BMW Group Recycling.
Sustainability ensured by the ecologically responsible use of resources and materials has been the fundamental policy of the BMW Group for many years. Long before lawmakers introduced appropriate legislation, the BMW Group had developed exemplary processes and methods for the sensible use, recycling and disposal of materials as part of a comprehensive recycling concept.
The BMW Group follows a clearly specified procedure in designing parts and components for recycling. To meet recycling standards to the best possible extent from the very beginning in the design phase, recycling specialists first determine the demands made of the components involved. Then, cooperating with construction engineers, they develop solutions within a team. This partnership of interdisciplinary development continues throughout the entire process of product creation, that is from the first concept for a new model all the way to production standard. Benchmarks achieved in the process such as the time required for dismantling or the accessibility of components are revised time and again as work progresses.

Sustainability has been a firm element of the BMW Group’s corporate philosophy for many years and is one of the Group’s overriding corporate objectives. This consistent orientation has been duly recognised and acknowledged worldwide: Ever since the introduction of the Dow Jones Sustainability Group Index in 1999 as the world’s most significant stock index for companies pursuing a process of sustained management, the BMW Group has been the leading company in the automotive industry ranking No 1 each year. This recognition of BMW’s sustainability strategy by the financial world is reflected within the Company inter alia by a thorough and comprehensive recycling policy.

The BMW Group not only promotes the efficient use of resources within the entire production process as well as the efficient recycling of end-of-life vehicles in accordance with environmental requirements, but also leads the way in recycling-oriented product design. Such “design for recycling” is indeed one of the three interacting core elements underlying the BMW Group’s recycling strategy. The other two core elements are the designation of materials and the Recycling and Dismantling Centre (RDC) in Lohhof near Munich, which is being upgraded to the status of a fully-fledged competence centre and technology forum for all questions of vehicle recycling.

A further point is the efficient use of valuable resources such as water, energy and materials ensured by intelligent recycling systems throughout the entire production process.

**Design for recycling**

To enhance the level of economical recycling, one has to consider all stages in the lifecycle of a car from the very beginning in the initial design phase. Recycling-oriented product design involves both the choice of materials and joining technologies as well as the development of individual components. BMW’s engineers furthermore seek to make an increasing number of parts from recycled materials, thus closing the economic cycle of materials management with the highest possible ecological and economic standard. These are materials already used and subsequently fed back into production through the materials cycle.

Components designed for recycling must fulfill a number of fundamental requirements:

- Use of pure, recyclable plastics
- Reduction of the diversity of materials in the use of plastics
- Use of composite materials which may subsequently be recycled together as one compound
- Application of appropriate joining methods, such as plug-in connections instead of bolts
- Use of high-quality secondary materials, that is recycled materials

Examples of recycling-optimised design are to be found throughout all of the BMW Group’s current model series, with numerous parts and components. One example is the use of materials for thermal insulation of the underfloor built specifically for recycling requirements. Only a few years ago, the material used here was a composite formation of mineral wool and thin aluminium sheet not suitable for subsequent recycling. After replacing the mineral wool by a honeycomb aluminium structure, the entire insulation layer now consists of a pure aluminium compound 100 per cent recyclable without the need to separate any materials.
The positive repercussions of BMW’s design for recycling are to be found in all model series. Precisely this is why virtually all of the BMW Group’s current models can be recycled economically. On the current BMW 3 Series the share of plastics suitable for recycling has increased to almost 43 kilos versus 26 kilos on the former model, that is an improvement by more than 65 per cent. Significant progress has also been made in the use of recycled plastics increasing for example on the BMW 5 Series from 2.5 kilos on the former model to 24 kilos in the current model, that is an almost ten-fold improvement. On the new BMW 7 Series, in turn, approximately 15 per cent of the car’s overall weight can be made of recycled materials.

Life cycle analysis considering ecological factors far beyond recycling alone

The BMW Group applies the life cycle analysis method in order to understand the environmental effects of a car’s components right from the start in product development. Some applications of this far-reaching method may however create conflicts of interest, for example between the choice of materials and the function of components. “Intelligent” lightweight materials, for example, potentially serve to reduce fuel consumption by reducing the weight of a car. The use of re-growing natural materials, in turn, for example for the door linings in the 7 Series, can help to preserve the world’s resources. Choosing certain materials or joining technologies only makes sense, however, if these materials and technologies are considered within their overall ecological context. An example is the use of carbon fibre in Formula 1: Given its unique combination of low weight and supreme strength, this material may be of interest in series production under appropriate economic conditions.

