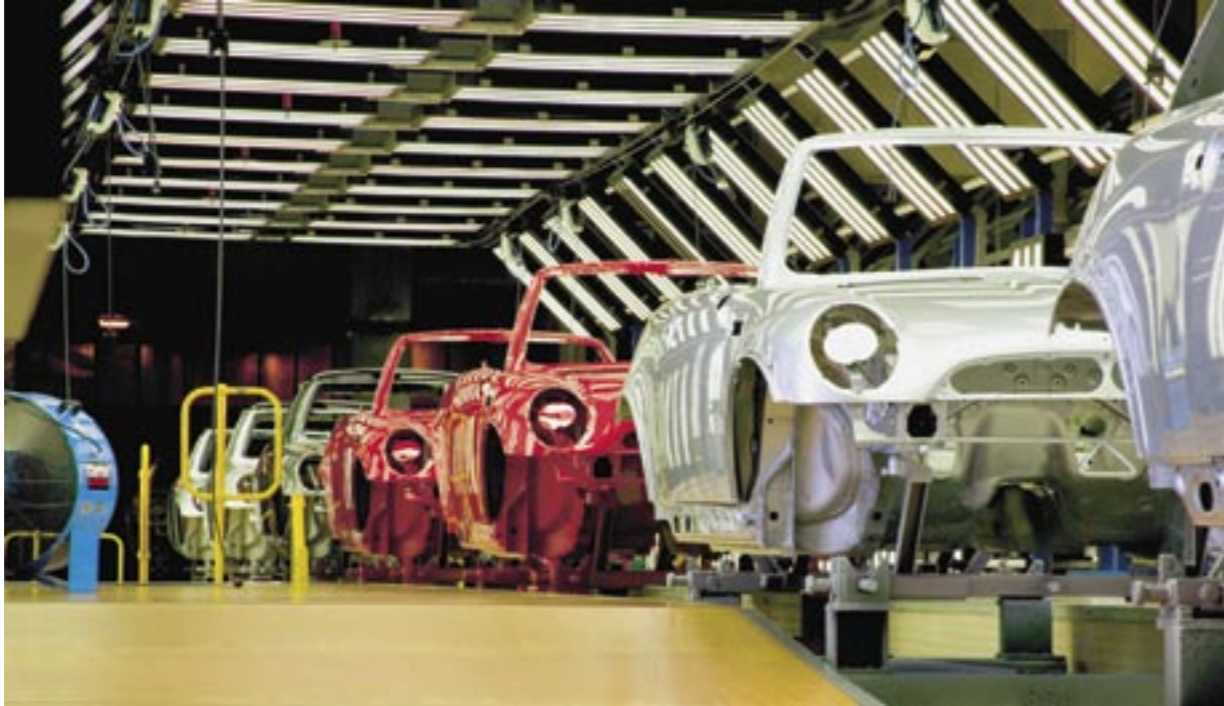


The Fascination of Production



Global Production Network
flexible • efficient • innovative

Information on the internet

BMW Group
www.bmwgroup.com/production

Sustainability
www.bmwgroup.com/responsibility

BMW Group company history
www.bmwgroup.com/history

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BMW Group publications

You can obtain an overview of selected publications in German and English at the fax number: +49 89 382-24418
e-mail: publications@bmwgroup.com

Published by
Bayerische Motoren Werke Aktiengesellschaft
Technology Communication
D-80788 München

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The content of this brochure is accurate at the time of printing.
Status: 2009

BMW Group



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Frank-Peter Arndt
Member of the Board of
BMW AG, Production



“Made by the BMW Group”

The BMW Group aspires to be right at the top of all market segments in which our four brands are represented. Highly emotional, individually tailored products with exceptional design and supreme customer benefits are a clear expression of our consistent premium strategy.

