EVERYTHING THAT KEEPS US GOING.

FAG OEM und Handel AG

FAG

A company on the move

We are specialists in the field of movement: Machines worldwide are working with FAG rolling bearings and perform their intended movements with supreme precision of up to a thousandth of a millimetre. However, movement is also a basic principle of our company management. FAG stands for change, innovation and optimisation – with respect to products and services.

Quality and price are not the only factors which are decisive in international competition: services, advice, individual solutions and branch-specific knowhow are equally important to be able to hold one's own in the global markets.

We have set ourselves ambitious goals: We want to expand our position continuously. We want to grow faster than the market. We approach our tasks with passion and an entrepreneurial attitude.

We orient ourselves by our customers – worldwide. Therefore we have reorganised FAG OEM und Handel AG (OEM and Distribution), the largest Business Unit within the FAG Group, and equipped it with a new industry segment management concept.

Our main activities are now focused on the following industry segments:

- ***Mining & Construction***
- ***Pulp & Paper***
- ***Steel***
- ***Railway & Transport***
- ***Mechanical Transmission & Electrical Machinery***
- ***Special OE Industries***
- ***Distribution Partners***

At the same time we have concentrated the European distribution activities of our twelve subsidiaries in FAG Sales Europe GmbH. Europe-wide, the logistic sector was optimised through our four warehouses located at Schweinfurt, Milan, Brussels and Stockholm. Furthermore, global logistic activities with focus on North America and Asia were also reorganised.

To an increasing extent, we are supporting the trade sector with training and sales promotion measures. We regard the trade to be an equal partner; OEMs and users are our mutual customers.

The brochure on hand is aimed at informing you about these developments and about the new industry segment management concept within FAG OEM und Handel AG. Yet it will also show that – despite all changes – there is continuity in competence, performance, quality and services. This is what FAG OEM und Handel AG with its 7,400 employees worldwide stands for.

Georg Konstantinou
Chairman of the Managing Board of FAG OEM und Handel AG, Member of the Managing Board of FAG Kugelfischer Georg Schäfer AG

The development of FAG OEM und Handel is characterised by the interplay of aiming at and achieving goals. Without being self-complacent, we can justly maintain that we have reached an outstanding level in products and services. But this does not alter the fact that we strive for even bigger medium- and long-term goals. There is always room for improvement.

Our Mission Statement

On the basis of high-quality products, FAG OEM und Handel AG will become the leading services and systems supplier among the rolling bearing manufacturers worldwide.

FAG OEM und Handel AG aims to enhance the success of its industrial customers and distribution partners through application engineering competence and comprehensive customer services.

- *We are the largest Business Unit within the FAG Group with manufacturing sites in Germany, Italy, Portugal, India, Korea and the USA*

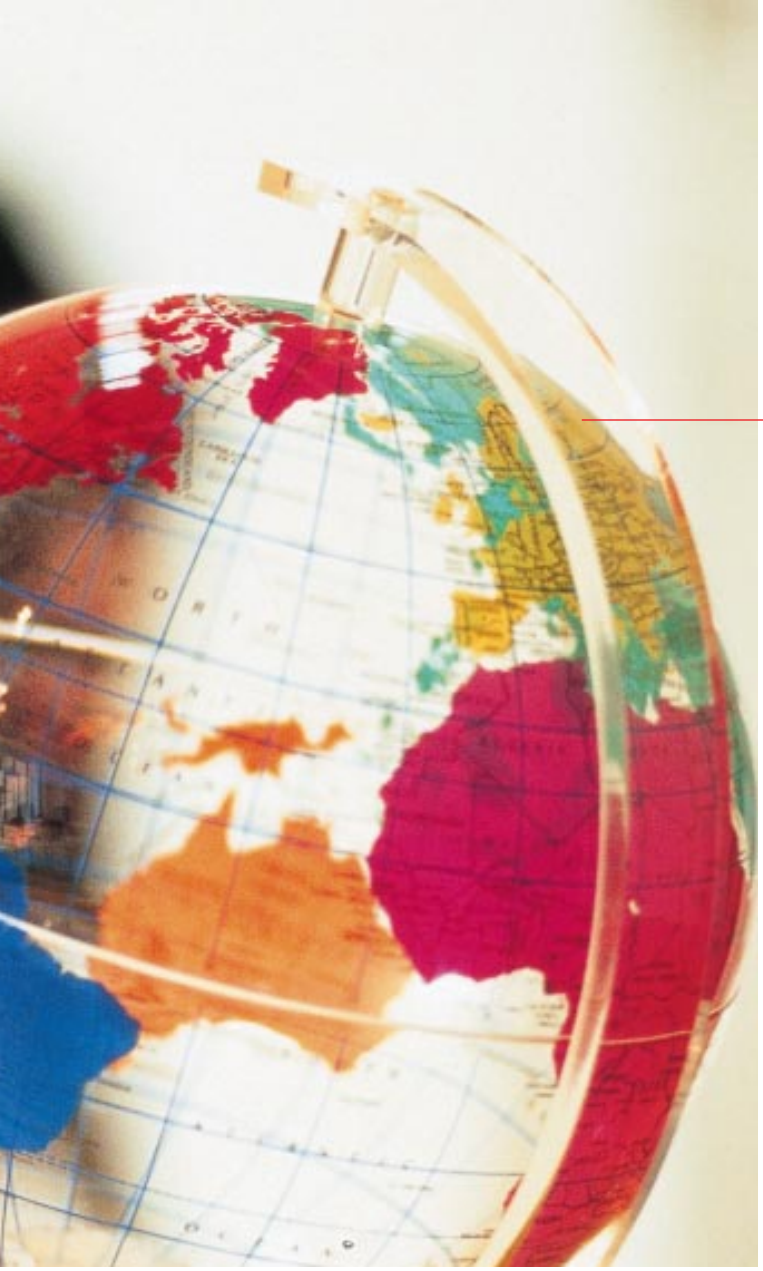
Mission Statement
Everything that keeps us going ...

- *We offer first-class quality products, services and logistics*
- *Our ball bearings, roller bearings, housings and the corresponding accessories are available worldwide, just as the services that go with them*
- *We attend to OEM customers of the mechanical engineering industry, our distribution partners and to the aftermarket*
- *We employ our technical competence for the benefit of our customers*
- *We practise customer proximity through:*
  1. *geographical presence*
  2. *customer-oriented industry segment management*
  3. *flexibility in distribution, production and logistic processes*

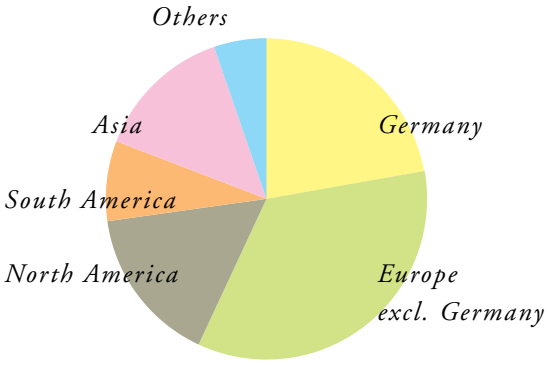
Only in geographical terms can our world be still described as the often quoted "wide" world. From the economic point of view all continents have become close together – very close. Whoever wants to maintain his leading role in international competition, has to go beyond the limits – those of his thinking and those of his entrepreneurial action.

The map of a Global Player

One of the basic principles of FAG has always been to be as close to the customer as possible - also in the literal sense. Customer proximity can only be practised if competent contacts are at hand nearby who are flexible in their reaction to customer demands. For this reason FAG is present in all continents. The global network of company-owned manufacturing sites, sales companies and sales offices is continuously being extended. The same applies to the world-wide network of distributors – 75 per cent of our sales are being achieved in export markets.



Distribution/ Manufacturing sites/Locations



Main external sales regions

Worldwide presence

FAG OEM und Handel AG has manufacturing sites in Germany, the USA, Portugal, Italy, Korea and India. Distribution worldwide is organised through 26 sales companies in the most important markets. In addition there is a closely-meshed network of distribution partners in all markets.

In 1999, the trend-setting industry segment management was introduced at FAG OEM und Handel. This fundamental restructuring has resulted in an even closer orientation towards customer requirements in all different industrial branches. More than ever can we offer our customers special knowhow related to their specific application tasks.

