Realising your PowertrainGoals

Building powertrain performance for the road ahead

The automotive industry is changing all the time. Electric, hybrid and internal combustion vehicles are powering towards the future at different speeds. So with different customer demands and a changing market, every design engineer has different powertrain goals.

The combustion engine's dominance is reducing. But estimates say traditional vehicles will represent 94% of the market through to 2022 and some time beyond. So OEMs will need to continue manufacturing for combustion engines and meeting stricter emissions regulations. They also have to explore electrification which demands expensive investment in new technology and the total redesign of every vehicle platform.

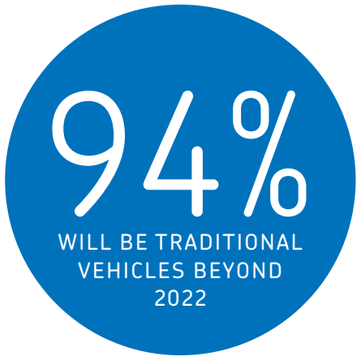
"It is estimated traditional vehicles (including micro and mild hybrid) will represent more than 94% of the market through to 2022 and for some time beyond."

IHS Auto Insight, December 2017

"The world hybrid and EV market is set to reach 13 million vehicles in 2025."

Automotive Powertrain, Chassis Body and Materials Roadmaps. Frost & Sullivan

As a partner to the automotive industry, SKF understands all the diverse and developing technologies of the exciting new landscape. We also understand OEM powertrain goals from emissions regulations to manufacturing investment. SKF will work with you to find the powertrain solutions engineered around your technologies, designs and needs.



Performance. Different for everyone

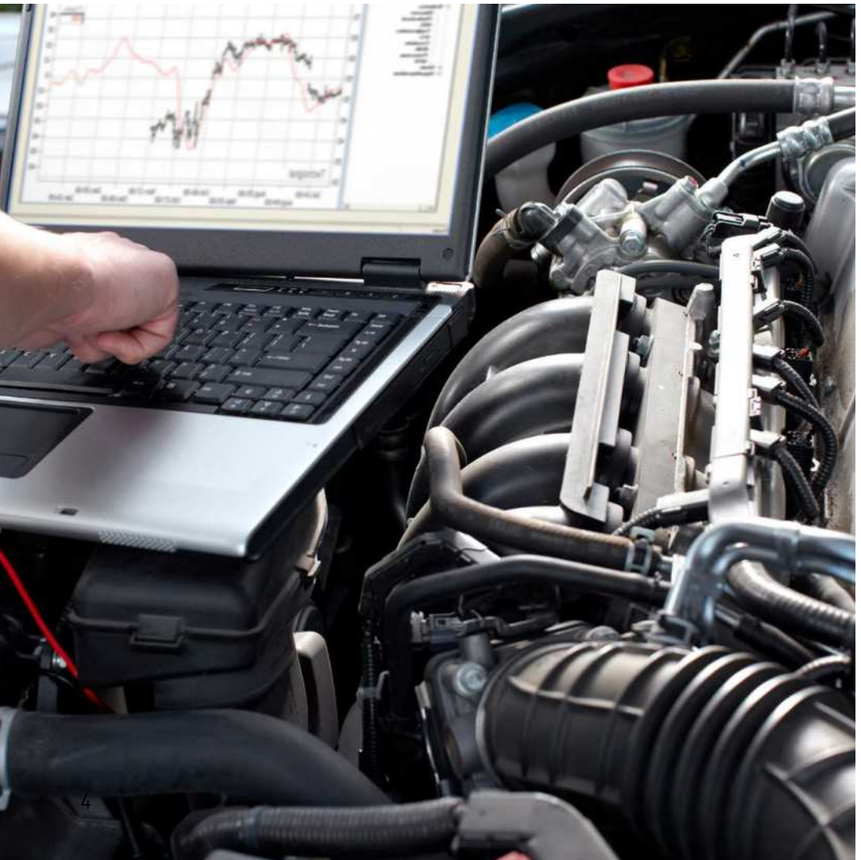
Performance means something different for every customer. Electric, hybrid and internal combustion powertrains all have their unique technical and legislative demands. But within each of these sectors are categories of vehicle from urban cars to SUVs that will all have specific definitions of powertrain performance.

