Aerodynamics of the New BMW X5
A Contribution to BMW Efficient Dynamics

The goal pursued in the development of the aerodynamics of the new BMW X5 was to achieve the lowest drag coefficient in its class. Close cooperation between aerodynamics and design was imperative in order to further reduce the already low value of the predecessor. Besides optimising the exterior shape, also technical measures designed to reduce drag were employed while additionally subjecting classic conflicts of aerodynamics objectives to detailed analysis. Consequently, the aerodynamic development of the new BMW X5 was characterised by meticulous attention paid to all aspects under the premises of achieving the lowest possible drag values.
1 Introduction

Climate change, growing energy demand worldwide, the finite nature of fossil energy sources and political crises are jeopardising our mobility. Mobility, however, is an elementary precondition of our economic system and therefore a key factor in attaining employment, prosperity and quality of life. National and international discussions regarding legislative control of CO₂ emissions additionally provide a compelling case for exercising the greatest possible efficiency when using energy.

Less CO₂ and increased efficiency – the BMW Group remains committed to this goal. In the past, reductions in fuel consumption and CO₂ emissions were largely achieved by pursuing classic routes in terms of further developing engines and transmissions. To realise further significant reductions, it is now necessary to take a function-orientated complete vehicle approach. The first step is to minimise driving resistance to serve as a basis for establishing requirement-orientated energy conversion with maximum efficiency.

In addition to a noticeable reduction in fuel consumption, customers also demand even greater driving pleasure with high degrees of spontaneity and dynamics. Great significance is therefore attached to initially contradictory development objectives for achieving market success. The BMW Group is therefore further advancing the driving pleasure gained with the ultimate driving machine based on „efficient dynamics“. In this respect, sports utility vehicles (SUVs) and sports activity vehicles (SAVs) pose a particular challenge. Especially in this class of vehicle aerodynamics provides enormous scope for implementing the BMW Efficient Dynamics strategy.

The goal pursued in the development of the aerodynamics of the new BMW X5 was therefore to achieve the lowest drag coefficient in its class. The predecessor already assumed this top position for many years with a drag coefficient of $c_D = 0.35$. Close cooperation between aerodynamics and design was imperative in order to further reduce this already low value. Besides optimising the exterior shape, also technical measures designed to reduce drag were employed while additionally subjecting classic conflicts of aerodynamics objectives to detailed analysis. Consequently, the aerodynamic development of the new BMW X5 was characterised by meticulous attention paid to all aspects under the premises of achieving the lowest possible drag values.

This article outlines the aerodynamic development of the new BMW X5 and illustrates the measures used to even further reduce the drag coefficient of $c_D = 0.35$ of the predecessor which, for many years, represented the lowest value, thus retaining the top position worldwide. The article also examines the effects on fuel consumption, CO₂ emission and driving performance within the framework of the BMW Efficient Dynamics strategy.

2 Strategic Focal Points

The development of aerodynamics is faced with demanding challenges if SAVs are still to be successfully marketed against the backdrop of today’s need to reduce CO₂ emissions particularly in this vehicle class. In comparison with modern saloon design, the task of optimising the shape and function is considerably more involved and difficult for development engineers.

The scope of aerodynamics development is divided into four strategic focal points:
- Form – Proportion
- Internal Flow
- Underbody
- Wheel – Wheel House.

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