Branches and traces

Let us take a short philological excursion with respect to these "branches". The history of the word "branch" leads us to the French "branche" which stands for "branch" or "twig". When tracing back the roots of the word to an even earlier point in time, we arrive at the Latin word "branca" which means "footprint". Branches and traces are the symbols for the basic idea of industry segment management at FAG OEM und Handel. The knowhow which we have acquired in working out solutions for innumerable branch-specific tasks, branches out widely and has left its traces in our company. On the one hand these traces document our experience, but on the other they also serve as guide when we approach new challenges with proven methods. Our customers can be sure that we know their industrial branch inside out; that we are well familiar with all the processes and technologies and possess excellent references. Industry segment management means a maximum of customer proximity and intimate knowledge of the requirements specific to the particular branch.

The world of our customers and their own customers

- ***Mechanical Transmission & Electrical Machinery***
  Our customers manufacture gears and electrical machinery, ships and wind power plants or belong to the non-specific operator industries (e.g. chemical industry, sugar industry or mineral oil industry)
- ***Special OE Industries***
  Our customers manufacture pumps and compressors, floor conveyors and industrial vehicles as well as printing machines, textile machinery, agricultural machinery, medical-technological equipment and other special machinery and equipment
- ***Distribution Partners***
  Always close at hand, our distribution partners attend to customers from industry and commerce on site

We are at home in the following industry segments

- ***Mining & Construction***
  Our customers manufacture or operate ore transporting equipment, mines, cement plants, oil platforms, hard crushers, construction machinery and large-scale building sites
- ***Pulp & Paper***
  Our customers manufacture or operate paper mills, wood pulp works and papermaking machines
- ***Steel***
  Our customers manufacture or operate steel works and rolling mills
- ***Railway & Transport***
  Our customers manufacture or operate rail-bound vehicles

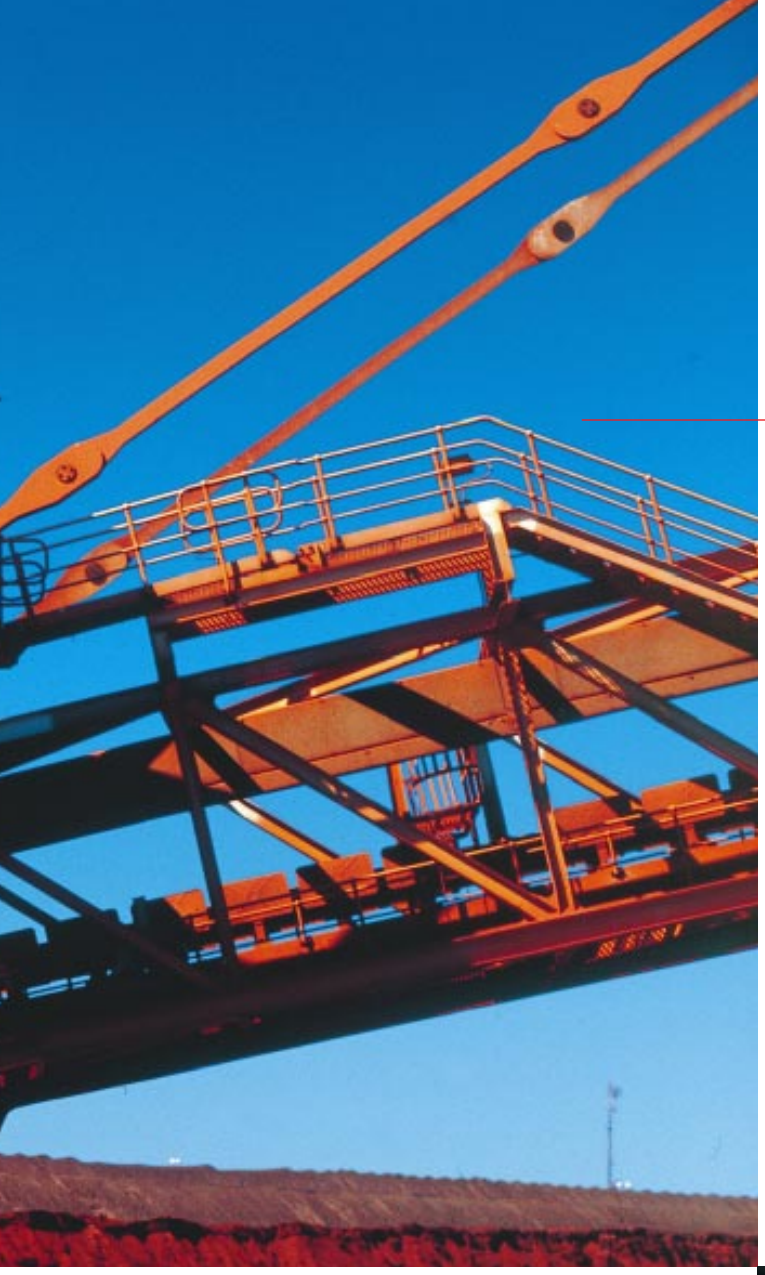
FAG

A wag once maintained that the only motivation for building tunnels is human laziness – people simply prefer the direct short cut to walking round an obstacle. Although there is some truth in this assessment, it fails to recognise the tremendous efforts which people and machinery have to undertake before a railway or road tunnel becomes passable. For instance, the tunnelling machines with their immense drilling pressure show performances which cannot be described in terms of human work. It is not at all uncommon for the incorporated FAG rolling bearings to have an outside diameter of up to 4,250 millimetres – more than four metres!

Under the earth, under the sea

FAG bearings accommodate the entire forward thrust exerted by the cutter head against the rock. In many applications the axial-radial cylindrical roller bearings or tapered roller bearings have outside diameters of more than three metres. Machines used for building subways and water tunnels incorporate similar FAG rolling bearings. Also in the case of the 50 km-Euro Tunnel, which connects France and England and runs 40 metres below the sea bed, FAG technology was employed.

Mining & Construction



The cutter head of a tunnelling machine which was operated from the French side was equipped with a three-row FAG axial-radial cylindrical roller bearing. A forward thrust of up to 12,000 kN permitted the tunnel construction works to proceed up to five metres per hour under favourable geological conditions. To be prepared for a possible inrush of water, all bearings had to be equipped with seals which would resist a water pressure of 12 bar.

Underground and above ground

Also in the underground mining of coal, salt, ore and other types of rock, tunnelling and cutting machines which are equipped with FAG bearings have been in operation for decades. Finally, hoisting facilities will bring the mineral resources to daylight.

No fear of large rocks

In coarse and fine grinding of rocks, FAG bearings are exposed to enormous shocks. Despite these adverse conditions, their design and an optimum sealing against fine dust permit extremely long maintenance intervals. The cement industry, too, relies on FAG bearing technology for crushing hard materials.

When the heavy material is hoisted from depths as low as 3,500 metres, FAG bearings ensure that the friction in the winding cable sheaves is kept to a minimum. In above-ground mining, gigantic bucket wheel and dragline excavators are employed. These imposing machines incorporate particularly low-friction FAG bearings with long maintenance intervals which make their contribution to an economic production of raw materials.
Also in the several kilometre-long belt conveyors plants FAG bearings operate in the usual reliable way – worldwide.

In several processes even the hardest rock is ground to a grain size of just a few hundredths of a millimetre. Various FAG rolling bearings fulfil central functions in these crushers and mills. The same applies to the application of FAG bearings in vibrating screens which grade solid matter.

Mineral oil and natural gas from depths of more than ten kilometres

In oil and gas production drilling depths of more than ten kilometres have been nothing unusual for a long time now. This applies to on-shore and off-shore production alike. FAG ball and roller bearings are used to ensure safe guidance of the drill string in the aggregates of the derrick. They are designed in such a way that they carry several tonnes of the drill string weight without being impeded in their function.

FAG success factors

- *High load carrying capacity in extremely limited mounting space*
- *Application-oriented designs*
- *Complete solutions through bearing units (housings, bearings, sleeves, lubrication, sealing)*
- *Reduction of downtime resulting in cost reduction, for instance through the use of split bearings*
- *Designs suitable for vibrating stress*
- *Coatings which reduce the coefficient of friction*

A German saying holds that "Paper is patient". However somebody who has seen a papermaking machine in operation, will quickly revise this view of things. At least in paper production there is no such thing as patience. It rather calls for the highest possible productivity with perfect and friction-less operation of all machinery components. When the huge papermaking machines run at their highest speeds, they produce almost two kilometres of paper per minute with a width of 10 metres and more – at speeds of more than 100 km/h. Despite its enormous weight, the roll which takes up the finished product at the end of the machine rotates at a breathtaking speed.

