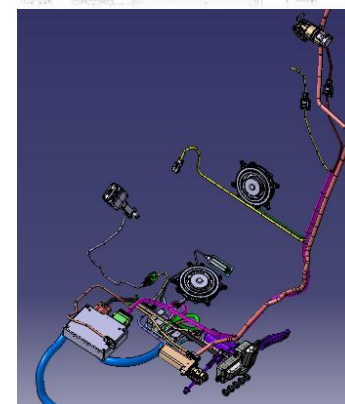
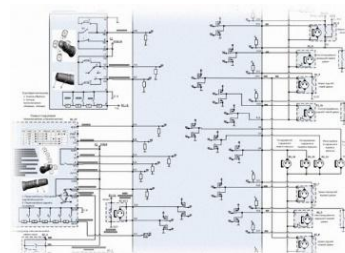


2. Optimization of CV joint's cover



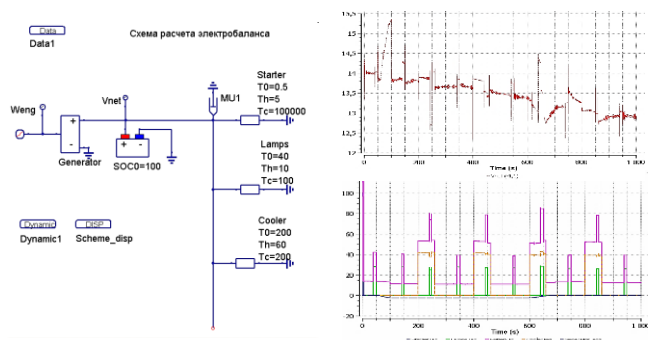
AUTOMOTIVE ELECTRONIC SYSTEMS (E&E) AND ADAS

- ▶ Development of automotive electronic systems and devices
 - ▶ Development of schematic diagrams, functional and ECAD models
 - ▶ Forming the system architecture of electronic products
 - ▶ ADAS system development
 - ▶ Wire harness design and electrical routing
- ▶ Styling electronic devices
- ▶ Hardware-in-the-loop simulation
- ▶ Calculation of the energy balance
- ▶ Development of documentation and drawings (ISO, DIN, GOST)
- ▶ FMEA and requirements management

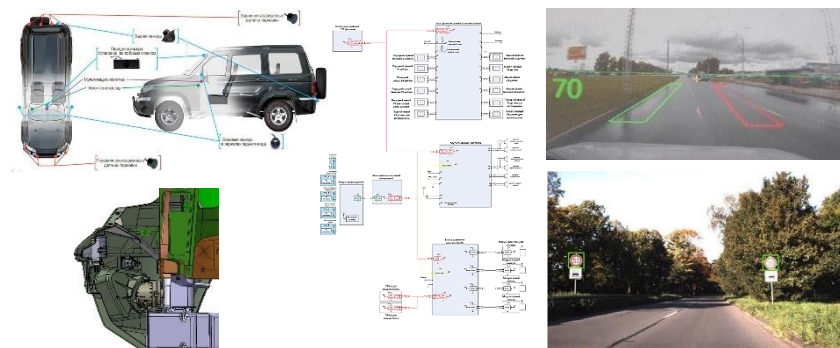


Examples of work performed

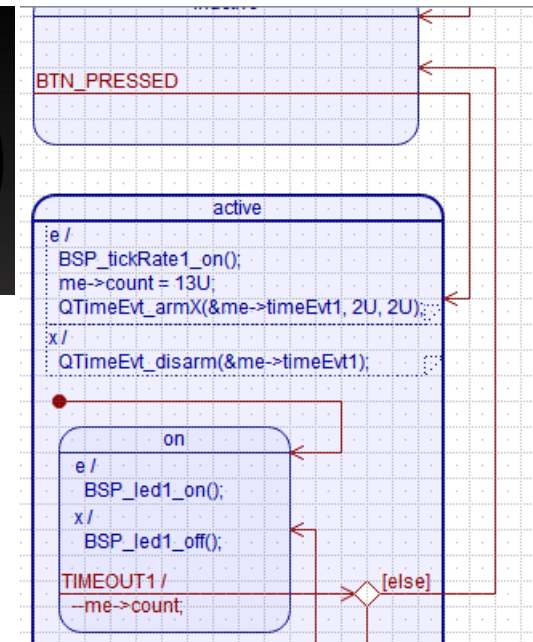
1. Calculation and optimization of vehicle energy balance



2. Development of vehicle ADAS system



1. Development by using Assembler/C/C++ for STM/Microchip/NXP/TI...
2. Development of real time software (ECU, VCU, BMS and etc.) based on FreeRTOS, QP/C/C++ Framework
3. Development of complex UI/UX software for ECU (Instrumental Cluster (IC), Information Vehicle Interface (IVI), Multimedia System (MMS) and etc.) base on Automotive Grade Linux and Qt (C++)
4. Model based design of software
5. StateFlow simulation
6. Functional safety analysis (ISO 26262)



THANKS FOR YOUR ATTENTION!