Pushing the boundaries.
The design of the new BMW M3.

Interview with: Ulf Weidhase, Head of Design, BMW M and Martina Bachmann, Head of Interior Design, BMW M.

When did work start on the design of the new M3?

Weidhase: We had the first ideas as early as 1996 and the concept group started work in earnest in 1997. A team of ten or eleven of us worked intensively on the design of the new M3 for around two years.

What were the initial considerations?

Weidhase: We started more or less with a clean slate in coming up with a vision for the new M3. The basic questions were: What should an innovative sports car look like? What will the major focal points be in the design, given the means at our disposal? What does the customer want? At this early stage, designers have a great deal of scope: What should the bonnet and rear look like, how are we going to style the bumpers, the wings, the wheels? How are exterior and interior design going to fit together? At the beginning there are many such questions and designers have to come up with creative, innovative answers in close consultation with the engineers.

What basic prerequisites were there?

Weidhase: The objective was to give full aesthetic expression to the promise of high performance embodied by the new M3.

How would you characterize the design of the new M3?

Weidhase: The design expresses the fascination of the new M3 and the breathtaking performance on tap, combining racing car technology with complete suitability for everyday use. On the one hand, it has the comfort for enjoyable long-distance driving; on the other, it is sensationally fast around Nurbürgring's Nordschleife, posting times that, just a few years ago, could only be achieved by a racing car. This unique fusion of power, comfort and elegance is characteristic of the new M3's design.

The new M3 appears much more muscular than its predecessor. Was that a conscious design decision?

Weidhase: Yes, the strong differentiation from its predecessor is of course intentional. For one thing, the new M3 has wider wings, both front and back. That looks powerful, creates space for wider tyres and makes for perfect road-holding. Athletes build up muscles on the parts of their bodies that have to do the most work. In automotive terms that's the suspension and engine and that's where bodywork styling can be especially effective. Our aim with the exterior design was to create a look that combines both power and elegance.

How important was ergonomics to the design of the new M3?

Bachmann: Ergonomics was a crucial factor in designing the interior. BMW designers have to think in terms of ergonomics. We drew on the latest findings in this field when developing the sports seats for the new M3. They give perfect side support and are optimally adapted to the high g-force that the new M3 is capable of generating. The width of the seat backs can also be set to individual body size for a comfortable, relaxed, yet sporty driving style. The material, the contours and the design as a whole all play a major part in this.

What details make the high quality of BMW M design particularly clear?

Bachmann: The drive for high quality, for a ”premium” look, is apparent in the overall design of the M3, but also in the details, such as the hand-brushed aluminium trim, the distinctive seams on the seats and the door panel inserts. The high standards we set for materials as BMW M designers are founded on extensive research and development. Not only the appearance but also the feel of the materials is crucial. For example, we have used air-permeable leather in the interior of the new M3. Obviously, this is costly, but all the materials used must be of outstanding quality because our aim is to produce fascinating cars. The new M3 is just that, but without being excessively expensive.

What effect did the powerful engine of the new M3 have on the design of the exterior?

Weidhase: One consequence of the new M3’s high-performance engine was a wider chassis. And that meant bigger wheels, bigger brakes and wider wings. Engineering and design are closely interlinked in the new M3. The new M3 was repeatedly tested in a wind tunnel to cut wind resistance and lift to a minimum. We improved the aerodynamics and increased the air flow with the aid of various elements such as the rear lip spoiler and the new bumpers with bigger vents. Even the wing mirrors contribute to the streamlining effect. All these things are innovations that assure unbeatable driving characteristics and immediately distinguish the new M3 as an aesthetically fascinating design.

What were the initial steps in developing the design?

Weidhase: The first thing was to draft a large number of different design sketches. These drawings were subjected to intense discussion by the team, repeatedly modified and re-submitted for scrutiny. Finally, we chose a draft for the exterior design and produced a tape rendering. A tape rendering is an elaborate life-size drawing which includes shadow and light effects and provides a very realistic impression of the envisaged car. This was presented and then the final decision was made on the new M3 concept. After the show rendering, once the general direction had been determined, we set to work on a three-dimensional implementation of the drawings.

What computer techniques were used in the design of the new M3?

Weidhase: CAS (computer-aided styling) is a particularly important design tool. It lets us simulate the entire structure of the body and interior on-screen. With CAS you can change surfaces, work in swage lines, simulate tensions and much more besides. Nevertheless, despite all the possibilities opened up by computers, human judgement is still the key factor in the design of BMW M cars.

What can computer-aided styling do?