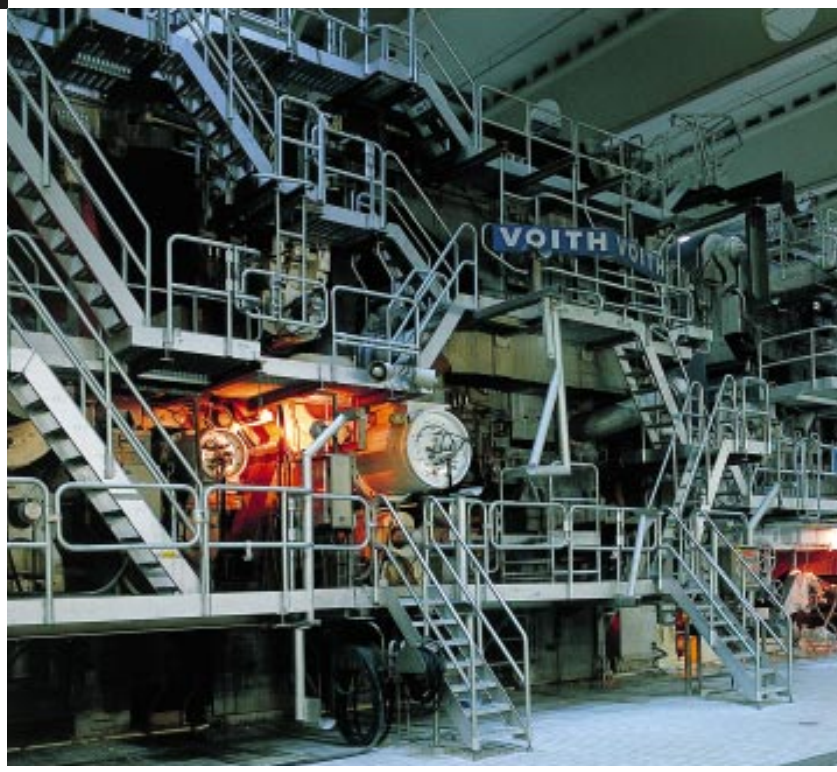
The immense demand for paper of all kinds can only be covered by means of cost-effective paper machines which operate without downtime. Here, too, FAG bearings make an important contribution.

From wood to cellulose

The papermaking industry needs enormous amounts of cellulose for the production of different paper qualities. To produce cellulose, wood (mainly pine, fir, birch and beech) is chopped in pieces and cooked until it has become a mushy pulp.

Pulp & Paper

The peeling and grinding machines applied for this purpose require especially robust rolling bearings which work with absolute reliability under even the most adverse operating conditions. To ensure that the FAG bearings are neither affected by humidity nor by dust, they exhibit particularly safe sealing and thus are protected against corrosion. Having passed the wire and press section, the cellulose sheet is dried and pressed in the dryer section. This incorporates FAG bearings which can even cope with temperatures as high as 150 °C without problems.



Permanent operation

Some of the larger machines for the production of paper and cardboard measure up to 200 metres in length. Due to these enormous dimensions and the consequently large distances between the bearings it is essential that the bearing arrangements are capable of accommodating major changes in the linear expansion of rolls and cylinders and can compensate for errors of alignment. Spherical roller bearings are the most commonly used bearings in papermaking machines. But also cylindrical roller bearings, tapered roller bearings, deep groove ball bearings and angular contact ball bearings are used, in particular in auxiliary equipment such as motors, gears, ventilators and pumps. As papermaking machines incorporate a great number of rolls and cylinders, it is possible that in some cases up to 2,000 FAG rolling bearings are present to ensure low friction at the same time as maximum precision.

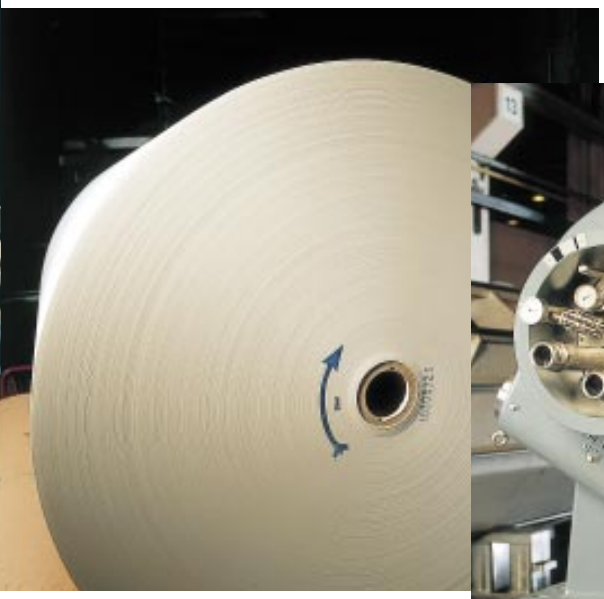
24 hours a day

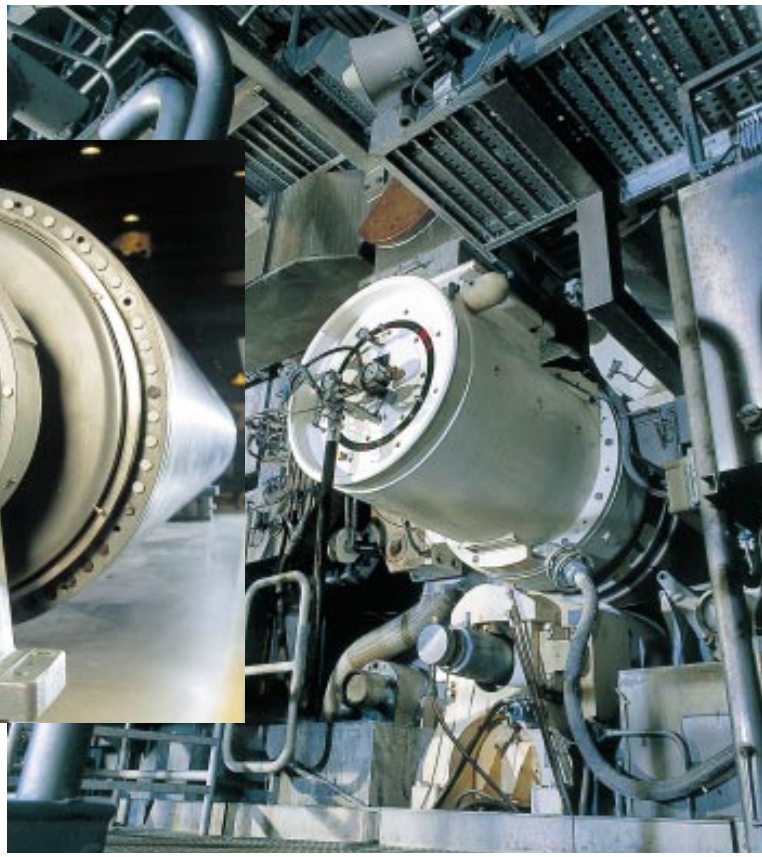
For economic and technical reasons papermaking machines usually work around the clock. Only during major maintenance and repair work is their operation interrupted. For the rolling bearings and all other construction components this means that the demands with respect to operational reliability are particularly high. Furthermore, they are suitable for high speeds and easily maintained and exchanged.

Resistant against corrosion and heat

As in the case of machines for cellulose production, papermaking machines are divided into a wet and a dryer section. Naturally, the ambient humidity is extremely high in the wet section. To protect the FAG bearing arrangements against water intrusion and corrosion, they are completely sealed. This design feature extends their life to a considerable degree. In the dryer section the bearings are exposed to entirely different conditions.