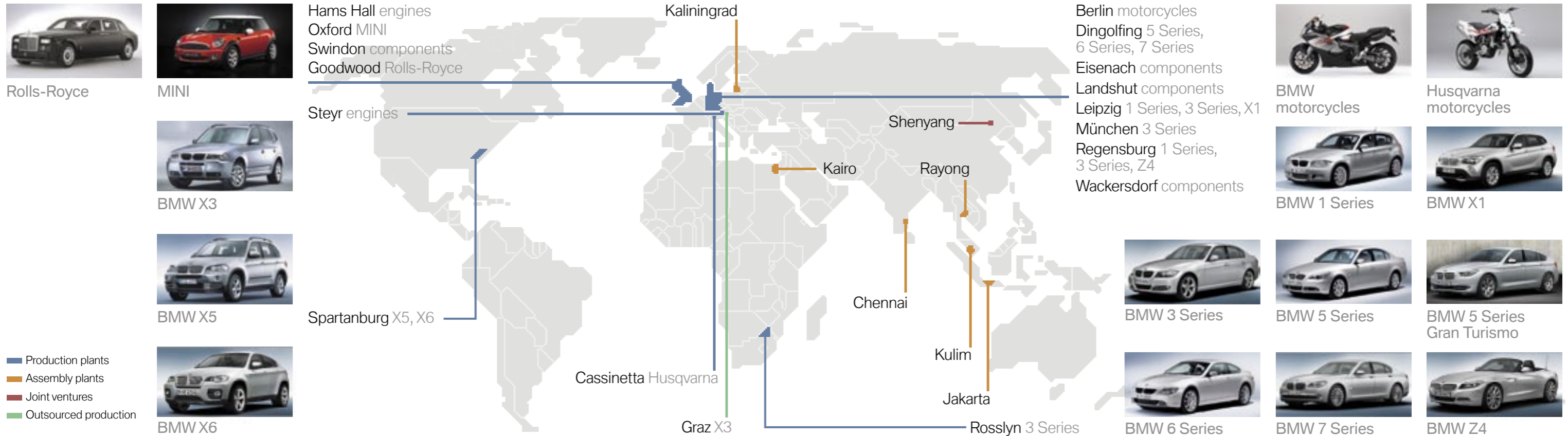
Our fascinating products are created by a very versatile and highly efficient production network with sophisticated work processes and state-of-the-art plants and facilities. Beyond the confines of individual plants and borders, we constantly and consistently improve our resources and expertise. And thanks to flexible management we are quickly able to adjust our production to the requirements of the respective market.

Throughout this global production network, the BMW Group applies the same high standards to processes, quality, safety, and sustainability. This guarantees that all products “Made by the BMW Group” fulfil the significant demands made of premium products.

The network is founded upon the sound expertise and enormous commitment of our associates. They are the key to the success of the BMW Group.



EFFICIENT NETWORK



Global Production

As a global player, the BMW Group is represented by its premium products of the BMW, MINI, Rolls-Royce and Husqvarna brands in more than 140 countries the world over. A flexible network of 24 production plants in 13 countries ensures that customers receive exactly the car they have ordered, tailored specifically to their wishes and preferences.

Production follows the market

Pursuing a strategy of local production, the BMW Group capitalises on opportunities to penetrate and develop markets with long-term growth potential. This enhances local acceptance in the market and makes the BMW Group a local player. The BMW Group pursues this strategy particularly in markets where high import duties obstruct the import of fully assembled automobiles and thus prevent more extensive market penetration. In addition to operating local automobile plants, so-called “completely knocked down” (CKD) plants can also be used in such cases to offer products in emerging market at competitive prices. In the CKD process, cars are assembled locally from imported sets of parts and components and supplemented by parts produced locally, thus fulfilling the local content requirement imposed by governments.

The BMW Group also makes use of natural hedging: a high level of purchase volume in key sales regions with differing currencies serves to balance out the flow of merchandise as well as make up for currency fluctuations and the associated trading risks.

Four brands, four model series

Apart from BMW, MINI, and Rolls-Royce cars, the BMW Group production network also builds BMW motorcycle models of the BMW and Husqvarna brands.

BMW automobiles are built at 14 plants the world over. The backbone of BMW’s production network is formed by six plants in Dingolfing, Leipzig, Munich, Regensburg, Rossllyn, and Spartanburg, as well as a joint venture in Shenyang. Wherever appropriate, the BMW Group integrates external partners into serial production, for example in the production of the BMW X3 in Graz, Austria. But the BMW Group continues to retain the relevant expertise as well as maintaining overall control and decision-making authority when it comes to design, engine construction, purchasing, testing, service and warranty matters.

