The automotive sector is changing radically. Especially the laws concerning the reduction of CO₂ emissions are challenging for the fields of powertrain and running gear. To meet these challenges, we devised the following goals:

- Development of alternative drive concepts with reduced exhaust emissions (hybrid and electric vehicles)
- Substantial performance increase of current drive concepts together with a reduction of component weight and installation space (engine downsizing)
- Increasing integration of additional functions (e.g. exhaust gas treatment)

These challenges lead to several new requirements for the development and production of powertrain and running gear components:

- Implementation of new drive concepts, from power generation to energy transmission and storage
- Reduction of component weight and installation space
- Guaranteeing increased resilience of components, surfaces and joints
- Integration of functions
- Enabling the flexible and economical production of components
Our services
The institutes cooperating in the business unit powertrain and running gear of the Fraunhofer Automobile Production Alliance offer complete solutions for the following key subjects:

Material development
We develop and optimize materials, material composites and coatings in accordance with requirements and customer specifications. We also develop application guidelines. In principle, future material has to be more efficient, more durable and more cost effective. To achieve this, our goals are:
– Providing guidelines for optimized material usage according to the stresses the material will be subjected to and its function or assembly; also for material composites and mixed compounds
– Minimization of friction and wear
– Maximization of efficiency
– Integration of functions in materials and coatings

Construction and calculation
We develop construction principles as well as methods for calculating and testing the proper dimensioning of drive components in regard to stress and procedure. Drive components have to become lighter, less noisy and more durable. The business unit powertrain and running gear focuses on:
– Increasing performance and reducing weight
– Ensuring operational lifetime and improving operational behavior
– Improving producibility and quality

Production process development
We develop, optimize and validate production methods, production processes, and tools. One of our top priorities is to make the production as a whole more efficient, more ecological, and more reliable. In regard to these goals, we are active in the following areas:
– Process development in the areas of
  – Primary forming
  – Forming
  – Joining
  – Cutting
  – Coating
– Tool development and optimization
– Automatization, control and process monitoring
– Quality assurance
– Clean production
– Recycling

Process chain development
A key feature of the Automobile Production Alliance is that we look at process chains holistically. Therefore, we are able to ideally determine possibilities to increase efficiency. The business unit powertrain and running gear focuses on:
– Market analysis
– Shortening of process chains by combining near-net-shape forming and finish machining
– Material saving component design
– Cost-benefit calculation
– Rough and fine planning of technological processes
– Technological dimensioning of processing machines
– Planning and implementation of machine investments

Selected Examples
Below you find a selection of developments from the institutes of the business unit powertrain and running gear, which showcase some of our different research areas:
– Bearing ring with thin-layer integrated sensor technology in its raceway to measure the load distribution in the raceway, the rotation speed and direction, the temperature, the bearing damage, and to detect potential damage early on
– Modified DLC coating for spherical journals, which improves friction, wear and corrosion behavior while transmitting high static and dynamic forces
– Forming of spur and helical idler gears by cold rolling teeth directly into the full material, which leads to material savings and property improvement
– Hollow drive shaft produced by spin extrusion, which saves weight in moving parts
– Pulse magnetically joined drive shaft, which enables the joining of dissimilar materials and the optimization of mass
– Laser welded differential, enables compact design and efficient production by using a welded structure and inductive welding
– Active system for the reduction of vibration at the rear axle transmission (inertial mass actuator and control), which interrupts the transfer path of the structure-borne noise into the passenger compartment, thus reducing noise