Defining your PowertrainGoals

Each new automotive project has its own individual equation of performance. Powertrains need to be designed in ways that balance all the factors in realising the design goal.

Addressing emissions regulations is one key business imperative, especially as they become stricter and fines become tougher. Lower fuel consumption is another constant target for manufacturers.

Other key definitions of powertrain performance are reduced friction, longevity of components as well as resistance to temperature and stray electrical currents.



The powertrain goals of the next 10 years

How will manufacturers keep pace with change? Currently most cars spend most of the time parked. New models of ownership and utilisation will change that, as will the advent of autonomous vehicles. Driverless cars might easily run up 100 000 miles in 2 years rather than 10 years . So will bearings need to last much longer? Or will they be replaceable every 6 months? How do you design for these possibilities?

Whatever you want to achieve, we've got the product

Electrification solutions

Electrification is transforming the automotive market. Radical re-designs of powertrain architectures are pushing the potential of electric and hybrid vehicles to greater limits to deliver the level of vehicle performance customers expect, from longer range to faster vehicles enabled by higher speed bearings.

SKF has the application engineering expertise and support capabilities to help our OEM customers lead this change. Thanks to our proprietary digital simulation software and industry-leading test facilities we have the knowledge to help you explore entirely new dimensions of performance with confidence.

SKF has been a pioneering partner with some of the world's leading hybrid and electric powertrain OEMs since they first started exploring the technology. In collaboration with you, we can bring a high level of experience and knowledge to your solutions and a range of bearings built for these specific applications. This allows you to get to the most reliable answer faster. So you can build in increased performance in reduced development time.

Internal combustion engine solutions

Stricter CO_2 standards are the major challenge to established technology manufacturers. Changing engine architecture to accommodate new legislation is expensive.

> Between 2015 and 2021, CO_2 emissions in different regions of the world will have to decrease by on average 20-25%. To meet EU standards for example, OEMs will have to reduce CO_2 emissions to 95 g/km.

Working with SKF, you can follow the more economic strategy of modifying and optimising existing architectures. With a wide choice of products, you can explore tailored solutions, advanced materials and more efficient configurations that will improve engine performance. Increasing fuel pressures, reducing oil flow demands and lowering general engine friction are all possible and all within the same or similar size envelope.

Transmission: a single supplier for a complex application

Transmissions pose a complex engineering challenge. They contain up to 30 bearings, each with its own performance criteria and role to play, and any changes in specification have the potential to cause knock-on impact elsewhere in the architecture.

Working with SKF, you will be able to access the full range of bearing needs throughout the driveline, and the knowhow to navigate complexity and bring every component together into a system that delivers the overall performance you need.

Helping you innovate – meet your new R&D team

The automotive future is full of complex challenges from increasing electric vehicle performance to mainstream production of driverless vehicles. SKF understands the importance of research and development for the future of the industry. Our R&D team is working on the next generation of bearings to realise your powertrain goals today and in the future.

Automotive future challenges:

- Reducing fuel consumption and CO_2 and pollution emissions
- Energy recovery through 48 V architecture to improve vehicle efficiency
- Increasing electric battery life
- Managing charging and distribution of electricity more energy efficiently

Our development capabilities will support you in reaching the right solution for your performance needs and powertrain goals.

Design Optimisation

- Metallurgical and chemical laboratory with expertise in metallic, polymers, ceramic, rubber and lubricant materials to help you make decisions about the right materials to use.
- Dedicated SKF simulation software (including SKF SimPro Expert and BEAST) to select best bearing internal geometry and to perform detailed studies of the bearing behaviour in the application in terms of tribology, lubrication flow and topography
- Design optimisation before prototyping, to save design time, using virtual testing and DoEs thanks to a range of validated simulation tools including complex CFD and dynamic modelling
- Finite element analysis to simulate stress and deformation behaviour of bearing in its operating environment as well as optimising material usage and structural stiffness to reduce weight.