Progress also in material cycles

The use of secondary materials, that is recycled plastics, contributes significantly to the preservation of resources and, accordingly, to the avoidance of waste. Currently more than 10 per cent of the plastic components on the 3 Series are made of recycled plastics, and this share will increase to 15 per cent in future.

Duromer plastics, that is solid components which cannot be melted afterwards, form another category also to be considered in this context: Two examples are the floor plate in the luggage compartment comprising about 90 per cent duromers and the parcel shelf containing 85 per cent recycled plastic. The trendsetting quality of both of these components is the sandwich structure of the substrate made of recycled polyurethane inside.

Recycling damper fluid: Specialists at the RDC have developed the fastest and most effective drainage procedure
Research laboratory and think-tank in recycling: BMW’s Recycling and Dismantling Centre (RDC)

Neither lifecycle analysis nor design for recycling would be possible without appropriate know-how and experience. Precisely this knowledge is provided to a large extent by the BMW Group’s Recycling and Dismantling Centre (RDC) in Lohhof near Munich. Just 15 kilometres from BMW’s Research and Innovation Centre, the RDC serves as a think-tank for vehicle recycling as well as an information forum for all departments within the BMW Group.

The RDC is both a licensed and fully controlled recycling unit and a laboratory for fundamental research and development as well as initial and further training. The integration of the RDC in the process of developing new cars sets standards for the automotive industry worldwide. Ever since 1990 the RDC has been developing recycling concepts entering subsequent European legislation only 10 years later in the year 2000. In daily practice, the RDC serves primarily as a communication forum developing and transferring know-how in the field of recycling. To this end recycling specialists actively contact their colleagues in Development and, together with other activities, organise construction meetings providing specific recommendations for the environmentally-minded design of specific car modules. Taking a systematic approach in implementing information and knowledge on dismantling by way of dismantling analysis, the experts are able to compile important data and conclusions for the development of vehicles in future.

The RDC also tests and develops dismantling techniques under practical conditions. Such future-oriented processes and methods serve to recycle end-of-life vehicles economically and in line with environmental requirements. At the same time, recycling specialists have to think ahead 15 years and more, already working today on processes for, say, the optimum dismantling and recycling of hydrogen cars of the future with their special components.

Ongoing exchange of information between the RDC, BMW’s worldwide dealer organisation and the partners involved in the BMW Group’s recycling network guarantees appropriate implementation of the concepts developed. A workstation has been developed and built, for example, for the removal of operating fluids from all BMW model series. Featuring separate drainage systems for all kinds of fluids, this workstation is able to collect materials in their pure form for subsequent reconditioning and feedback into the recycling process.

Since the RDC also has the task to think in closed, complete cycles and to develop appropriate concepts, specialists work not only on dismantling procedures, but also on logistics and reconditioning.

IDIS database

Another project at the Recycling and Dismantling Centre is to compile a complete set of data in the IDIS (International Dismantling Information System) database. As the name indicates, IDIS is an international information system comprising more than 20 car makers and the components/material lists of over 20,000 car components. This allows environmentally-minded recycling even today of more than 360 different models.

Apart from a comprehensive database, the IDIS programme package also comprises a dismantling manual with dismantling diagrams and cutaway drawings of individual modules, specifications for average dismantling times, and the weight of the materials used. All this data is compiled at the Recycling and Dismantling Centre by documenting and analysing the process of dismantling new models step-by-step.

The BMW Group’s focus on cooperation: Building up a Europe-wide recycling network

As a general commitment with the objective to save resources, the BMW Group is the first car maker in the world to start establishing a network of recycling centres in Germany. Indeed, the first recycling partner authorised by BMW started activities in this area more than 10 years ago. Implementing the EU End-of-Life Vehicle Directive, the recycling network now covering many countries is being enlarged step-by-step throughout Europe. Specially trained partners recycle end-of-life vehicles according to BMW’s strict standards, their operations being regularly monitored, supported by expert advice and the latest methods.