The BMW Group operates the CKD plants in Chennai and Rayong and Rayong, while in Jakarta, Cairo,

Kaliningrad and Kuala Lumpur BMW cooperates closely with external partners.

Production of the MINI is located in Great Britain, where the “MINI Production Triangle” comprises the Oxford, Hams Hall, and Swindon plants. Swindon produces pressings and body components for MINI cars, which are delivered just-in-time to the body assembly plant in Oxford. Hams Hall builds 4-cylinder petrol engines, which arrive at the assembly line in Oxford just-in-sequence, i.e. exactly on time and tailored to each car on the assembly line. All MINI automobiles for the world market are manufactured at the Oxford plant.

Rolls-Royce Motor Cars Ltd. has had its production facilities in Goodwood in the south of England since 2003. Working largely by hand, experienced specialists create the exclusive Phantom models at this very special plant dedicated entirely to Rolls-Royce: the classic Sedan (2003), the Drophead Coupé (2007), the Coupé (2008) and the new model Ghost (2009).

All BMW motorcycles and most motorcycle engines are built at BMW’s motorcycle plant in Berlin, where production of the highest standard is combined with truly outstanding tradition: production of motorcycles

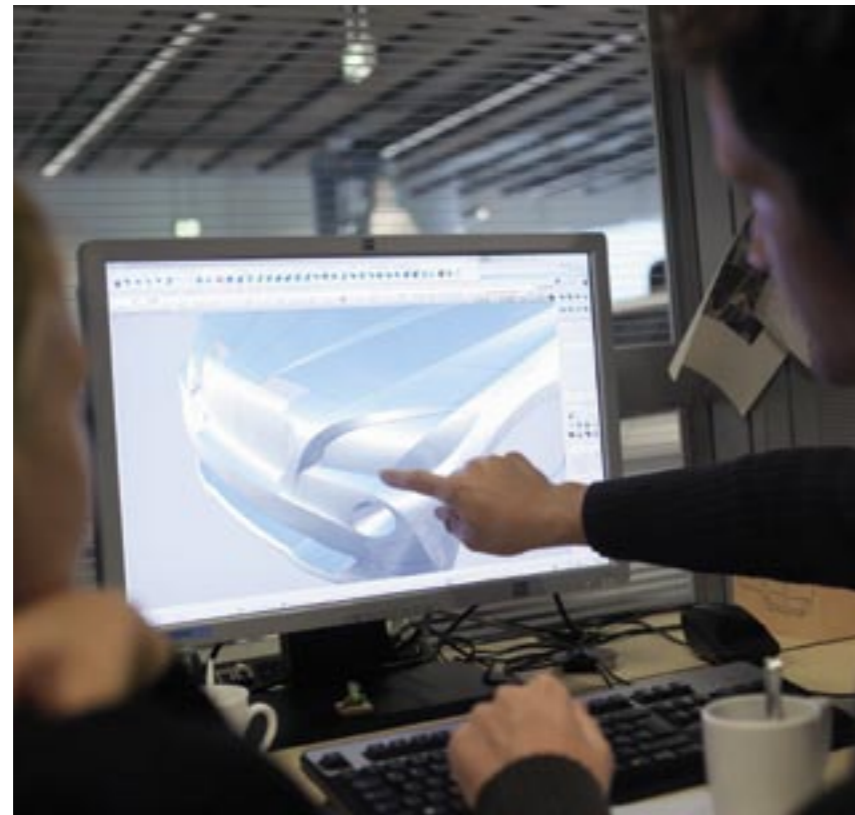
involves a large share of craftsmanship and manual work. The decal lines on various motorcycle components, for example, are still applied by hand as in the early years of BMW motorcycle production.

The Husqvarna brand has also belonged to the BMW Group since 2008. The Cassinetta plant near Varese in northern Italy employs a workforce of over 260. This production site produces all 22 models in the areas Enduro, Supermotard, Dual Purpose, Cross Country and Motocross.

