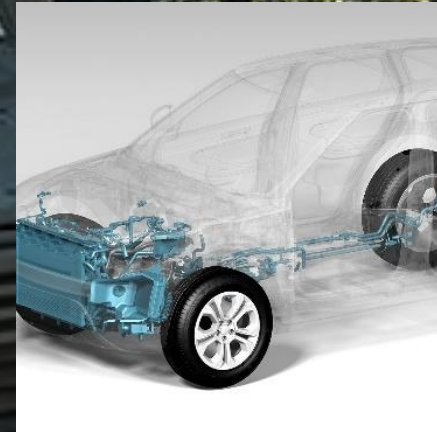


Vehicle Engineering



Styling

- Concept design development
- Surface & visualization
- Serial design development
- Hardware modelling

Chassis

- Chassis frame
- Axle / suspension system
- Steering system
- Powertrain integration

Cabin / Body

- Cabin concept
- Body in white development (BIW)
- Exterior development
- Interior development

System Engineering

- System architecture
- System requirements engineering
- Vehicle simulation
- Energy management

Prototyping & Testing

- Prototyping
- HiL test benches
- Vehicle testing
- Measurement services

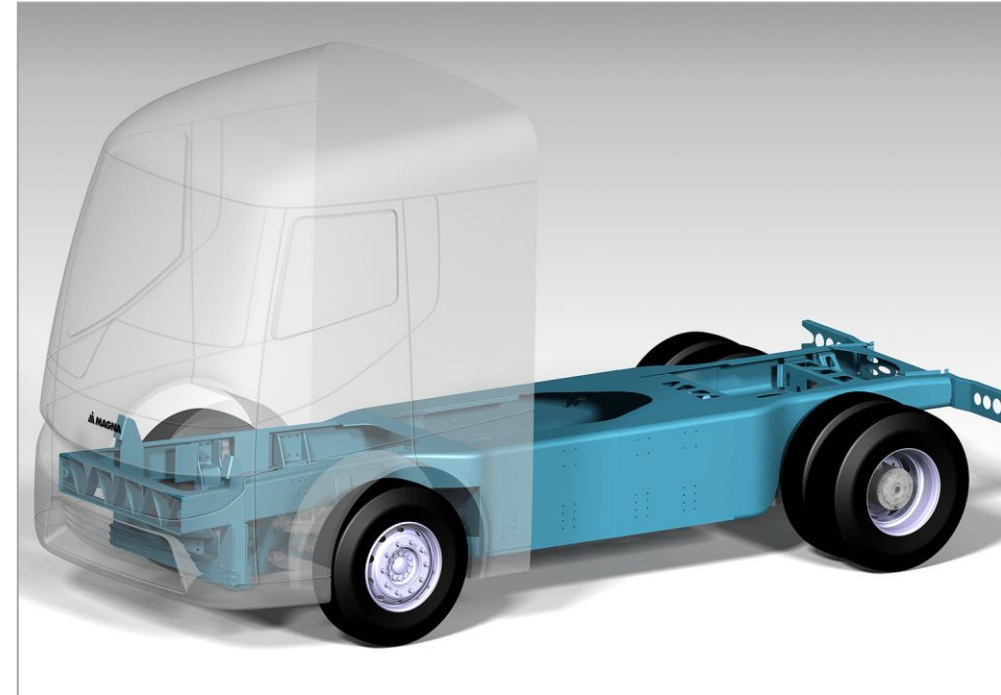
Styling

- **Concept design development**
 - Trend research / styling benchmark
 - Orientation program / mood boards
 - Design strategy
 - Theme development exterior / interior
- **Surface & visualization**
 - Fast modelling (polygon modelling)
 - CAS – 3D theme development
 - Class A surfacing
 - Powerwall visualization
 - Virtual reality design check
- **Serial design development**
 - Theme verification
 - Serial design support during realization
 - Styling – technical unification
 - Color & trim
 - Detail design
- **Hardware modelling**
 - Design check model exterior / interior
 - Scale models
 - Clay models
 - Interior seating buck