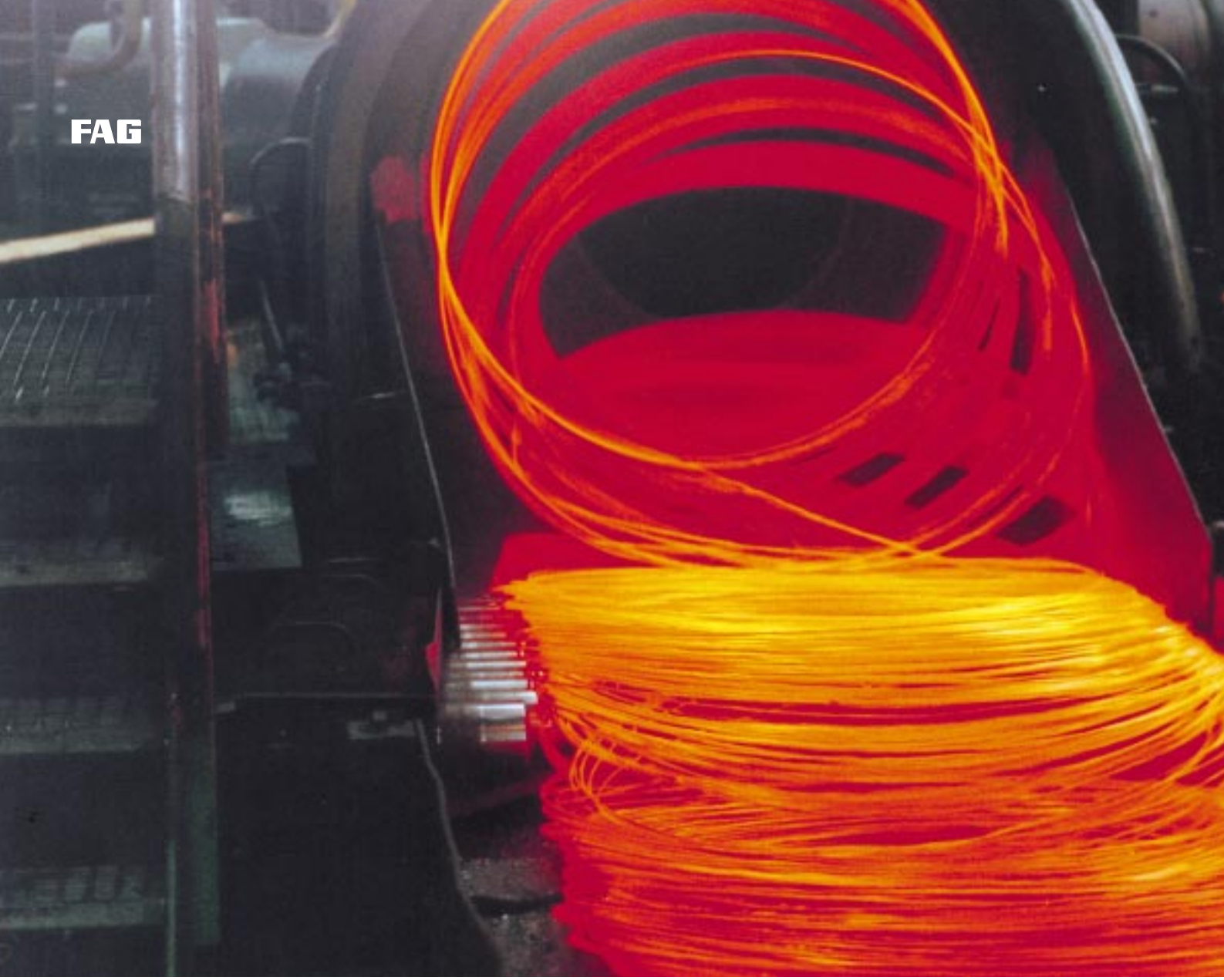
At an extremely high humidity and ambient temperatures of more than 100 °C, a substantial linear expansion of the dryer roll cannot be avoided. Several millimetres is nothing unusual. For this application FAG develops and manufactures floating bearing concepts which permit easy compensation of the length differences. The self-aligning cylindrical roller bearings which can be radially stressed in each direction allow this compensation even at temperatures of 200 °C.





FAG success factors

- *High product quality*
- *Particularly cost-effective solutions*
- *Extended bearing life, yet less maintenance requirements*
- *Maximum precision for all fields of application*
- *Worldwide availability of important bearings in papermaking machines through Paper Scope*
- *Skilled personnel for technical advice and services on site*



As far as geological standards are concerned, the Iron Age is over and done with, but not so in industrial everyday life – on the contrary! Year by year, steelworks produce hundreds of millions of tonnes of raw steel in ore processing and supply it to the rolling mills for further treatment. Without iron and steel there would be nothing on in our modern-day society. For FAG, steel production is important in two respects. On the one hand FAG bearings in steelworks and rolling mills contribute to the energy-saving production of high-performance steel products.

On the other hand FAG itself depends on high-performance alloys in order to produce even its enhanced rolling bearings. This is how the wheel comes full circle.

Extreme stress and infernal temperatures

The supporting bearing arrangements of steel converters are exposed to heavy shocks during tilting and dumping. In the converter, which often weighs up to 300 tonnes itself, liquid raw iron is converted into different steel alloys.

Continuous casting plants where bearings are exposed to high forces and extreme temperatures are similarly impressive. One should bear in mind that only as from temperatures over 900 °C, iron will reach its liquid state and that this "infernal mash" heats up its surroundings to a considerable degree. To ensure that the operation of FAG bearings is not impeded they are mounted in housings with special water cooling.

Heaviest labour in rolling mills

One can hardly imagine what forces are required in a rolling mill to roll a 2 millimetre steel sheet from a 300 mm slab. Or what precision is required to produce a wafer-thin foil of 0.006 millimetres. Here the radial load of the rolling mill bearings can exceed 30,000 kN, and the multi-row FAG tapered and cylindrical roller bearings – usually four-row bearings - have to do heavy labour – in the true sense of the word. This does not mean that precision goes by the board; in the case of foils the thickness tolerance is a matter of a few thousandths of a millimetre. FAG meets these demands, too. Roll forming places particularly high demands on bearing technology.

If high loads are being transferred during the rolling of heavy sections, the bearings have to rotate quickly in wire rolling in order to achieve rolling speeds of up to 150 metres per second – this corresponds to 540 km/h.

FAG success factors

- *Stress optimised bearing arrangements for converters, continuous casting plants, rolling stands*
- *Special bearing arrangements for maximum conveyor speeds*
- *Special bearing designs for high shock loads and vibration*
- *Bearings from case hardening steel of highest purity*
- *Maximum load carrying capacity through optimum internal design*
- *Less maintenance requirements and reduction of operating costs through environmentally-friendly sealed bearings*
- *On-line monitoring to prevent unpredictable downtime of equipment*

Modern human thinking is strongly linked to the concepts of space and time. The interpretation of this pattern comes to a clear quintessence: We want to and have to travel longer and longer distances in less and less time. For people as well as goods, the "go signal" means that distances can be covered quickly and safely. Yet for the operators of rail vehicles it has another dimension – they do not associate it with the green light but more with the basic technical requirements for the reliable and smooth operation of their vehicles. Downtime is expensive.

Extreme stress on axlebox roller bearings

Axlebox roller bearings belong to the major safety components of rail vehicles. At the intersecting point of axlebox and bogie frame they are exposed to extreme stresses while having to fulfil a variety of entirely different demands. In close cooperation with the manufacturers and operators of rail vehicles, FAG develops axlebox roller bearings which are precisely adjusted to their special surroundings. The bearing types primarily used here are cylindrical and tapered roller bearings.

Maintenance intervals of 1.2 million kilometres

Through continuous improvements it has been possible to extend the life and maintenance intervals of rolling bearings to a considerable degree. For rail vehicles which are used on long-distance routes, a maintenance-free operation of 1.2 million kilometres is the FAG standard. As the lubricant is of decisive influence on rolling bearing life, FAG maintains close cooperation with renowned lubricant manufacturers in developing new types of heavy-duty grease which will further reduce the friction and wear inside the rolling bearing.

More than 500 km/h

FAG axlebox bearings which are incorporated in long-distance vehicles have achieved speeds of up to 506.8 km/h on test routes. In everyday operation of the German ICE and other high-speed trains 280 km/h is nothing unusual. A stable guidance of the axleboxes in terms of kinematics and travelling comfort of passengers is of the utmost importance.

The reliability of the bearings under extreme conditions is tested on FAG test rigs which simulate travelling speeds of up to 550 km/h and wind speeds of up to 180 km/h.

Lightweight design in short-distance traffic

Frequent stop and go of short-distance vehicles places increased demands on the lubrication of axlebox bearings. Furthermore the weight of underground and suburban trains as well as of city railways and trams must be kept low so that top speeds can be reached as quickly as possible on the short route sections. For this reason, FAG has been using aluminium as housing material since the nineteen-fifties, thus making an important contribution to energy saving.

Bearing arrangements in transmission gears and traction motors

In addition, FAG develops and manufactures rolling bearings which are incorporated in transmission gears and traction motors.

The transmission gears in rail vehicles incorporate practically all types of ball and roller bearings for shaft guidance while traction motors primarily include cylindrical roller bearings at the pinion end and cylindrical roller bearings or deep groove ball bearings at the locating bearing end.