Engines and components

The heart of every vehicle is its engine – which is precisely why the BMW Group has always focused consistently on the development and production of power units. The BMW Group’s three engine production plants in Hams Hall, Munich, and Steyr supply engines to the Group’s worldwide production network. This is supplemented by the production of components at four German production sites: Berlin, Eisenach, Landshut, and Wackersdorf.

The same standards of quality, safety and the prudent use of resources apply worldwide to all BMW Group plants and products.



Intelligent Processes

The BMW Group's production network operates hand-in-hand with the Group's international research and development centres as well as external partners. This makes it possible to put new products on the market swiftly, adapting production to suit customer wishes.

Close collaboration between the BMW Group's Research and Innovation Centre in Munich and the worldwide research and development offices ensures ongoing improvement and enhancement of BMW products. Right from the start in a very early phase of the Product Development Process (PEP), the two divisions – Development and Production – cooperate very closely, assuming joint responsibility for the appropriate completion of each vehicle project as well as the quality and reliability of the automobiles supplied.

Virtual testing for a smooth start to serial production

The development of a new vehicle and the production facilities required would be quite inconceivable today without the use of virtual tools such as computer-based design programs and complex simulation models. Using 3D simulations and computer models of a virtual factory, BMW specialists are able to replicate the entire flow of production and simulate

production conditions very close to subsequent reality. In the production of automobiles, over 80 per cent of all processes are now verified and confirmed in virtual reality in advance, long before the first production facilities are actually in place.

Fast and flexible

Despite the constant increase in model diversity, the BMW Group's production network is sufficiently flexible to build different models and versions at every plant. An important feature in this context is the universal main assembly line in production, allowing as-sembly of various models in any sequence on one and the same production line. This enables the BMW Group to respond flexibly to fluctuations in the market and individual customer wishes, working to optimum capacity at all plants.

Since it is impossible for a car-maker to manufacture all of the up to 20,000 individual components of each model in-house, close cooperation with partners is absolutely essential. These include conventional supply companies as well as small, efficient high-tech companies. Outsourced production of the BMW X3 in Graz, Austria, shows how complete production by a partner can intelligently supplement the capacities of the BMW Group, thereby increasing flexibility.

The Human Success Factor

Apart from sophisticated work processes and state-of-the-art plant technology, the human factor plays a decisive role in the production of premium products. Working time models used in this context enhance flexibility while at the same time securing jobs.

Qualified and committed

Each and every associate contributes to the quality of our products. A high level of individual responsibility, constant supervision of one's own quality at work, and the wish to obtain even higher qualifications for new tasks all are part of the corporate culture lived out consistently by all associates of BMW. Forming an integral part of the BMW Group's worldwide network, this corporate culture ensures an efficient transfer of knowledge beyond the borders and confines of the individual plants. And through their commitment and hard work at all new plants and in the launch of new models, BMW Group associates ensure a punctual start of production in each case, maintaining a high level of product quality right from the beginning.

Flexible working times

More than 300 working time models are used within the BMW Group, enabling the company to respond flexibly to fluctuations in the market and ensure

optimum use of machinery and funds, while at the same time catering to the individual needs of the company's associates. This flexibility is achieved by separating personal working hours from machine operating times: while weekly working hours remain the same on average throughout the year, machine operating hours can vary considerably.

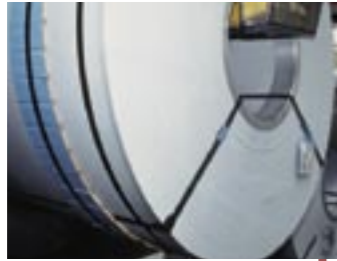
Responsible personnel policy

From an international perspective, the BMW Group is one of the most popular employers in the world. One of the reasons is that the company takes its social responsibility towards associates very seriously.

What is more it offers flexible working hours, part-time models, job-sharing, sabbaticals, temporary periods of employment abroad and a range of initial and further training programs.

Main processes

Components and pre-assembly



Origin
Production of a car starts with the steel and aluminium plates cut out of huge coils weighing several tons.