Chassis

- **Chassis frame**
 - Ride & handling simulation and performance target setting
 - Frame for special vehicle application
 - Brake system simulation and integration
 - Lightweight solutions
 - Strength & fatigue simulation
- **Axle / suspension system**
 - Rigid axle suspension
 - Independent suspension
 - Pusher- / trailing axles suspension
 - Spring types (air, steel, hydraulic)
 - Kinematics simulation and performance target setting
- **Steering system**
 - System design for standard rigid axle or independent suspension
 - Kinematics steering & suspension system development
 - Steering column kinematics
 - Steering ratios & forces
 - Steering system interface development
- **Powertrain integration**
 - Passenger cars to heavy duty trucks
 - Powertrain packaging
 - Interface system development
 - Cooling system
 - Air intake, fuel and after treatment system
 - Powertrain performance and energy demand optimization



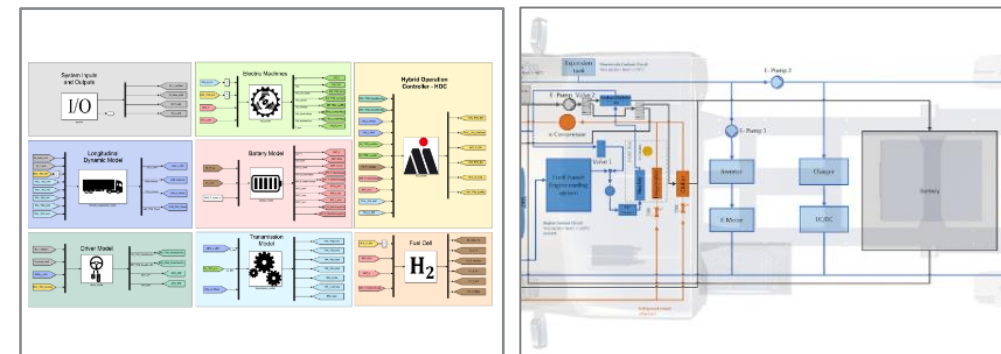
Cabin / Body

- **Cabin concept**
 - Line up & dimensions definition
 - Ergonomic & package layout
 - Modularity / assembly concepts
 - Legal requirements / regulations
 - Specification book
 - Chassis and E/E interface investigations
- **Body in white development (BIW)**
 - Function integration
 - BIW structure & door design
 - Performance & crash optimization
 - Light weight solutions
 - Modular assembly
- **Exterior development**
 - Interface integration (e.g. E / E, cameras, ADAS, ...)
 - Design for bumper, hood, steps, spoilers, ...
 - Aerodynamic & pollution optimization
 - Assembly and maintenance concepts
 - Manufacturing & material definition
- **Interior development**
 - Integration of interfaces
 - Modern living & equipment
 - Ergonomic driver's place, HMI
 - Assembly and maintenance solutions
 - Design for dashboard, storages, trims, berth, ...
 - Manufacturing, splitting line & material definition



System Engineering

- **System architecture**
 - Development of vehicle systems
 - System specification
 - System benchmarking
 - System validation
 - HV / LV system design
- **Vehicle simulation**
 - Vehicle performance analysis
 - Vehicle topology evaluation
 - Specification of powertrain components
 - Plant model build up for SiL analysis
- **System requirements engineering**
 - System requirements engineering
 - Function development
 - Vehicle system application
- **HV PDU development**
 - Specification
 - Design & Layout
 - Simulation & Testing
 - PDU Prototyping up to small volume production



Prototyping & Testing

- **Prototyping**
 - Prototype parts & sub systems
 - Demonstration vehicles
 - Mule vehicles
 - Full vehicles
- **HIL test benches**
 - Full vehicle disassembly
 - Reassemble of all components outside the chassis
 - Integration of new components
 - Measurement of signals and functions
 - Test of new components and gateways
 - Use of gateway tools to combine different systems and new components
- **Vehicle testing**
 - Subjective and objective vehicle evaluation
 - Vehicle tuning
 - Functional & durability testing
 - Testing resources
- **Measurement services**
 - Vehicle dynamics / comfort
 - Vehicle durability / development tests
 - System / component measurement services
 - EE system analysis

