175 years of German railways

Eternal pulling power of the diesel

It's July 7th 2010. Conductor Markus Schäffler waves the green lollipop to signal that the Interregio 4231 from Friedrichshafen to Lindau is clear to depart. He is following a well-practiced routine he has been used to for many years.

But let's take a look back in time. To 7th September 1835. William Wilson has dressed smartly for this occasion. He's wearing a black tailcoat and top hat. It's a special day for him because he is to have the honor of driving Germany's first steam locomotive. The train leaves Nuremberg station to the cheers of a crowd of onlookers and arrives in Fürth six kilometers distant exactly 14 minutes later. The railway enabled people to travel and goods to be transported more quickly and easily than before and made way for the industrial revolution. But not everybody cheered its arrival. Many were skeptical and even afraid of the smoke-spewing, steam-spitting monster rushing along at the dizzying speed for the time of 30 kilometers per hour in the days before diesel engines had even been thought of. Doctors even warned of the dangers of "delirium furiosum", a state of mental unrest that might be brought about by train travel. But the march of the railway was not to be resisted.

So climb aboard for a train ride through 175 years of German railway history. We will be stopping at every place along the way where MTU engines played a part in making that history.

1835 | 1933 | 1952 | 1953 | 1956 | 1957

The MD engine (MD stands for Maybach diesel) is Maybach's first modular engine and far ahead of its time. Along with its precombustion chambers, its pioneering design features include the fuel injection system developed together with L'Orange, in which pump and injector are combined in a single unit. That enables the high-pressure fuel lines previously required to be dispensed with and short injection periods to be achieved at moderate pump pressures.

1933: Trains learn to fly. Cheering crowds and incredulous faces at Hamburg's central railway station. They have all come to see the unimaginable with their own eyes. Less than two and a half hours ago, the world's first streamlined train set off from Berlin – not pulled by gigantic steam engines but driven by Maybach GO-5 diesel engines. Driven by the equivalent power of 820 horses, the train reaches the incredible speed of 160 kilometers an hour and completes the 268-kilometer trip in precisely 138 minutes – a sensational achievement which earns it the name "Fliegender Hamburger". Karl Maybach has already unveiled a 150 hp diesel engine nine years previously at the international railway show in Seddin near Berlin. But for use on main lines, the railways demand that the engines are more powerful. So Maybach produces the 410-hp GO-5 unit. His engineers also take account not only of the immediate engine peripherals such as its mountings, air and fuel supply, exhaust and cooling systems, but also of the train cooling system and the transmission. And Maybach makes use of the Zeppelin airship company's wind tunnel to develop an aerodynamic power car. Those tests result in the streamlined shape that helps the "Fliegender Hamburger" set its record and which is later copied by many other manufacturers.

1952: V 80 breaks new ground. The V 80 mainline locomotive introduces a new era in locomotive design after the Second World War. It is the first new design brought in by Deutsche Bundesbahn and rates as a pioneering development with its universal-joint driveshafts, one-man operation and multi-unit control for twin traction and push-pull trains. Although only ten examples are ever built, they form the basis for all future development by the German railways in this area. The V 80 is the first Deutsche Bundesbahn locomotive to be driven by a Maybach MD engine.

1953: Birth of a legend. They have gone down in history. Railway enthusiasts all over the world go misty-eyed at the sight of a gleaming, deep red V 200 locomotive. Virtually no other Deutsche Bundesbahn locomotive so perfectly reflects the image of the German railways in the post-war period. It is the symbol of the modern railway and the structural transformations in the period of the "economic miracle". Power unit: twin 1,000-hp Maybach MD 650 engines, Mekydro gearbox and axle reduction boxes. The arrival of the V 200 also marked the end of the age of steam in Germany. Diesels were more economical to run, adapted better to the changing demands of train size and route profile and were ready for service more quickly as they didn't have to spend hours building up steam.

1956: Diesel power for shunters. For shunting duties too, the now aging steam engines are phased out because of their increasing unreliability, and replaced by diesels. Virtually all major locomotive makers were involved in the development and production of the V 60, the first diesel shunter. Maybach supplied its 650-hp diesel engine, the GTO 6.

1957: Start of an era. At the beginning of the summer timetable on 2nd June 1957, Deutsche Bundesbahn and four other West European railways introduces a new class of train for cross-border routes within Europe, the Trans-Europ-Express or TEE. Its most famous representative is the VT 11.5. In each power car it has a Maybach MD diesel engine rated at 1,100 hp. Built initially only for international services, the trains are incorporated into the intercity services from 1971.

1958: Rugged branch-line workhorse. The V 100 is the epitome of the branch-line locomotive. It is a rugged engine capable of coping with steep inclines and just as happy on heavy shunting duty as on light to medium-duty passenger and goods services. It is powered by a Maybach MD 650 diesel unit capable of 1,000 hp.

1964: Power of engines grows. Rail diesel engine power ratings rise to 1,900 hp and more. The German railway starts developing a single-engine, medium-heavy mainline diesel locomotive with a top speed of 120 kilometers per hour. It makes its debut in 1964 as the V 160. It is driven by an MTU Series 538 diesel engine.

1968: MTU engines drive the world's most powerful locomotives. The Deutsche Bahn 218 Class is a member of the V 160 family. It is the last to be developed. There are still several hundred of them in service today. No successor is on the horizon as most of the passenger trains pulled by 218 Class locomotives have been changed over to diesel multiple units. The Class 218 is the most powerful diesel locomotive to be procured by the German railways in large numbers. That power is provided in the beginning by 12-cylinder MTU Series 956 engines producing 2,060 kilowatts. Later on, many of them are repowered with 2,000-kilowatt Series 4000 engines.