Dies and tooling
Tools and dies are constructed and produced for the press plant and body shop..



Modules
Seats, cockpits, front ends and customer-specific components are completed in advance and fed into the assembly line just-in-sequence.



Press plant
Here the crude panels cut into shape are pressed into the right form by means of high-performance presses.



Body shop
Industrial robots put together some 500 metal components to form the body of a car. In the process they use joining methods such as spot and laser welding as well as riveting and bonding.



Paint shop
Up to four layers of paint protect the car from environmental effects and give the vehicle a lasting, brilliant gloss.



Assembly
Experienced, well-trained associates then complete the painted body shells to produce premium cars tailored to each individual customer.



The "marriage"
During the final assembly stage, the customer-specific body is bolted to the drivetrain, consisting of the engine, gearbox and chassis: this is referred to as the "marriage".



Production of axles
Aluminium chassis and suspension components guarantee excellent driving qualities but also demand a high level of production expertise.



Light alloy foundry
Various materials are used for various requirements, even including light-weight aluminium-magnesium compounds. As one would expect, the casting methods used are highly versatile and innovative.



Engine production
Precise craftsmanship, experience and state-of-the-art plant technology provide the foundation for engines of the very highest standard.

Creating Mobility

An automobile consists of up to 20,000 individual components. Mastering the complex process chain from the huge coils of sheet metal arriving at the production plant all the way to the finished product is a significant challenge to both man and machine.



Final assembly
Now the car stands on its own wheels. The final parts and body components are fitted in position and the engine is started for the first time.



Finish
In a final functional and visual inspection, specially trained associates ensure that every car comes off the assembly line meeting the customary premium quality standards.



Delivery
Carefully prepared for their journey, the vehicles then leave the plant by train, truck or ship to customers in more than 140 countries the world over.

Supreme flexibility for the customer

The BMW Group has optimised its internal processes to such an extent that wishes expressed by the customer to alter the engine, paint finish, upholstery or special equipment of the car ordered can be taken into account just six days prior to the start of assembly – without any effect on the delivery date of the car. Referred to as the Customer-Oriented Sales and Production Process (or KOVP in short, to use the German abbreviation), this concept optimises the entire process chain from the initial order all the way to delivery, gearing work processes towards the customer's wishes.

The painted body shells are not assigned to a specific customer order until the start of assembly, when the cars receive their "identity" - the individual chassis number. Considering the mathematically possible number of some 5 x 1,032 versions – that is a figure with 32 zeros – which can be configured within the BMW Group's product range, one can appreciate the vast range of choice offered to the customer in configuring the automobile, and the enormous demands made in terms of stable process planning.

The foundation for this efficiency is provided by a complete network connecting dealers to the production plants, referred to as the Online Ordering System. This system gives the dealer the opportunity to show the customer their "dream" car on the screen and confirm the delivery date immediately upon receipt of the customer's order. So within just a few seconds, the customer and dealer know when the car can be built with the desired features and equipment. The relevant order is then fed into the respective plant's Production Planning Department.



Shapes and Paints

Car production starts with the process of molding steel and aluminium plates into body components. These are then put together to form the complete body of the car and subsequently painted, creating the “painted body shell”.

A very wide range of materials is used in the production of a car. Depending on the requirements in each case, components are manufactured using an intelligent mix of materials. High-strength steel, aluminium, magnesium and plastics are some of the materials used, applied according to their properties. For example, light alloy serves to reduce both weight and fuel consumption, while plastics are primarily used to provide a new dimension of versatility in shaping body contours.

Press plant

In the press shop, steel and aluminium plates are rolled off large coils and cut up into smaller panels. Up to 2 millimetres or 0.08” thick, these metal panels are molded into shape in presses at a pressure of up to 9,500 tons. Large components such as side frames, doors and roofs are manufactured in several stages in a complete line of presses. Innovative technologies such as internal high-pressure moulding (IHM) allow production of single-section,

hollow shapes which would not be possible with conventional pressing tools.