FAG success factors

- *High reliability of components through state-of-the-art design methods*
- *High economic efficiency through low operating costs and extended maintenance intervals*
- *Quiet and smooth operation*
- *Stable guidance*
- *Energy saving through weight reduction*
- *Use of environmentally acceptable materials*

The economic efficiency of a bearing arrangement incorporated in electrical machinery and transmission aggregates is essentially determined by two factors: performance capability and costs. On the other hand, load carrying capacity, guiding accuracy, speed strength and low noise are the decisive parameters for the quality of a bearing. No matter whether the operating loads are high or low, whether a standard bearing or a special design is required, the wide selection of different types of FAG ball and roller bearings makes it relatively easy to choose the best suitable bearing for a specific customer application.

The right bearing design or system solution for each field of application

The extensive FAG bearing range meets all kinds of different demands. It is addressed to the manufacturers and operators of electric motors and generators, electric household appliances, wind power plants and gears for all kinds of industrial facilities. If certain requirements cannot be fulfilled by bearings from our standard product range, we will develop an individual tailor-made solution in cooperation with the customer.

FAG

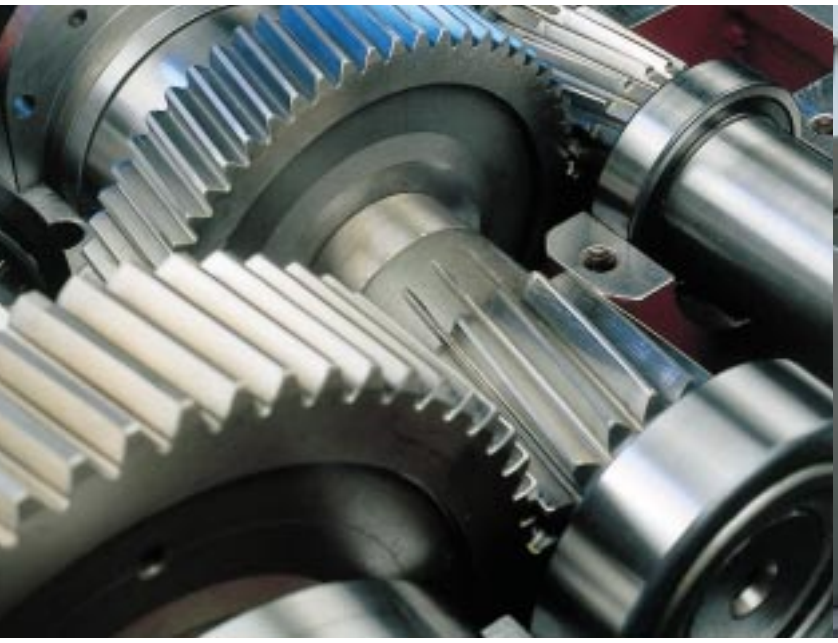
Mechanical Transmission & Electrical Machinery

Often, complete system solutions are the obvious choice. Here we depend on the branch-specific knowhow of our application engineers as well as the all-embracing competence of our experts from the research and development sector. One example of a product developed in this way is the sensor bearing, an integration of rolling bearing and modern sensor technology, enabling control, regulation and monitoring functions.

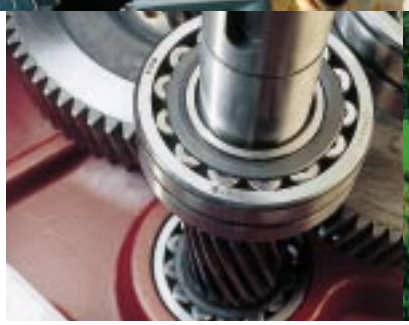
Our package of services

Each of our customers benefits from attractive services centred around the rolling bearing. In close cooperation with our experts, he can take advantage of their branch-specific experience in order to select reliable and cost-effective bearing arrangements.

On request, FAG service technicians will train the staff of our customers and take over the mounting and monitoring of bearings. The FAG Bearing Analyser, a notebook with vibration sensor and analysis software, is a typical example from our package of services related to the rolling bearing.

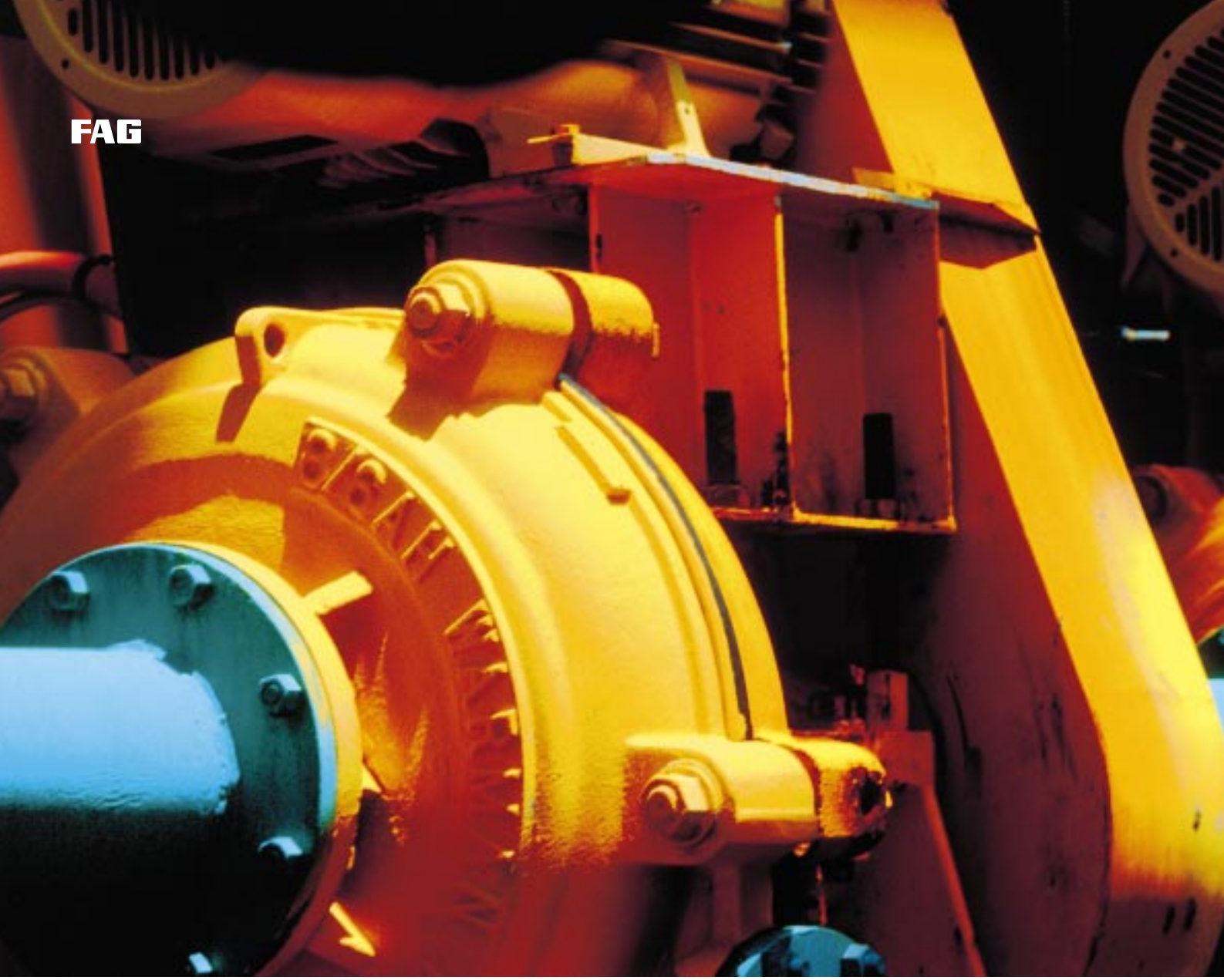


Prior to the final determination of the bearing type, there are usually extensive special calculations to ensure that all operating conditions have been taken into consideration. For this purpose, FAG can call upon a wide selection of modern in-house calculation programs including a calculation service. But our advisory service goes far beyond the field of bearing selection. We also clarify all questions related to the design of adjacent components, the lubrication, sealing and mounting or dismounting of bearings.