Railways are booming not only in Germany but all over the world. And diesel engines prove themselves to be economical, powerful and reliable. Twenty diesel-hydraulic Henschel locomotives enter service in China. They remain the most powerful of their kind to this day. They too are driven by twin MTU Series 956 engines. The two 12-cylinder units produce a combined power output of 3,970 kilowatts (5,400 hp). Some years later, diesel-electric locomotives with MTU engines climb the 4,800-meter Condor Pasa pass in Bolivia. It is a record. Until the construction of the Tibetan Railway, this was the highest railway line in the world. MTU engineers tune the 956's turbochargers so that they still produce enough boost even in the rarified high-altitude air to ensure there is enough power to drive the locomotive. Many of those locomotives are still in use today and their engines have clocked up well over 100,000 hours of duty over the years.

1996: Series 4000 becomes top seller and record-breaker. In 1996, MTU unveils the Series 4000. It is the world's first high-performance diesel engine to feature the advanced common-rail fuel injection system that can infinitely vary

1958 | 1964 | 1968 | 1996 | 1997 | 2002 | 2010

1 MTU's Series 4000 engines are used to power locomotives. Launched in 1996, the Series 4000 engine was the world's first high-speed diesel engine equipped with Common Rail injection.

2 Complete packages: PowerPacks comprise the engine and drive peripherals and are installed in the railcar.

injection timing, volume and pressure. That makes it possible to control combustion much more precisely and so run the engine more economically. For a locomotive that covers 130,000 kilometers a year, that is a decisive advantage. "The engine uses substantially less fuel than its predecessor to produce the same level of performance. That means the operators are saving a large proportion of the running costs," explains rail applications expert Klaus Peiler. The Series 4000 rail engines have become an unqualified sales success in the 14 years since they first appeared. More than 3,000 of them have so far been bought by train operators all over the world. In 2002, the multiple-unit train made by Spanish manufacturer Petentes Talgo S.A. and powered by two 1,500-kilowatt (2,040 hp) Series 4000 engines reaches a speed of 254 kilometers per hour on the high-speed rail link between Madrid and Barcelona. It is a world record that still stands to this day.

1997: Integrated solution – the MTU PowerPack®. Railcars are being used more and more widely on regional services. They are lighter, more convenient and more attractive for local passenger services than large locomotives. MTU is the first supplier in the world to offer compact power modules as underfloor traction units for them. These integrated solutions consist of an initially 275-kilowatt, and later 315-kilowatt, MTU Series 183 engine, gearbox or generator, hydraulics, cooling system, oil and air filter systems, exhaust system, compressors and many other peripherals required for traction and electrical power supply. All components are mounted on a rigid subframe with all wiring and piping ready connected up. Because of its "4-pin suspension", the PowerPack is quick to fit and replace and the design, production and installation work for the railcar manufacturer reduced to a minimum. The traction modules can also be more efficiently serviced. The PowerPack is removed and serviced while the train remains in service with a replacement unit. The first railcar with an MTU PowerPack to be used on German railways is the VT 664, a Talent-class design produced by Bombardier. Two years later, the Siemens "Desiro" railcar is also equipped with an MTU PowerPack.

2002: PowerPack performance increases. The concept of an integrated traction module for railcars in the shape of the PowerPack has proven itself and MTU develops it further. The units are now offered with Series 1800 engines that come in a choice of four power ratings ranging from 315 to 390 kilowatts. Those additional reserves of power make it possible for railcars to accelerate more quickly and so cope with changing route profiles with increasing numbers of stops. One of the biggest PowerPack buyers is Alstom. The LINT local service railcar designated the 640 Class by Deutsche Bahn is one of the designs to feature the new MTU PowerPacks.

2010: The future of rail engines. Diesel engines have to become more environmentally friendly. That is not just a legal requirement, it is an aim pursued by MTU for many years. At the world's biggest rail industry show, Innotrans in Berlin, the company presents an advanced version of the Series 4000 rail engine that answers that demand with the aid of optimized combustion, cooled exhaust recirculation, two-stage turbocharging and a diesel particulate filter. Not only does it produce substantially lower particulate and nitrogen oxide emissions than its predecessor, it also requires less fuel. It will be used for the first time in a Deutsche Bahn freight locomotive as part of the CleanER-D project in 2011. A few months after that, MTU will be trialing a hybrid traction system in a Deutsche Bahn railcar for the first time. It consists of a diesel engine combined with an electric motor. The electric motor is used for starting off and driving at low speeds but the internal combustion engine is more efficient at steady higher speeds. When braking, the electric motor becomes a generator and uses the braking energy to charge its batteries. This type of system offers major advantages on local services with frequent braking and station stops. And it doesn't just lower the fuel consumption considerably. The typical rumble of the diesel engine as the train enters the station, stands at the platform and moves off again is also removed because in those situations only the electric motor is used. What a difference in passenger experience from the "smoke-spewing monsters" of the age of steam.

So here we are at the end of the 175-year journey through the history of German railways. Despite airborne competition and endlessly growing numbers of vehicles on the roads, trains are a long way from being obsolete. In 2009, the railways in Germany carried more than 1.9 billion passengers, traveling almost 77 billion kilometers in the process.

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MEMO

Standard time for standardized timetables

The importance of the railways in Germany is evidenced by many things – one of them being the time. Whereas, before the age of the train, the time of day was determined individually by the position of the sun at every location, once the railways were established a standard time was required. In order to be able to produce interregional timetables, the large railway companies introduced their own railway times in the second half of the 19th century, while otherwise people continued to organize their day-to-day lives by their local times. Not until the introduction of Central European Time (CET) on 1st April 1893 was there a standard time for the whole of Germany.