Performance testing

- Testing under operating conditions to validate performance
- Industry-leading laboratory network in ten countries across three continents
- Homologation tests to evaluate endurance, seal performance, wear and strength under simulated field conditions
- Expert support for NVH measurement and analysis at system level

Physical Bearings Analysis

- SKF Global Bearings Investigation Centres (GBIs) carry out inspection, disassembly and microscopic analysis to learn for the future
- Understand and learn from bearing failure

Car applications: Powertrain

EV/HEV applications portfolio

Electric Motor for BSG 48 V/ DHT/E-axles


DGBB


RPB


Hybrid Bearing

Gear train for DHT/E-axles


DGBB


CRB


ACBB


TRB


Hybrid Bearing


NRB

Transmission applications portfolio

Gearbox


Bearing Retainer


TRB


CRB


DGBB


Wet CBU


NRB

Final drives


TRB


DGBB

Engine applications portfolio

Balancing shaft and camshaft


DRACBB


DGBB


NRB

Valvetrain and fuel injection


RAB


CFU

Timing and accessories


Idler

E-accessories


DGBB

Your successes

Powertrain goal 1: a more efficient balancing shaft

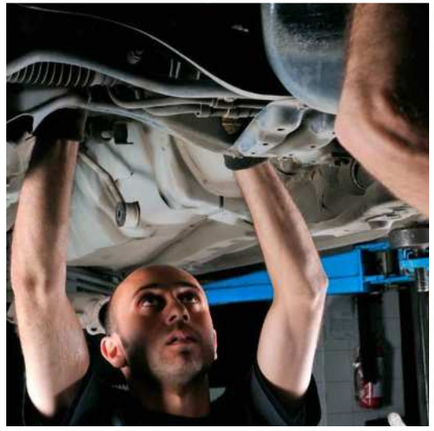
Partnering with a major European OEM, SKF helped reconfigure bearings between shafts to increase efficiency and reduce CO_2 emissions. Our rolling bearings enabled the manufacturer to replace their traditional journal bearings and significantly reduce friction. SKF offers a complete bearing package for balancing shaft applications, including bearings to run on the shaft itself and options for pinion/drive bearings. The package offers a more than 1% reduction in CO_2 emissions and fuel consumption compared to traditional journal bearing solutions.

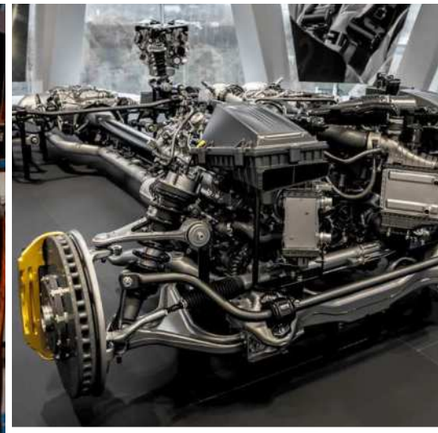
Powertrain goal 2: a more efficient compact transmission

Our OEM customer wanted to increase the efficiency of their transmission architecture, without compromising compactness, in order to reduce fuel consumption and CO_2 emissions. Working with SKF, this OEM was able to integrate custom compact ball bearings made of sheet metal at two points in the system, decreasing friction by removing the rubber-to-metal contact of the dynamic seals. No increase in the overall size of the system necessary. The bearing used was a clutch bearing for wet double clutch applications. Compact and designed for a lifetime of 300 000 km, it resulted in an 85% reduction in power losses and a 0,5 g CO_2 /km reduction in carbon output.

Powertrain goal 3: faster electric vehicles

One electric vehicle OEM was finding that traditional bearing designs were failing in tests because they could not handle the high speeds required in electric vehicles. They needed a new design, fast. SKF developed advanced simulation software to optimise bearing component design for high speeds, resulting in a radically re-engineered backbone for the cage in the bearing. We were then able to test the bearing at higher speeds using our aerospace test rigs. From design and validation to mass production took less than 18 months.





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