FAG success factors

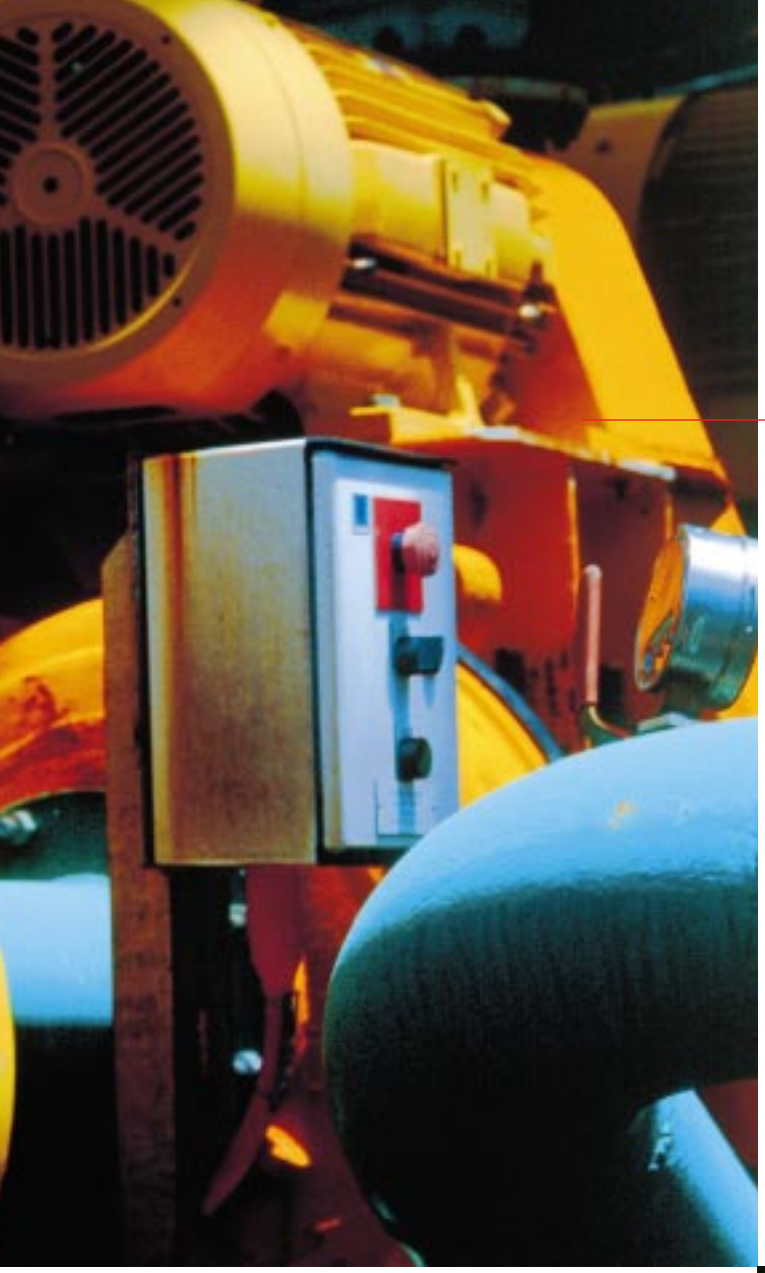
- *Development partnerships with our customers*
- *Practice-oriented life calculations for bearing selection and documentation*
- *Extensive range of advanced calculation programs*
- *Wide and standardised selection of all popular bearing designs and dimensions*
- *Worldwide availability of our products*
- *Supreme manufacturing quality, ensuring lowest possible noise level for electrical equipment*
- *Ceramic insulation against passage of electric current*
- *Complete range of services all around bearings*



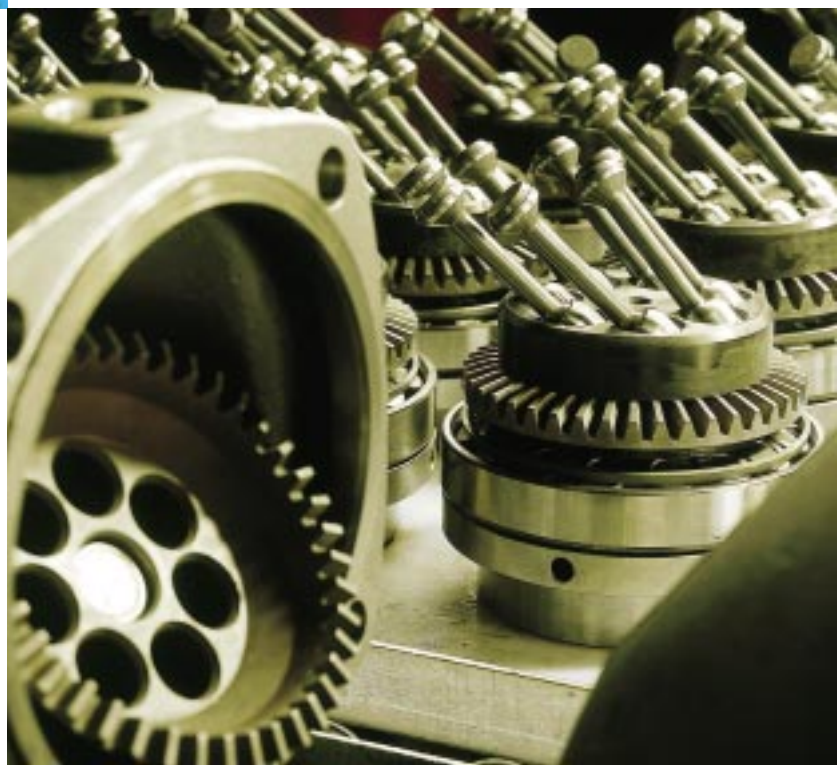
Just like a conveyor belt which keeps transporting one part after another, FAG keeps developing bearing solutions. However, FAG also develops bearing arrangement solutions for conveyor belts since wherever things are in motion, FAG rolling bearings are not too far off. The term Special OE Industries embraces all those manufacturers and users who are at home in special branches of the mechanical and apparatus engineering industry, for instance in the sectors of pumps and compressors, printing machines, textile machinery, agricultural machinery, machine tools, conveyor belts and vehicles, communal antennae, medicine technology, etc.

100 kilometres through the desert

In factories, working processes would be unthinkable without conveyor belts and assembly lines. They function according to the principle "If the mounting personnel won't come to the workpiece, the workpiece will come to the mounting personnel". In this way they make work easier for innumerable people. The dimensions of the longest conveyor belt system in the world are not quoted in metres but in kilometres. At the Northwest coast of Africa, in Spanish Sahara, it transports rock phosphate over a distance of 100 kilometres! It goes without saying that reliable and easy running FAG bearings are particularly sought after when such distances are involved. Any trouble in operation or any unnecessary friction increases the energy demand of the conveyor belts which in any case is extremely high.



The distances that have to be covered by paper sheets are much shorter but then they are led with an enormous pressure through the cylinders of the printing machines. With high running accuracy, the low-friction bearings ensure that the printing quality leaves nothing to be desired. For the bearing arrangement of the main cylinder FAG has developed locating/floating bearing concepts in numerous variations. On a smaller scale but just as efficient and precise, special FAG bearings for office and communication technology do their work in printers, copying machines, computers etc. Precision à la FAG also makes an essential contribution to the smooth functioning of many medical instruments. The utmost smoothness and quietness of operation and a low frictional moment are some of the characteristic features of special bearings which FAG delivers as complete ready-to-mount units for computer tomographs.



Plenty of wind and air

While solid materials can be transported by means of belts, pumps of different capacity are required for the transport of liquid or gaseous substances. FAG has developed a wide selection of maintenance-free rolling bearings for incorporation in pumps used in the home for water supply or in heating systems.

Here, rotational speeds measure up to 400 kilometres per hour. The relatively small FAG spherical roller bearings which are incorporated in these blasts have a nominal life of more than 100,000 hours.

Bearings in large pumping stations which ensure the oil or gas transport through pipelines, work under considerably tougher conditions. Also in the case of compressors and ventilating fans the different dimensions place totally different demands on bearing technology. In a "harmless" desk fan simple ball bearings ensure fresh air. However, the blasts required in brown coal fired power stations have to move up to 800,000 cubic metres of smoke and fumes.

FAG success factors

- *Maximum load carrying capacity in a minimum of space*
- *Application-oriented designs*
- *Complete system solutions through bearing units (housings, bearings, sleeves, lubrication, sealing)*
- *Wear-reducing rolling bearing coatings*
- *Special applications for rolling bearings with rolling elements made from 100Cr6 and rings made from W220 as well as bearings with rolling elements made from ceramics and rings from Cronidur 30®*
- *S-type bearing range in line with market requirements*
- *Quick implementation of FAG research results*

All over the world, our distribution partners keep a wide selection of FAG bearings in stock. The composition of these regional stocks depends on the customer structure of the respective distributor. Stock-keeping is adjusted to individual customer requirements and planned well ahead.

