ESSENTIAL AND CHALLENGING

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How have the demands on aerodynamics development changed over time?

Michael Pfadenhauer The demands on aerodynamics have become more diverse and complex. While just a few years ago it was enough to present a model outfitted with special measures that had a low C_D value, today the focus has shifted to fleet consumption and thus an overall view of all models, and in particular the highest-selling ones. In addition to this, there are a range of technical questions focusing on performance, comfort and complexity with regard to controllable elements, and, not least, strong cost pressures on solutions that are to be implemented, as well as a pronounced feel for and understanding of the appearance aspects of aerodynamic elements: Nowadays no one accepts solutions that are either beautiful or aerodynamic; the expectation is that premium products will be optimal in both regards. Now more than ever, aerodynamics development is one of the central factors in successful vehicle development, with increasing numbers of involved parties and issues to resolve. That's what makes it so interesting and the challenges in a traditional development discipline so exciting.

What role will simulation play in the future?

Pfadenhauer Even today, without simulations we would not be able to do our work. As such, the capability of using software effectively and interpreting it correctly is a core competence without which aerodynamics development would be unthinkable today. Rapid processes in developing models and in the computing itself, as well as the availability of adequate software and hardware resources, are just as critical as the intelligent interaction with the equally necessary conventional testing methods. It's no accident that Porsche has concluded long-term cooperation agreements both in the computing area with the supercomputer manufacturer Cray and with software suppliers while investing in-house in the construction of our aeroacoustic wind tunnel. That gives us the capability to deliver reliable testing results long before there is any hardware. In early phases, it is now possible to make targeted decisions at a stage in the process when the costs for making changes, both in terms of time and resources, are still at a manageable level. This is the only way of handling hardware-free project phases efficiently. The importance of simulation will continue to rise in the future—but in my estimation, purely virtual development will not be possible.

Michael Pfadenhauer

Michael Pfadenhauer (47) studied aerospace engineering at the Technische Universität München. After completing his post-graduate engineering studies, for ten years he held a managerial position in aerodynamics with Audi in Ingolstadt. He joined Porsche in 2005 and has headed up the aerodynamics/thermal management development area since then.

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What are the special aerodynamics requirements for Porsche vehicles?

Pfadenhauer We develop vehicles of extraordinary quality for extraordinary customers. The simultaneous achievement of all the typical Porsche juxtapositions of seemingly contrasting values, such as tradition and innovation, performance and everyday usability, exclusiveness and social acceptance, and design and functionality, is the embodiment of these standards. We want to develop products that deliver both low consumption and high performance, i.e. low drag for low consumption and yet high downforce at the same time for high performance on the track. Physics, unfortunately, binds the two in a rather unfavorable manner, such that high downforces are naturally associated with high drag. We could just throw up our hands and accept that that's just how it is. But we don't. At Porsche, the solution for this is known as adaptive aerodynamics, i.e. the targeted adjustment of the aerodynamics to the preferences of the driver or the operating mode. That means low drag when the intention is to drive economically and downforce when performance on the track is called for. Our vehicles can do both—that's what distinguishes us and is a part of the reason for the success of Porsche. The same naturally applies to the design: Both aspects have to fulfill the premium standard to the utmost to be regarded as a premium product on the market and succeed in that environment.

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To what extent do electrified vehicles present new challenges for aerodynamics development?

Pfadenhauer Due to the special characteristics of electric drive systems in automobiles, there is a shift in the loss distribution of the energy required to power the vehicle. The combustion engine is eliminated as a high source of loss, which brings the overall vehicle losses, such as rolling resistance and, in particular for faster electric vehicles, the drag, into the foreground. Moreover, the recuperation options mean that less importance can be given to the vehicle weight. The result is that for such vehicles, aerodynamics plays an even more important role than in conventional vehicles and is therefore an important factor for consumption and range, and thus ultimately for the success of the product. All of the manufacturers are aware of this, and if you look closely, almost all electric vehicles are equipped with special aerodynamic solutions. We pay attention to this issue as well, but when we go forward with it, then naturally with a typical Porsche solution. So you can look forward to finding out what we've come up with. ■