

CROSSFIRE

Want to get behind the wheel of a racing car? You already are. Jesse Crosse on how track technology is transforming BMW road cars



The look on Wolfgang Nehse's face is beginning to worry me. At dinner the night before he was relaxed but now his eyes have narrowed, the corners of his mouth turned down into a snarl. He's staring through the M3's windscreen, his gaze fixed on a point near the end of the racetrack's start-finish straight. He reaches for the stubby aluminium-trimmed lever, pushes it forward hard and mashes the throttle pedal into the carpet.

The M3's straight-six engine barks a swift response and within half a second is howling and snarling defiance at the hidden electronics keeping the wheels stationary on the smooth tarmac. I just have time for a nervous tweak of my safety harness before the clutch finally bites. And it starts – four laps of punishing, blistering, G-force-laden mayhem.

The M3 trails a line of smoking rubber as Nehse aims a swift prod at the stumpy lever of the Sequential M Gearbox and launches it down the first straight, its 321bhp engine

motorsport-inspired technology could be transferred to the cars we drive every day on ordinary roads.

BMW's history is full of examples of how its road cars have been adapted for racing. What is, perhaps, less appreciated is how lessons learned from track success have been ploughed back into the next generation of road cars to improve the bloodline. And it's not just M cars. Deliver the merest sliver from a 316i to a mechanic and he'll find motorsport DNA.

Today, there are as many motorsport-inspired options on road cars as there are colours. You can now have sequential paddle-shift gearboxes in dozens of models – not to mention the hundreds of engineering tweaks that have made it from the racetrack to production-car engines. More and more customers are grabbing Formula One-driven technology with both hands. One quarter of buyers of the new Z4 are expected to choose the sequential 'box.

FOUR LAPS OF PUNISHING, BLISTERING, G-FORCE MAYHEM – WITH A BMW ENGINEER AT THE WHEEL

unleashed in a joyous crescendo. With no clutch pedal, the shift into second seems instantaneous. My head snaps forward and back, neck muscles nowhere. I promise myself – again – I'll join the local gym once this is over.

We slam into the first right-hander, tyres howling in protest, my shin bones threatening to burst through my knee caps as Nehse hits the brakes. On the back straight I sneak a quick glance at Nehse's face and realise I'm in even more trouble than I thought. His determined snarl has softened into a smile. He's enjoying himself. He *likes* this.

The date was 1998, the track Oulton Park in Cheshire, but the memory lingers. It was a thrilling drive but that wasn't what impressed me most. What struck me at the time was that Wolfgang was not a racing driver but the chief engineer behind the Formula One-style Sequential M Gearbox (SMG) and we were on a test run, working out how this

How did we get here? To find out, you need to go back to the 1930s when BMW's 328s ruled the road as well as the track. In 1940 a streamlined version won the Mille Miglia outright. It set the tone for the future, creating the bond between road and track that has remained ever since. Fast-forward to the '60s and what do you see? Racing grids – and roads – full of all-conquering 'New Class' 2002s.

In 1972, the corporate horsepower kicked in with the creation of BMW M GmbH. The results were devastating, the 3.0 CSL becoming the most successful touring car of its era winning six European Championships between 1973 and 1979. In 1978, the dedicated sports subsidiary also built the M1 GT. It was the first racer from BMW not to be based on a production model but its fabulous 24-valve straight-six engine would later appear in road-going versions of both the M635 CSi and the first M5 in 1984. Not surprising,



BMW's huge investment in F1 pays off in road cars

HALF A CENTURY – NO HALF MEASURES

Fifty years of performance peaks, in pictures



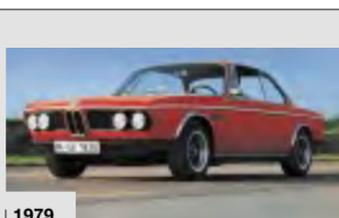
1940

Streamlined BMW 328 wins the Mille Miglia



1969

Dieter Quester wins European Touring Car Championship in a BMW 2002



1979

A BMW 3.2 CSL wins the European Championship in the hands of Carlo Facetti and Manfred Finotto for the sixth time since 1973. BMW launches M1 Pro Car Series



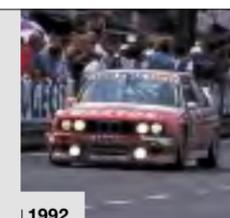
1983

Nelson Piquet becomes F1 World Champion driving a Brabham-BMW



1984

BMW M5 and M635 CSi launched in Germany powered by the 286bhp, 3.5-litre six-cylinder engine from the M1



1992

286bhp, six-cylinder M3 is launched



1995

McLaren F1 GTR wins Le Mans, powered by a BMW V12 engine



2000

BMW enters Formula One

NATIONAL MOTOR MUSEUM, GETTY, LAT, SUITON



One for the road: the M3 CSL

then, that in the 1980s BMW's motorsport and performance road car activities reached a peak.