Partnership in the foreground

Sufficient and appropriate stocks together with quick availability and the resulting short-term deliveries are the decisive criteria for the performance capability of our distribution partners. Each will ensure that all rolling bearings are at the right place at the right time, even in the case of unscheduled maintenance works.

Products will be delivered within 24 hours – 365 days a year. In top urgent cases our distribution partners will deliver from one hour to the next, thus avoiding expensive downtime. Modern on-line networks and EDP connection to FAG ensure flexibility and smooth flow of information and goods. Many FAG distribution partners are in a position to supply the entire FAG range, i.e., in addition to rolling bearings, they also deliver the complete range of products from power transmission engineering, lubrication engineering, safety engineering and sealing engineering. FAG distributors are regarded as being our partners who do not only sell our goods but also convey knowhow. The distributors are at the centre of the "Customer-Trade-Manufacturer Axis" and take over important consulting and service functions.

Distribution Partners

Transport and logistics play of course an equally important role in the distribution sector. Our distribution partners have long years of experience in the forwarding business. For them speed is not a piece of witchcraft but often the decisive factor in order placing.

For this reason their regular instruction by FAG experts takes place as a matter of course.

On-time delivery from manufacturing site to distribution partner / On-time delivery from distribution partner to customer

The flawless logistic concept ensures the worldwide availability of FAG bearings. Here, the four European FAG warehouses play a central role. Since the beginning of 1999 all activities of transport logistics have been controlled in Schweinfurt, Milan, Brussels and Stockholm. For the markets in North America and Asia, FAG has only recently reorganised transport logistics.

FAG success factors

- *Worldwide presence through a close-meshed network of sales companies*
- *High availability of all bearings*
- *Extensive delivery service*
- *Training sessions for distribution partners and their own customers*
- *Cooperation with international logistic partners*

For the users of FAG bearings, service is more than just an optional and temporary extra but rather a performance procedure which is already employed in the design of a bear-ing. For what use is a clever design if the bearing itself can only be mounted in a complicated and thus uneconomic way?

Service right from the beginning

During their entire life, FAG services will accompany the bearings. The FAG motto "Service for increased operational reliability" means that at any time a user can rely on personal support and advice or on being equipped with all the instruments required for independent mounting, measuring, diagnosis and maintenance works.

Well trained and experienced fitters and chief fitters

On request, experienced FAG fitters undertake the mounting of all types of rolling bearings, the acceptance inspection of the mating components (shafts and housings), failure diagnosis in the case of bearing arrangements working incorrectly and dismounting of bearings of all kinds. They are also prepared to instruct the fitting personnel and give advice in terms of mounting procedure rationalisation. The fitters also assist in selecting the suitable tools and introduce the devices and corresponding procedures.

A complete range of quality tools

Supreme caution during mounting and cleanliness at the mounting location are essential requirements for long bearing life. Here, a large variety of suitable mounting instruments and other equipment is required; for instance induction heating devices, special extractors, hydraulic nuts or, for hydraulic procedures, modern hand pump sets and high-pressure pumps. Which mounting procedure is suited best will be decided for each particular application. Furthermore, FAG has compiled a measuring device programme which corresponds precisely to the needs of everyday work. It includes simple feeler gauges and taper master rings as well as taper measuring instruments, boundary circle measuring instruments, temperature measuring devices, speed counters and sound locators. They can be applied for checking the bearing seating, adjusting the radial clearance, monitoring the temperature during mounting and, when in operation later, for measuring speeds and analysing bearing noise etc. To enable all machine operators to avail themselves of the economic advantages of condition-dependent maintenance, FAG offers different diagnosis systems. The FAG Detector has been designed for simple bearing arrangements while the Bearing Analyser, a synthesis of Detector and laptop, offers enhanced comfort, mobility and interpretation reliability.

Boundary curve spectrum and time signal make damage visible and damage progress predictable. The diagnosis system VibroCheck was designed for on-line monitoring and long-distance diagnosis of rolling bearing arrangements and gears. The entire monitoring system is adjusted and controlled via a PC.

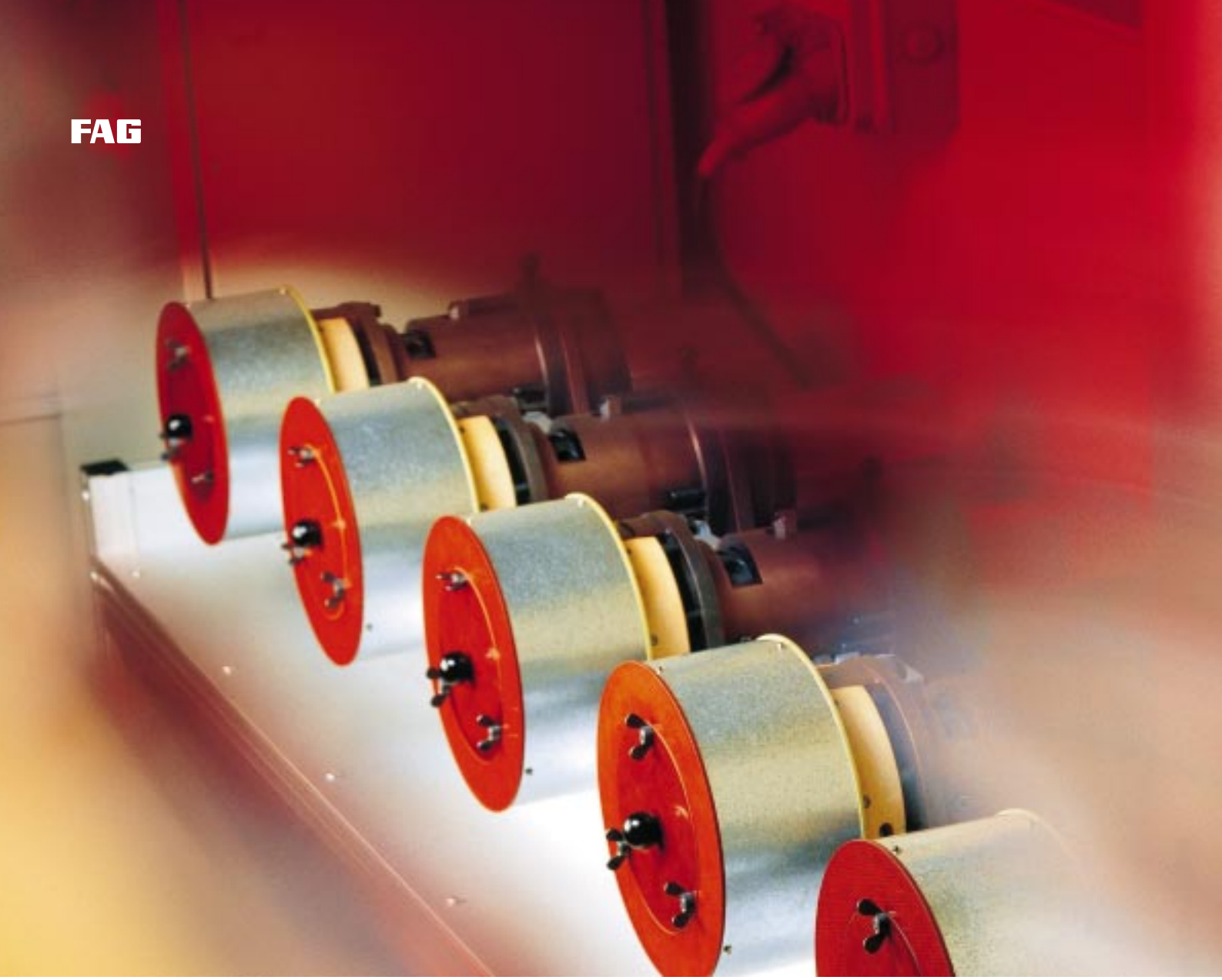
Good service all round

Increased technical knowledge helps to avoid bearing damage and extend bearing life. Therefore FAG offers a wide range of publications, starting from catalogues via branch information through to specialised literature.

Selection and calculation programs, a training programme, video films, practice-oriented training sessions as well as a basic rolling bearing course for professional training round the programme off.

