



A milestone in mobility: MAN drove the first truck with diesel direct injection 90 years ago

Munich, May 22, 2014

The new process made the diesel engine compact and light enough to fit in a motor vehicle

On 12 March 1924, MAN engineers Sturm and Wiebicke set off from the factory at Augsburg, headed for Nuremberg in an M.A.N. Saurer truck. The 4-tonne platform truck was powered by an experimental diesel engine which for the first time injected fuel directly into the four cylinders.

With around 40 HP in available output, the test drivers managed to complete the 140-kilometre trip in five and a half hours. This successful drive was a baptism of fire for technology that enabled the economical diesel engine to be built compactly enough that it could be used in motor vehicles for the first time.

The direct-injection process is of fundamental importance, says Bernd Maierhofer, Executive Board Member for Research & Development at MAN Truck & Bus: "The first MAN with diesel direct injection represents a milestone in engine technology. You can still see its massive impact today: every modern diesel engine, whether it be for a car or truck, uses the principle of direct injection. Its latest incarnation is common-rail injection. We use it in all MAN diesel engines as it allows us to efficiently control the combustion process in the cylinder."

The solution: Injector pump and injection nozzles

Rudolf Diesel patented the first diesel engine in 1897. Up to the mid-1920s, diesel engines were only used as static engines in factories or for powering ships, on account of their size and weight. The first M.A.N. Saurer trucks and buses were fitted with petrol engines.

In 1919–1923, MAN continued to work on developing diesel engines for use in motor vehicles. Two major technical issues needed to be solved in the development of the diesel engine for commercial vehicles: firstly, the drive technology had to be reduced in size so that the engine could fit under the bonnet, and secondly, it was necessary to dispense with the

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The MAN Group is one of Europe's leading industrial players in transport-related engineering, with revenue of approximately €15.7 billion in 2013. As a supplier of trucks, buses, diesel engines, turbomachinery, and special gear units, MAN employs approximately 53,500 people worldwide. Its business areas hold leading positions in their respective markets.



heavy, power-hungry high-pressure compressor. Its purpose was to compress the air needed to force the fuel into the engine cylinders.

Fuel injection without air injection was a major step forward. The combustion air is compressed to 20 units of atmosphere (20 bar) inside the cylinder by the upward movement of the piston, which causes it to heat up intensely. The fuel is injected into the highly compressed air. The combination of the fine atomisation of the fuel and the high temperature of the gas causes the mixture to ignite.

Injecting the fuel into the compressed air in the cylinder could only be achieved by using a mechanical injector pump to force it into the injection valves under very high pressure. The injection valves atomise the fuel into tiny droplets, thus increasing its combustibility. A high degree of precision was needed to build the injector pump, which was manufactured by MAN itself.

The arrangement of the valves was also a crucial factor in the success of the direct injection process. In the new M.A.N. engine, the fuel was injected through two open nozzles set into the sides of the cylinder head. The tangential alignment of the nozzles allowed the injected fuel to mix with the compressed air within the engine.

The first three experimental engines were built in Augsburg in 1924 and successfully tested in a truck and a motorised plough. These first diesel engines with direct injection had a 105 mm bore, delivering 35 to 40 HP at 1,000 rpm and weighing in at around 420 kg.

Premiered at the 1924 Berlin Motor Show

In the first half of the year, the test truck covered 2,500 kilometres before MAN showcased its innovation at the Berlin Motor Show on 10–18 December 1924.

Engineer Sturm insisted on driving the lorry to the Berlin exhibition centre in person. The journey from Nuremberg took him two days. There were no breakdowns on the way, apart from some dirty valves. "Trip completed satisfactorily," wrote Sturm in a telegram to his MAN colleagues in Augsburg on his arrival.

Public and motoring press alike were impressed. The magazine of the German Association of Engineers delivered its verdict: "In the whole field of lorry engines and associated fuel matters, the MAN compressor-free diesel



engine is surely the most significant innovation ever to be seen at the exhibition." The engine exhibited at the Berlin Motor Show in 1924 can now be seen on display at the Deutsche Museum in Munich.

Direct injection goes into series production

Following the success of Berlin, the way was open for the serial production of the new Series D 1580 B diesel engine to begin, and thus for the mass production of diesel engines for commercial vehicles at MAN. The first customers were Kraftverkehr Bayern and the Reichspost in Munich, Augsburg and Nuremberg, who each took receipt of a vehicle diesel engine for trial purposes. The first customer to take a truck with a diesel engine was the "zum Hasen" brewery in Augsburg. This first beer lorry was in service in Augsburg for decades without any major issues. The first diesel bus engine was acquired by the Reichspost in 1925.

Two sales points were obvious right from the start: the low vehicle weight of the engine and the massive 80% savings in operating costs compared with the conventional carburettor engines of the time. These were arguments that customers found very persuasive even in those days. By the mid-1920s, demand in the truck division had increased to such an extent that all production of diesel engines for commercial vehicles was moved to the specially-expanded Nuremberg plant.

To this day, Nuremberg remains MAN's centre of excellence for engines. All engines for the entire production range are developed, tested and, to a large extent, manufactured and assembled there.