Partners have to be found not only for recycling end-of-life vehicles, but also for the disposal of old parts after repairs in close cooperation with workshops. BMW’s partner throughout Germany in this process is CCR Logistics Systems AG handling all waste management activities for workshops. More than 90 per cent of all BMW dealers are already affiliated to this network.
Shredders cut up the pressed car bodies into pieces the size of a human hand. Ferrous and non-ferrous metals are then processed separately.

The last owner delivers his end-of-life vehicle to a certified dismantler: the process begins.

As of the year 2015, only 5 per cent remaining materials may be deposited under the EU Directive. This equals roughly the contents of an 80-litre household garbage bin.

The residual vehicles left over after the initial recycling process are compressed into dense packages. This reduces the cost of transport for further processing in shredders.

Under the EU Directive, 85 out of 100 kilos of each end-of-life vehicle must be recycled either as components or materials. BMW already complied with this standard for metal parts a long time ago.

Recycling as such begins with the removal of all operating fluids: oil, fuel, refrigerant in the air conditioning, coolant, and brake fluid.

Every vehicle received is first registered and specified. For security reasons, the airbags are ignited as the first step.

Glass and many plastics can already be recycled economically today. Progress made possible by the BMW Group introducing important new procedures.

Professionally dismantled engines can be reconditioned and re-used as valuable components without any loss of quality. They provide the input for the production of BMW exchange parts in Landshut.

The residual vehicles left over after the initial recycling process are compressed into dense packages. This reduces the cost of transport for further processing in shredders.

Coming full circle: The end is a new beginning.
Cleaner production – sustainability in all production processes
Apart from trendsetting methods and processes for sensible recycling and disposal of end-of-life vehicles, the efficient use of valuable resources in all production processes is another cornerstone of BMW’s sustainability strategy.

In September 2001 the BMW Group, signing the International Declaration of the United Nations Environmental Programme, committed itself to cleaner production. This international declaration is a voluntary but public agreement on the application of a specific, preventive environmental management strategy, the so-called Cleaner Production Strategy. This concept seeks to avoid negative influences on the environment from the start as an alternative to “end-of-pipe” solutions, that is technologies not taking effect until the end of the production chain.

Accordingly, the BMW Group uses valuable resources such as water, energy and production materials with maximum efficiency in all production processes, applying an “intelligent” recycling concept for this purpose.

Precious water
Checked for possible leaks and the intrusion of water, hundreds of cars are subjected to a downpour of water every day in special immersion booths. This test procedure requires several cubic metres of water for each and every vehicle. An almost 100 per cent self-contained water circuit, with water being prepared in several stages, reduces the amount of water required in this procedure by 80 per cent. Thanks to the most advanced recirculation systems, production of a BMW generates only 1.06 cubic metres of waste water on average, far below the overall figure for the automotive industry as a whole.

Energy
Consistent use of thermal regeneration facilities and power-saving production technologies has helped to reduce the consumption of energy by 20 per cent for each car built between 1996 and the year 2000.

![Energy Consumption Chart]

Powder-based clear paint
In May 1997, the BMW Group became the world’s first car maker to use powder-based clear paint at the Dingolfing Plant. Making a significant contribution in protecting the environment, such paint is applied as the top layer on a car to safeguard the surface from aggressive substances in the atmosphere. Powder-based clear paint is a dry substance fully eliminating the need for solvents and offering many advantages:

- Absolutely no consumption of water, no generation of waste water
- No need for chemical cleaning agents
- Almost 100 per cent use of materials, with direct recycling inside the paint-application plant almost entirely eliminating the generation of waste
- No solvent emissions

Recycling: The BMW Group sets the standard
Recycling is business as usual for the BMW Group. Thinking and acting in the interest of the environment and applying recycling processes is now just as much part of BMW’s corporate culture as the proverbial sheer driving pleasure we have to offer. The integration of the Recycling and Dismantling Centre in the development of automobiles helps to create cars for tomorrow which, the day after tomorrow, can be recycled even more efficiently, economically, and with cleaner results.

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Further information on the BMW Group in the internet:
http://www.bmwgroup.com
http://www.bmwgroup.com/scienceclub