Body shop

In the body shop several hundred components are joined to one another in stages to form the complete body of the car. Depending on the function required of the respective material combinations, various joining and bonding technologies are used. These include spot-welding and riveting, as well as innovative processes such as laser welding and bonding. The body shop is dominated by industrial robots: body construction is one of the most highly automated areas within the whole of BMW Group production, with a degree of automation of almost 100 per cent.

In the interests of quality assurance, specific parts of the body are consistently checked and verified for accurate dimensions by means of laser sensors during the production process. To provide additional back-up, complete car bodies are taken off the assembly line for random checks and measured by computer-aided measuring devices in special measuring areas.

Paint shop

The paint shop gives the body the appropriate rust-proofing, paint finish and gloss. And to make sure these qualities are maintained throughout the entire lifetime of the car, several layers of paint are applied in a number of processes. After being thoroughly cleaned, the car bodies are first covered by a fine layer of zinc phosphate, forming the foundation for a total of four layers of paint. The first layer is applied in the cathode dip bath where paint is deposited evenly on the surface in a dip basin by means of an electrostatic charging process. This is followed by the filler layer already matched with the body colour as such, providing a smooth surface and protecting the car from stone chip, for example.

Application of the top paint coat and clear coat gives the body its final colour. The BMW Group uses low-emission paints throughout so as to protect the environment. And to apply the paint consistently and smoothly over the entire surface, an electrostatic charging process is used: here electrically charged and extremely fine paint particles are sprayed from jets and attracted to the grounded body, which acts like a magnet. In the process new spray-application methods and robots ensure a high level of efficiency. Ultra-fine filters in the air feed system, over-pressure in the paint

application booths, air showers at all entrance points and abrasion-free clothes worn by the associates working in this area serve to keep the paint free of even the smallest grain of dust.

The cars are given their final brilliance with the application of clear paint, ensuring superior resistance to environmental effects and damage.

When the clear coat is applied the vehicle is covered with a layer of “icing sugar” which does not become transparent until it goes through the drying furnace.

Once the painted bodies have passed through the specially illuminated test areas and have been approved by the trained eye of the experienced paintwork specialist without any complaints, they continue on to the assembly area.

Traditional and modern at the same time

The fuel tanks and fairing components for BMW motorcycles receive their final touch of brilliance at the BMW Berlin plant by means of spray guns. This is where paint quality of the highest standard is combined with impressive tradition in a very special way: the decal lines on the motorcycle fairings are still applied by hand as in the founding years of BMW motorcycle production.



Engine Construction

The whole is more than the sum of its parts. In engine construction hundreds of individual components are put together to create BMW high-performance engines tailored to the customer's specific wishes and requirements. In the process, high-precision, computer-based production technologies are supplemented perfectly by the expertise and skill of qualified associates.

An engine is made up of a wide range of mechanical and electronic components – but the crankcase and cylinder head always form the heart of the engine. To produce these parts, the BMW Group uses various materials depending on the requirements involved, including lightweight aluminium-magnesium compounds. As one would expect, the casting methods applied are diverse and innovative, with cast components such as camshafts being machined in the engine production shop by means of high-precision computer-aided machine tools. Here the main job of the associates is to monitor the processes and make any necessary adjustments.

In the precision measurement lab, for example, all engine components are verified by means of spot checks: precision engineers nowadays no longer



measure tolerance limits in tenths or hundredths but in thousandths of a millimetre (1 micron = 0.001 mm). By comparison, the diameter of a human hair is approximately 0.1 millimetre or 0.004 inch.

This precision is continued throughout the entire process of engine construction, whether for conventional petrol and diesel engines or special engines built for BMW's M models. Skilled craftsmanship remains an absolute must in engine production, with highly trained associates fitting pistons and bearings into the engine, installing pre-assembled cylinder heads, and assembling various modules, belt drives and wiring harnesses.

When the engine has been completed and is ready to run, elaborate technical systems take over once again, with the engines going through a final computer-based functional test on so-called cold testing stands.



Assembly - the Birth of a Car

Highly skilled craftsmen and high-tech facilities work hand-in-hand in the assembly shop, where the painted car bodies are turned into premium products for each individual customer with the addition of engines, components and add-on parts. A sophisticated logistical system and stable work processes make sure everything runs smoothly.