FAG success factors

- *FAG offers "Service for increased operational reliability"*
- *The customer gets all services from one place*
- *FAG service technicians are well trained and equipped*
- *An electronic catalogue for bearing selection and calculation of a bearing arrangement, a shaft and a shaft system*
- *State-of-the-art diagnosis systems for condition-oriented monitoring of facilities and machinery*
- *Cooperative stock management*



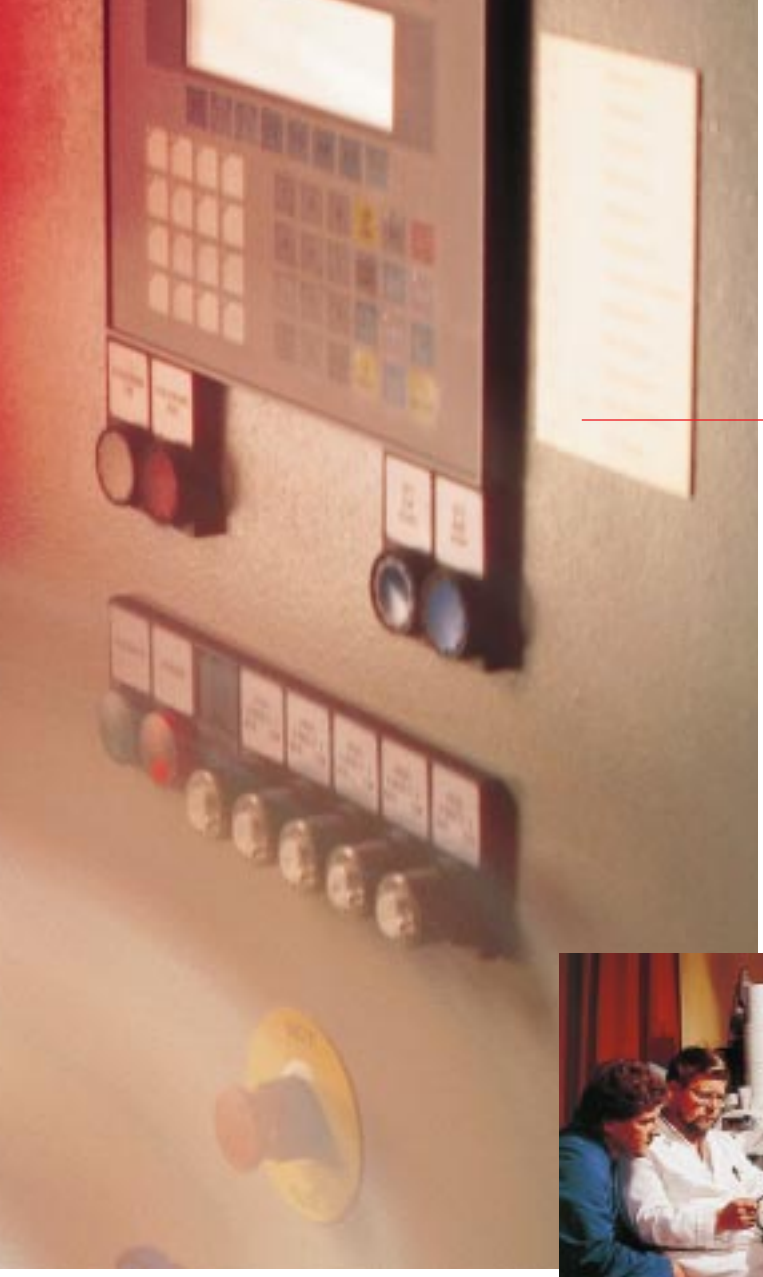
Somebody once said "Research and development bring knowledge out of money; innovations bring money out of knowledge." Admittedly there is always some blurredness to such formulas but one cannot deny that there is a certain degree of truth in them. Each FAG innovation is the result of extensive research activities; new solutions are not available free of charge. No matter how high the level of a product, it will be the starting point for further improvements. Whenever the market defines new requirements, FAG will find the unprecedented solution. Only Research and Development will buy us the ticket for our company's future. Little wonder that the investments in this sector will see a spectacular increase in the coming years.

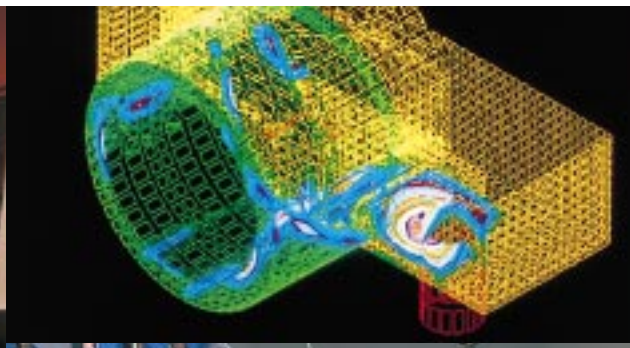
For the operational practice

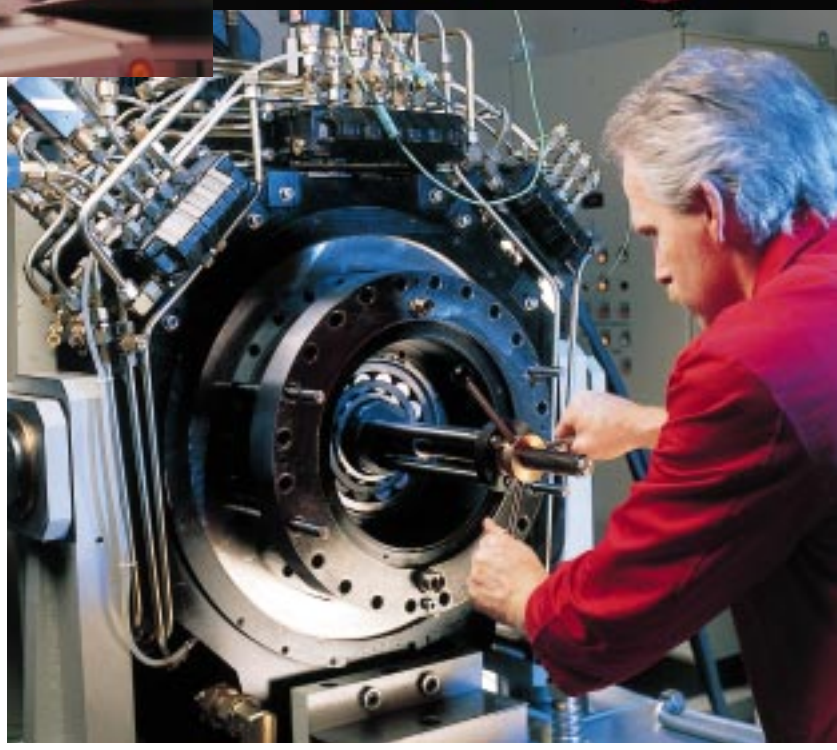
At FAG, Research and Development is not practised in an isolated ivory tower. Starting point for all activities are the requirements of the ultimate practical operation. Scientists and application engineers work closely together. The central themes of R&D activities are tribology and the development of modern calculation methods as well as the material, stress and damage analysis. The FAG research centre with its entire equipment is also open to external users.

Research and Development

- *On standardised grease test rigs developed in-house, we examine the life, friction and wear of grease by applying FAG test methods.*
- *FAG methods of rolling bearing life calculation, which take into consideration failure probability, material, lubrication, load, bearing type and cleanliness*







FAG success factors

- *New materials such as Cronidur 30®, which stand out for particular strength, corrosion resistance, durability and high-temperature hardness*
- *Hybrid bearings with rings made from steel and balls from ceramics offer considerably enhanced operational speeds and/or longer service life than conventional bearings*
- *Special coatings improve the tribological behaviour of rolling bearings, increase the resistance to wear and corrosion and ensure insulation against passage of electric current*

Quality is created in the manufacturing process

No FAG product will leave the manufacturing site before its quality has been verified through examination at a number of different test rigs.

All procedures are described in our quality handbook and certified in accordance with DIN EN ISO 9000 ff. However, we can only test what we have produced beforehand. In particular this applies to the quality of an FAG bearing and its components. In other words: Quality is created in the manufacturing process and not as a result of subsequent inspection.

For a long time companies regarded it as a strenuous and painful undertaking to assure the quality of their goods. But is that really true? On the contrary! The experience made by FAG proves that quality on the part of both the supplier and the customer brings a high degree of gratification. The better the quality, the more motivated and satisfied are all the people involved. This has absolutely nothing to do with strenuousness and pain but more with efforts and the willingness to accept responsibility for the result.

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