THE ENERGY BAR

TECHNOLOGY

NO REASON TO DOUBT: MENTAL AGILITY IS WHAT WINS RACES, AND IT WILL DETERMINE THE CARS OF THE FUTURE AS WELL. PORSCHE, THANKS TO ITS INNER VALUES, IS PREPARED FOR THE UPCOMING CHALLENGES.

An essay by **WOLFGANG PETERS** *on intelligent alternative drive systems.*

The cars of the future have come from racing—in light of the alternative drive systems on the horizon, this statement may sound surprising. But racing is a matter of mental agility, and Porsche was pursuing racing with engines and sports cars before the company existed in anything like its present form. That is why racing is one of the inner values at Porsche. To question proven technologies, to systematically surpass limits, and to bring concentrated stores of knowledge and experience as well as tradition to bear on the challenges of racing are the best prerequisites for the cars of the future, because the car of tomorrow will also be based on mental agility.

This is true especially when it comes not just to maintaining driving pleasure but also to increasing it wherever possible. And that requires smart solutions and creative intelligence. When the age of petroleum-driven economies nears its end, it will not mean the end of individual four-wheeled mobility. On the contrary, the drive systems of these cars will become even more sophisticated and efficient, with ever declining fuel consumption levels, or for that matter without combusting gasoline or diesel at all and thus emitting none of the associated harmful substances in their exhaust. The sources of propulsive power will not dry up but rather simply become more varied. We will greet the car of tomorrow with the casualness that comes from a new type of intelligence. And that of course applies all the more so to intelligent sports cars.

Because no one knows which drive system of the future will in fact attain a broad level of acceptance, development is currently proceeding on a number of different fronts. Perhaps there will be several different individual technologies and alternative drive systems, or a mixture of several different systems in one. But for the foreseeable future, an optimized combustion engine will be the dominant source of automotive power. A number of different drive strategies currently stand ready to power into the future. They go hand in hand with new overall automotive designs, which are more compact and lightweight and which are more closely tailored to specific applications.

In the hybrid drive system, a gasoline engine joins forces with an electric motor by means of an electronic-control unit (the first diesel hybrids are expected in late 2010 or early 2011). The electric motor draws its energy from a high-performance accumulator or battery that stores electricity. The accumulators and batteries are rechargeable and draw their power either from the combustion engine or from the electric grid (plug-in hybrid). Hybrid vehicles can recover a relatively small amount of power when in overrun mode or from (regenerative) braking.

Depending on the drive options, these cars can be either full or mild hybrids. Depending on their battery size and storage volume, full hybrids can drive short or long distances on purely electric power without using their combustion engines. The engine is activated automatically when the level of stored electric power dips below a defined lower limit. Mild hybrid vehicles cannot drive on purely electric power; instead, their motors provide a boost function for the combustion engine. This support function can also be used in full hybrids, for it is the source of the lower fuel consumption levels of hybrid drives: by means of an electronic-control system and with the help of the electric motor, the combustion engine usually can be driven under fuel-optimized conditions. Another advantage of hybrid technology is in the choice of a smaller combustion engine supported by the electric drive, or of high performance levels with low fuel consumption—a V6 hybrid can attain the output levels of a V8 gasoline engine.

The great benefit of an electric vehicle lies in zero-emission operations. Electric cars purr along nearly noiselessly without emitting harmful substances. Their energy comes from the electric grid and is stored in batteries (better described as accumulators on account of their rechargeability). One or more electric motors assume the drive function. Currently, nickel-metal-hydride batteries are being used. They offer a mature level of technology and relatively consistent operational qualities, albeit with a low energy density. The energy density is higher for lithium-ion batteries, which are expensive and saddled with complicated temperature management issues, thus restricting their use to high-tech vehicles.

All electric vehicles also share some disadvantages limiting their use: high battery weights that lower agility and handling, high storage-space requirements for the batteries, long charging times, and modest ranges. But in addition to their lack of ▸

Intelligent performance will determine the cars of the **FUTURE**.

Illustrations by Büro Lintentreu

emissions, the electric motor or motors feature another significant benefit for dynamic driving: their torque kicks in from the start, which means electric cars display impressive vehemence on the starting line as well as excellent acceleration properties.