Quality right from the source

Despite the most advanced and sophisticated plant technology, the assembly of an engine still requires a large amount of manual craftsmanship and expertise on the part of the associates involved. Associates working on the line move along with the cars on their own conveyor belts to complete several work stages in succession. They work together in small groups with a high level of individual responsibility.

Ergonomics on the job is particularly important point in the assembly process. Heavy components such as seats or pre-assembled doors no longer have to be lifted by the associates themselves but are moved and placed in position by means of easy-to-handle carrier systems. Swivel units maneuver the cars on the assembly line, helping to avoid tiring and strenuous physical work above head level.



A masterpiece of logistics

Flexible and efficient assembly is guaranteed by sophisticated logistics, allowing a smooth flow of materials and efficient production without disruption. All parts and components must arrive at the assembly line just-in-time or even just-in-sequence in the interests of maximum efficiency – and this is only possible if the suppliers are fully integrated in the production network. Efficient logistics ensures precise delivery of the produced at BMW Group component plants or by supplier companies.

Parts and modules arrive at the plants either by train or truck. Most of the parts and components supplied in this process are then put together in pre-assembly to form complete modules.

These structural groups such as doors and bumpers as well as cockpits and seats are subsequently delivered straight to the assembly line, again in precisely the right sequence. The high point of the assembly process is the so-called "marriage": here the drivetrain made up of the engine, transmission and chassis is bolted on to the body. Finally a functional and visual inspection ensures that all cars come off the assembly line meeting the customary standards of premium quality.



Responsibility as a Corporate Value

As far as the BMW Group is concerned, entrepreneurial success and sustainable management go together. In practice this means making efficient use of resources, identifying risks and acting in a socially responsible manner. This philosophy has put the BMW Group in a leading position in the field of sustainable management, a fact which is confirmed by independent experts. For example, the BMW Group repeatedly heads the Dow Jones Sustainability Index for the automotive industry.

Clean Production is a key element in the implementation of sustainable management. On this basis the BMW Group works continuously to improve preventive environmental protection in its global production network. There is a long tradition of environmental protection in the BMW Group: in 1973 the company became the first automobile manufacturer in the world to create a corporate function dedicated to environmental protection, with far-reaching responsibilities running across all divisions. By signing the United Nations "Cleaner Production" environmental declaration in 2001, the company once again endorsed its obligation to ensure preventive environmental protection in the area of production.

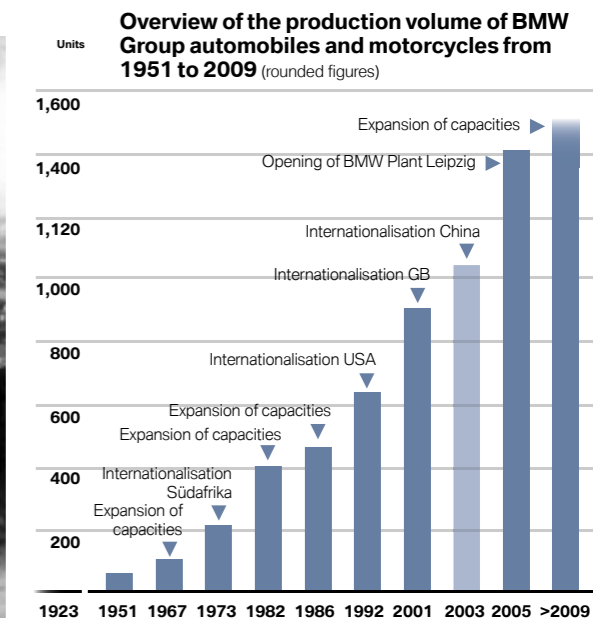
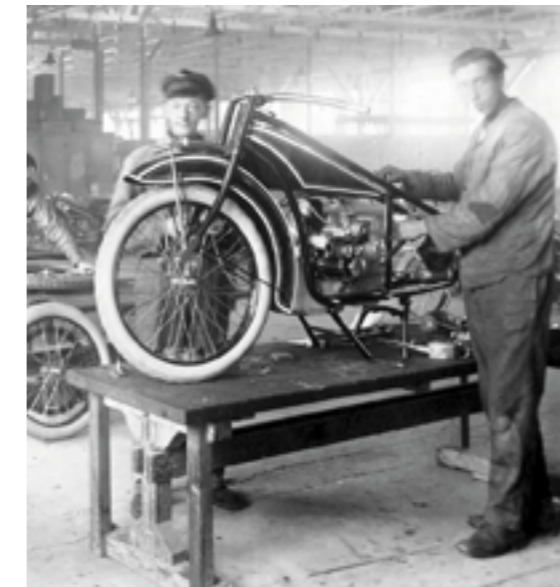
Environmental management systems at all sites ensure in-house environmental protection at a level which goes far beyond statutory requirements. All BMW Group production sites are externally certified according to international environmental management norms (ISO14001 and EMASII).