Weidhase: CAS is an excellent method for planning and shaping things because of its detail and accuracy. Forms developed with CAS can also be very quickly converted into three dimensions using a special process. Stereolithography is a technique used in doing this, one that BMW developed in collaboration with medical research teams. Stereolithography is a laser technology used in medical applications to produce artificial bones and hips, for example. In the car industry, stereolithography can be employed to make detailed models of many individual components for experimental purposes. The models are not fully functional but they allow us to draw initial inferences regarding the composition, ergonomics and functionality the parts should have.

How do designers and engineers work together at BMW M?

Weidhase: A constant exchange of views and information with the engineers is of fundamental importance, particularly in the so-called "package phase". The package phase is the stage of development at which the wheelbase, track, engine position and many other details are fixed. At BMW M, design has a great deal to say at this stage.

What do you especially like about the work at BMW M?

Weidhase: The nice thing about our work is the wide variety, ranging from thoroughbred sports cars to luxury sports sedans. From a historical point of view, the development of touring car championship models is of special significance at BMW M. Racing car design is very physical and engineering-oriented. The whole design is geared to performance and winning races. Being two-tenths of a second faster can be decisive on the racing circuit and this is the chief criterion for design too. A racing car designer learns very quickly how to work with engineers under pressure. The results on the track each weekend tell you how well you've done – it’s the toughest feedback you can get.

Would you say, then, that motor racing is good training for designers?

Weidhase: Yes. In motor racing you have to learn very quickly that there are technical requirements that designers can't get around. I think that applies fundamentally to all product design. While quite properly thinking in creative and artistic terms, designers must also be able to assess the practicability of their ideas and keep within the restrictions imposed by technical considerations. Know-how acquired in the development of racing cars is an important point of departure for designing BMW M cars. The maxim that applies there is not "form follows function" but "form is function": form and function are perfectly interwoven. This was also one of our guidelines in designing the new M3. If the power of the engine makes it necessary to improve the cooling system or the car needs bigger brakes and more air vents, we have to take account of that in our design. M design must be highly functional as well as aesthetically fascinating.

To what extent does design have to take account of technical solutions?

Bachmann: As designers, we also have to offer suggestions for technical solutions, otherwise we're not going to be able to achieve what we're aiming at. It's not enough for us to offer the "packaging" without some indication of a technical solution. Communication between designers and engineers is essential and we're very good at that at BMW M: styling and engineering go hand in hand here. It wouldn't work otherwise. The perfect harmony between all aspects of the new M3 would be inconceivable without excellent teamwork between engineers and designers.

Did any differences of opinion arise between engineers and designers during the development of the new M3?

Bachmann: Yes, of course. Particularly with regard to the design of the interior there was a great deal of constructive discussion between the engineers and designers. We talked over the drawings and models until we found the best way of moving ahead. It's never a question of styling or engineering coming out on top. The aim is always to arrive at an ideal combination of both interests.

Did the new design extend to details such as controls?

Bachmann: Yes, a lot of small components in the new M3 are all-new. It's often details like this that are crucial to the comfort and convenience of the cockpit. All the controls have to be at the driver's fingertips and designed so that they can be operated intuitively. The ergonomic functions in the interior determine whether or not you feel comfortable in the car. For example, the new M3 has an instrument panel that is unmistakably M, with a unique dial design which is easy to read and which perfectly expresses the car’s state-of-the-art technology.

A major step in your design work on the new M3 was the construction of clay models. How were these made?

Weidhase: We made them life-size so as to be visually scarcely distinguishable from a prototype. The finished clay models were covered with an elastic film and then painted. Even the windows looked deceptively real, although you couldn't see through them, of course. The clay model was painted silver and presented to the board of directors on a turntable together with its predecessor, the sister model in the range and a few competitors.

Were clay models also made of the interior of the new M3?

Bachmann: Yes, at the modelling stage we also made complete mock-ups of parts of the interior in clay. These were subjected to a number of revisions. Clay models play an important part in the development of an interior. We make most of the interior components, for example the seats, in clay first and then in foamed plastic, first using rigid and subsequently softer foams. This makes it extremely easy for us to work on the model and make all the desired modifications.

There's an important distinction, then, between clay models and plastic foam models?

Bachmann: That’s right. We need the clay models to establish the form. For the functional aspect we need the rigid foam models, especially for aerodynamics and for the aluminium prototypes – clay is too fragile for this. Then we go one step further. When we like the form we have established with the clay model we work out the details with CAS and have a functional model machined before further revisions are carried out. Design is a continuous process of trying things out, of scrapping ideas and starting over, and of learning.

How did you proceed with the new M3 steering wheel, for example?