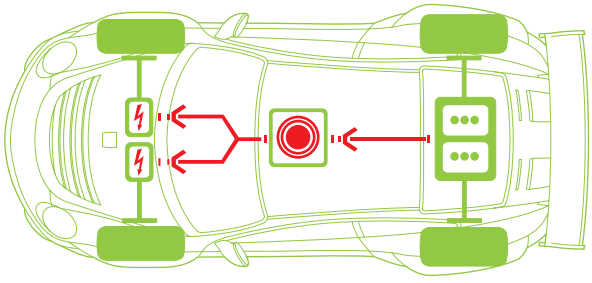
A mixed type of drive consists of an electric car with a small combustion engine (a range extender). This engine runs nonstop and charges the batteries via a generator, and thus does not power the car itself. This noticeably extends the range, and the engine can be operated at a constant rpm and at low fuel consumption levels.

The petroleum industry has great hopes for synthetic fuels. They are derived from renewable resources produced precisely for this purpose. Their properties can be modified to emit the lowest-possible harmful emissions levels during combustion.

The highest priority for the future has to be greater efficiency. Not least of all on account of its long racing history, Porsche has always taken greater efficiency as a standard. And that lies behind the performance levels typical of the brand. A Porsche car may never be ponderous, let alone sluggish. And we're not talking only about engine performance here. Powerful muscles alone are not enough; in keeping with typical Porsche characteristics, they are paired with lightness and nimbleness, agility and precision, the strengths of a long-distance runner combined with a spontaneous eagerness to accelerate and sprint. Uniting these qualities to drive into the future is one of the major challenges—for the essence of a Porsche automobile consists precisely in this special form of performance.

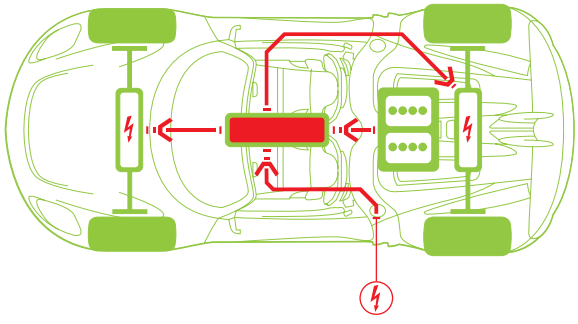
Although Porsche has not reinvented hybrid technology, it has rethought it with the intelligence specific to the brand, and come up with new solutions:

911 GT3 R HYBRID



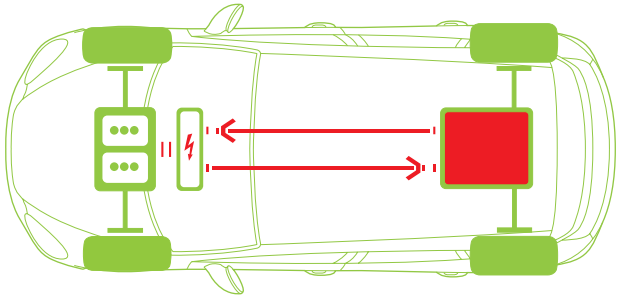
In the 911 GT3 R Hybrid, hybrid technology is reinterpreted with the help of a flywheel energy reservoir. Instead of the usual batteries, the flywheel stores the rotational energy that is converted into electric power and can be drawn on by the driver. Drivers therefore have not only the power of a four-liter six-cylinder boxer engine at their command, but also the power of two 60-kW electric motors that drive the front wheels.

918 SPYDER



The 918 Spyder is a concept car, high-performance sports car, and object lesson. Its hybrid technology is combined with a lightweight body design and the teamwork of a high-speed V8 engine and two electric motors on the front and rear axles with a combined power of 218 hp (160 kW). With its plug-in hybrid technology, the Spyder concept car can charge its batteries not only when it drives, but also with electric energy from the grid. It also recovers brake energy, which it then stores in the form of electric energy in the accumulators. This means the 918 Spyder can be driven purely electrically, without generating emissions where it is operated.

CAYENNE S HYBRID



The new Cayenne S Hybrid already makes use of fuel-reduction technology. The first standard-series Porsche with a hybrid drive combines greater power with lower fuel consumption. Its V6 engine is coupled with a synchronous electric motor that provides 47 hp (34 kW) and works together with the three-liter V6-compressor engine. This yields a system output of 380 hp (279 kW). The fact that the weight of the new Cayenne generation could be lowered by around 180 kilos (almost 400 lbs.) over its predecessor is part of the Porsche interpretation of performance.

The mental agility derived from racing is blazing new trails—especially for those who are making the cars of tomorrow viable for the future. With intelligence and performance, Porsche will ensure that the appeal of sports-oriented driving will continue, and will also become associated with the pleasures of saving energy. ◂

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