Preserving the environment

Since 2004, CO₂ emissions in the production of vehicles has been reduced by nearly 13 per cent, while waste water has been cut by almost 23 per cent and energy consumption by around five per cent. These savings have been achieved by such measures as combined heat and power generation facilities and by changing heating systems to natural gas and landfill gas. Solvent emissions per vehicle produced were reduced significantly in 2008 by almost 17 per cent, mainly as a result of improvements in paint finishing processes at all production sites.

Responsible partnerships

High ecological and social standards as well as stringent requirements in terms of environmental protection are key criteria applied to BMW Group suppliers. Even in the run-up to the nomination of suppliers for production material, goods, or services, the BMW Group ensures that internationally recognized sustainability standards are adhered to.



A History Steeped in Tradition

From a manufacturer of aircraft engines based in Munich to a global player

Aircraft engines proudly bearing the white-and-blue logo were built in the north of Munich for the first time in 1917. Following World War I, the small company was required to adapt all its production activities to the peacetime economy. So in addition to railway brakes and engines, BMW started to build motorcycles in Munich in 1923.

Five years later BMW started to produce cars: in 1928 the company acquired the Eisenach vehicle plant, building all BMW automobiles there up until 1941. During World War II, BMW once again concentrated its production activities on aircraft engines. After the dismantling of plant facilities and a period of emergency production, motorcycle production started again in Munich in 1948. In difficult conditions, the first cars once again came off the production line in Munich three years later.

After mastering a financial crisis in the second half of the 1950s, BMW consistently followed an upward path. In the late 1960s the company acquired Hans Glas GmbH, thereby adding the Dingolfing and Landshut plants to its production facilities. It was no longer possible to expand the Munich plant since the municipal authorities had developed the surrounding land, so in order to create space for engine and automobile production in Munich, motorcycle production was shifted to Berlin in 1969. In 1973 BMW opened its first foreign plant in Rosslyn, South Africa. Then in order to penetrate new markets worldwide, local production plants were established, with assembly plants being set up in Asia in the 1980s, for example.

BMW's new engine production plant in Steyr/Austria went into operation in 1982 and in 1986 BMW's Regensburg plant was added to the network of Bavarian production plants, which was further enlarged in 1989 with the completion of the Wackersdorf plant. In 1992 BMW returned to its automobile production roots in Eisenach: it has produced all its large-scale production tools there ever since. In the same year the company laid the founding stone for its Spartanburg plant in the USA, while further plants and sites in Great Britain were added to the production network in 1994 with the acquisition of the Rover Group. Six years later the Rover, MG, and Land Rover brands were sold for strategic reasons, though the MINI brand remained with the BMW Group.

The new MINI went into serial production at the Oxford plant in 2001, accompanied by the start of production at BMW's engine plant in Hams Hall in the same year. In early 2003 the first models of the newly developed Rolls-Royce Phantom left the highly specialised, purpose-built manual production facility in Goodwood in the south-west of England. Towards the end of the same year, BMW cars were built in China for the first time, in close cooperation with a partner. As of 2005, the new plant in Leipzig increased the production capacity of the BMW Group even further, and an interesting new market was penetrated in early 2007 when BMW opened an assembly plant in India.