The first M3 arrived in 1986. Powered by a 200bhp, 2.3-litre, four-cylinder engine, it caused a storm on the track and on forecourts. Albert Biermann, head of development for sport and touring cars, recalls: 'The reaction was amazing. What drivers liked most was the car's extraordinarily stiff bodyshell. It had a new, welded steel roll cage whereas, until that time, most people favoured aluminium pipes bolted to the car. We learned a lot from that and soon transferred the concept into road cars.' If you have ever wondered why your car grips the road so firmly, it's thanks, in part, to that first M3.

There was another landmark in the 1980s. The cylinder block on the 1.5-litre turbocharged grand prix car that took Nelson Piquet and his Brabham to a driver's championship

win in 1983 used technology previously seen in the 2002 road cars. Engineers were transferred from production cars to F1 to build it. The tricks they learned during their stay in motorsport they took back into road car development.

And boy, did they learn some tricks. They tested the F1 engines to destruction and succeeded spectacularly. At 1,440bhp, the F1 powerplant was around 14 times more powerful than its road-going brethren. On a recent visit to the BMW Motorsport engine development centre in Munich, I noticed that the technicians had kept trophies of those days atop filing cabinets and anywhere else they could find a space – lots of little engines personally, methodically and spectacularly blown to pieces by Nelson Piquet, just to prove that while 1,440bhp was possible, 1,441bhp was not. More practically, the engineers made

Hands-on experience

The SMG gearbox Wolfgang Nehse used to rearrange my internal organs on that fateful Cheshire day in 1998 was the first cut of what has turned out to be a hugely popular option on the M3. It started life as a conventional six-speed manual gearbox but with the addition of a high-speed computer and a number of tiny actuators, was transformed into a sequential, racing-style device capable of shifting gear in a couple of hundred milliseconds – quicker than the time it takes to blink.

With SMG there is no clutch pedal. Instead, the clutch is opened and closed under computer control when the driver nudges a short, stumpy, gear lever or pulls on Formula One-style paddles just behind the steering wheel. The gearbox and engine computers work together so the driver can 'shift-by-wire', even at full throttle.

Mario Thiessen says in good hands the SMG box is the fastest and best way to change gear. 'There is no question that keeping both hands on the wheel while changing gear works in

motorsport,' he says. 'It is a sports feature but it also increases safety and, in the future, may become even more commonplace in road cars.'

Some said BMW's first-generation SMG was too slow. On the second-generation SMG, the paddle-shifts work even faster – in an astonishing 80 milliseconds – and, as in the BMW Williams F1 car, there are 'shift lights' signalling the optimum gearchange point.



Box of tricks: gear changes faster than you can blink

sure a variant of the engine was built into the 316i and 318i.

Recently, successes on track took a different turn. In 1995 a BMW V12-powered McLaren F1 won Le Mans. Armed with the experience, BMW returned in 1998 with the all-new V12 LMR to win outright. It's another example of BMW people working across sports and production boundaries.

In 2000, BMW returned to F1 with a new V10 powerplant. Modern F1 engines have reached a level never seen before, a combination of feather weight and outright power that regularly catapults Ralf Schumacher and Juan Pablo Montoya directly to the podium.

'This time around,' says Mario Thiessen, BMW's head of motorsport, 'we could not use a production engine for the F1 project. The demands are too high. Despite that, BMW's return to F1 would not have been possible without the

synergy between racing and production technology.'

Thiessen is talking about long-standing family values. In the same way BMW production car engineers propelled Nelson Piquet to a spectacular victory almost 20 years ago, so today, the brains behind the electronics controlling M engines do the same job on the V10. Crucial elements of the V10 come from the plant that makes regular BMW engines. Processes developed for the race engine have subsequently been applied to the power units of the M3, M5, Z8 and even the 4.0-litre V8 diesel sold in Europe.

The paths of motorsport and road car development cross at the research centre in Munich known as the FIZ, the German initials for Research and Innovation. Some of the techniques practised there come straight from the realms of science fiction. Rather than render ideas on paper, engineers

can 'print in 3D'. Computer-controlled lasers create solid objects in liquid resin which can then be tested quickly. This technique has been put to extremely good use on the F1 engine whose design changed between every race in its first season. It also means that new ideas can quickly be introduced in road cars.

A good example is the high-performance M3 CSL, hothoused to perfection in the FIZ. 'It's a perfect illustration of how technology developed for motorsport has transferred into a road car,' says Gerhard Richter, project leader for M cars. 'The design of the suspension, choice of

tyres and use of lightweight construction and materials are all drawn from our racing heritage. And as we use these things more often, they will become less exotic, cheaper to make and then we can begin to use them across the rest of the range.'

Like that day at Oulton Park it sounds good but it also makes sound business sense. Any company involved in motorsport – especially F1 – has to ensure a return on the investment or risk wasting huge amounts of cash.

In BMW's case, the investment has paid off, not just now, but for more than half a century.



Future perfect

To see how motorsport technology could make further inroads into production cars, look no further than BMW's technology office in Palo Alto, California. Its technicians are the brains who come up with the kind of advanced electronic equipment BMW drivers now enjoy, including the 7 Series' driving concept iDrive.

Their latest project is installing a fighter pilot-style head-up display in Ralf Schumacher's F1 helmet. A tiny projector displays images with key information into Schumacher's line of sight using a 6x8mm screen built into the visor. There are no plans to bring the display into series production but technicians at Palo Alto never say never.