Bachmann: First we modelled it in clay so as to have maximum freedom in establishing the form. Then we made a rigid model to see whether the controls could be operated properly. Finally, the design was sufficiently evolved for the steering wheel to be installed in a prototype for testing. If the test drivers and engineers find that the steering wheel is too thick or thin or don't like the feel of it at this stage, we modify the design until they are perfectly satisfied.

What areas does interior design cover?

Bachmann: Interior design refers to the design of the entire inside of the car, including the engine compartment and boot. Interior design covers a wide variety of details that have to be developed and coordinated. Even where you would hardly think it, for instance in the design of the boot, there is a lot of work to be done. With a volume of 410 litres, the boot of the new M3 is somewhat bigger than that of its predecessor, thanks largely to the M Mobility System, which dispenses with the need for a cavity to take the spare wheel. Interior design is a world of its own that, in a way, is even more complex than exterior design because it involves much more detail.

Are the decisions taken by individuals or by the team as a whole?

Bachmann: It's a team effort. There's a lot of discussion at the early stage of development, particularly as regards the interior design. At this stage everything is open to comment. People all have their own views on colours and materials and there are often differences of opinion at the beginning, especially with regard to the choice of colours for the outside of the car. In the end the team arrives at a consensus. Silver is nowadays favoured as the colour for in-house presentation: it gives a very good visual definition of the surfaces, shows up the smallest flaw in the design of the exterior and allows for better assessment of the design – it’s a comparatively neutral colour.

How did it come about that Phoenix Yellow was chosen as the presentation colour for the new M3?

Weidhase: Yellow was very successful with the predecessor. We were surprised at how popular it was. As far as I remember, between 20 and 30 per cent of all second-generation M3s sold were yellow.

Did you already have Phoenix Yellow in mind as a presentation colour for the new M3 while you were working on the design?

Weidhase: Yes, the idea came up when we were at the three-dimensional modelling stage and were forming an initial notion of how we wanted to present the new M3. The new M3 represents a giant leap and we wanted that to be expressed in the presentation colour. That's why we decided on Phoenix Yellow, which is a very lively yellow. It has almost chameleon-like qualities: the appearance changes with the way the light strikes the car. It's a very versatile colour and expresses the luxury and sportiness of the new M3 to perfection.

To what extent do you take account of customers' suggestions?

Bachmann: We get a lot of suggestions and we listen to them. Feedback from our customers is very important and we take it very seriously.

Can you separate form, materials and colour in design?

Bachmann: No, you can't. It's all developed and coordinated at the same time. All the developments involved in design are closely interlinked. The discovery of a new material can open up the possibility of changing the shape of a seat, for example. Or the other way around: an ergonomically determined form might call for a particular material and colour. You can't compartmentalize these things.

Does BMW M have specialists constantly on the lookout for new materials? Is there a materials research department?

Bachmann: Of course. And, as designers, we are also looking and developing our own ideas in this field. It's part of our job as designers to keep our eyes peeled and take note of everything that’s going on around us. We are constantly searching for new forms and materials, for inspiration and stimuli, and not just in working hours, but in our free time and when on holiday too.

Ulf Weidhase, would you agree with that?

Weidhase: Yes, this is a job that is also a hobby. There's no other way of putting it. You're taking in new ideas all the time, whether you're at a Grand Prix, shopping in a department store or visiting a museum. Even a stroll through the Louvre, for instance, looking at the way gold and other materials were crafted to perfection in the ancient world is a source of inspiration for design developments at BMW M. Design at BMW M covers a wide spectrum right up to hand-built luxury cars and this segment also provides us with stimuli and ideas for production models.

Did designing the new M3 produce any surprises, or what aspects were particularly interesting?

Bachmann: As far as the interior is concerned, designing the new sports seats was a particular challenge. Obviously, grip is an important aspect. Leather upholstery looks great but is also pretty slippery. Our task was to find a non-slip material with breathable pores. The M texture interior option breaks new ground, looks good and is very comfortable.

How did you come up with the idea for M texture?

Bachmann: At first we used perforated Alcantara. This was fine to sit on but didn’t really look right. Then we had the idea of laying another material beneath the perforated Alcantara and that was a far better solution as far as looks were concerned. This is a good example of how we try things out, develop variations and finally get what we are looking for. Design at BMW M is always a lively process of creative, artistic interaction with materials and exterior and interior colours. The BMW Individual scheme offers our customers the option of having their BMW tailored to suit their own personal tastes.

Ulf Weidhase, is there any particular detail in the design of the new M3 that you’re especially proud of?

Weidhase: As far as the exterior design is concerned, the aluminium body parts were a challenge that we met very well. The new aluminium bonnet cuts down on weight and the powerdome creates more space for the engine. The bonnet of the new M3 is also a striking feature that distinguishes it from the standard 3 Series. The aluminium bonnet and powerdome make a major contribution to the overall impression of power and elegance.

Were there any initial difficulties developing the new aluminium bonnet?

Weidhase: At the very beginning we did discuss whether it was right to take the risk of a completely new bonnet in view of the large production numbers planned. Now though there are absolutely no production problems with the new M3’s aluminium bonnet. It was not easy at first to integrate the BMW badge. The badge is set in a recess rather than simply being stuck on. Getting this step in the production right for aluminium was a genuine technical and design challenge. I think the new bonnet will be of great importance for all future BMW models too. What’s more it proves how successful ”learning by doing” can be.

Martina Bachmann, what detail in the design of the new M3 are you particularly proud of?

Bachmann: The fascination of the new M3 results from the interplay of all its elements. But to answer your question, what immediately springs to my mind is the design of the new sports seats and the hand-brushed aluminium trim in the new M3. The work on the trim inserts was done in a small workshop in Italy. Every one of them has an individual grain; the surface is not machine-polished. We experimented with various machines and suppliers to get the right effect and had no joy for quite a long time. Then, with the help of our purchasing department, we found this little firm in Italy. Having a supplier like that is a dream; this way the interior of every M3 is, in a sense, unique.

Side gills continue their comeback with the new M3. What led to the decision to use gills?

Weidhase: Obviously, the word "retro" has been much used to describe the gills. People quite rightly think of the gills on the legendary BMW 507 of the 1950s and the BMW 3.0 of the 1970s. The BMW 3.0 was a very attractive coupé; it had similar gills to the new M3, although they weren’t chrome-plated. My intention was to give the new M3 gills that not only look good, but have a functional purpose too, and with the help of our engineers, we managed to do just that. The gills on the new M3 draw hot air away from the e-box, aiding cooling, particularly in stop-and-go traffic in high temperatures.

Has a new sound design also been developed?

Weidhase: Yes, of course. A perfect sound design has been developed for the engine and for the newly designed four-pipe exhaust. Of course, sound design also includes the question of how much engine noise penetrates the interior. BMW M is very concerned to have a perfect sound balance in every car. BMW M also offers the acoustically outstanding Individual High Audio sound system for the M5.

Has a special smell or fragrance been developed for the interior of the new M3?

Bachmann: No, there's nothing like that yet. And I confess to a certain scepticism on this point. Most of the available scents are quite simply extremely synthetic in character, much too chemical. We're quite happy for all M cars to have a neutral or natural smell – the smell of fine leather, for example. That's much more pleasant than a synthetic scent.

How important was the testing of prototypes to the evolution of the new M3 design?

Weidhase: Testing had a very great influence on the design of the new M3. We depend very heavily on feedback from the test engineers. Human reactions are a key criterion in the design of all BMW M cars.

What did the wind tunnel tests on the body of the new M3 involve?

Weidhase: The body was tested many times in a number of stages. For the wind tunnel tests, exact life-size models were made in rigid foam and the aerodynamic data recorded. We designers are constantly present in the laboratory during this stage. Afterwards, the information we have acquired is used to modify the clay model. If we're still not satisfied, we look for other alternatives. Then there are more checks and tests. Towards the end, of course, reference models with an almost fully evolved chassis and body are used for the wind tunnel tests. The side skirts, the wing mirrors, the new rear apron and the rear lip spoiler – all these things are innovations that resulted from intensive work on the aerodynamics of the new M3.

A lot of thought was also given to the underbody of the new M3 when designing the bodywork. Why is this?

Weidhase: Yes, a great deal of thought went into the underbody. It’s aerodynamic properties not only affect fuel consumption but also road-holding on the straight and in bends. The aim is to reduce lift. The flow mechanics are arranged so that the car is practically sucked down on to the road by the so-called Venturi effect. The cooling of the rear axle transmission is equally important, as high temperatures can occur there when the car is going flat out. The streamlining of the new M3’s underbody ensures that there is always an adequate air flow to the rear axle transmission. The performance of the M3 has reached new levels and this has meant pushing the boundaries of design too.

What is distinctive about the work of the design department at BMW M?

Weidhase: Work in the BMW M design department is characterized by very good communication within the team, a "direct line" to other departments and management and clearly defined decision-making structures in the company. Our size has major advantages: BMW M is an excellent small company with a highly motivated and experienced workforce. It is always clear what decisions have been made and by whom. This puts us in a position to deliver top-quality design in a short space of time. The new M3 is the quintessence of our corporate philosophy of precision and high performance.