ERTMS DEPLOYMENT IN GERMANY

ERTMS the basis for digital rail program

Germany is located in the heart of Europe and is therefore a central node of the European railway network with borders to many countries. There are 6 ETCS corridors crossing Germany, thus Germany forms the hub in rail traffic for people and goods and plays an important role for the deployment of ERTMS in Europe. Whilst many countries have already started implementation of ambitious ERTMS roll out programs, Germany is now pushing the implementation of ERTMS. In 2018 Deutsche Bahn has introduced its ambitious program "Digitale Schiene Deutschland" (digital rail Germany) which is based on the rollout of ERTMS on the railway network in Germany.

Status of ERTMS deployment in Germany

Germany a pioneer in ERTMS

In 1997 it was decided to equip the first line, Halle/Leipzig-Berlin, with ETCS Level 2 in Germany. More than 1.100 balises were installed on this 155km long line and 4 radio block centers (RBC) were connected to existing electronic interlocking. On July 7th, 2003 for the first time in Europe an ERTMS-controlled passenger train operated at a speed of 200kph between Jüterbog and Bitterfeld. Germany became a technical pioneer in the testing and development of ERTMS in Europe.

Deutsche Bahn has subsequently tested ETCS Level 1, Level 2 as well as ETCS L1LS systems on its network between Berlin - Frankfurt/Oder. All operational systems were evaluated under real operating conditions.

Where is ERTMS deployed in the Germany?

The Federal Republic of Germany notified the early migration plan in 2003 or first national deployment plan in 2007 with projects like Southern Berlin outer ring, Aachen-Belgium border, the POS Nord, Ludwigsfelde-Leipzig and Nuremberg-Ingolstadt-Munich. performance of rail transport by levelling the playing field between road and rail transport.

How about ERTMS fitted Rolling Stock in Germany?

A significant number of rolling stock is being equipped with ERTMS in Germany. The majority of the so called "White Fleet" – the long distance passenger high speed trains of Deutsche Bahn – have been retrofitted with ERTMS already. The fleet comprises of more than 186 high speed trains of several classes – "ICE 1", "ICE 3" and "ICE –T" trains. The trains are the backbone of the high speed long-distance passenger transportation network (ICE) in Germany with additional links to its neighbourhood countries like Switzerland and France for example.

In 2010 Deutsche Bahn ordered the next generation trains which are equipped with ERTMS by default. The new train class is branded with "ICE4" and enlarges the existing ICE fleet by 119 vehicles and also replaces the obsolete Intercity (IC) trains for medium and long distance operation. On the other hand, Deutsche Bahn also drives the modernization of its cargo fleet. A frame contract covering the delivery of 450 ERTMS fitted locomotives has been awarded in 2013. Beside of these major investments into ERTMS onboard continuing fitment of yellow fleet and existing rolling stock can be seen. The number of ERTMS fitted vehicles will continuously increase in the future along with further deployment of ERTMS lines in Germany.

Travelling with 300kph from Leipzig to Erfurt - with European Train Control System

As part of the so called VDE 8 "German Unification Traffic" program, the new high speed line Erfurt / Leipzig / Halle went into commercial service at the timetable change in December 2017. The new line has been equipped with the European train control system ETCS Level 2 Baseline 2 without line side signals and without legacy "fall back" system. This shows the maturity of ERTMS in function and marketwise. Real interoperability is demonstrated since the supplier of trackside equipment and the ERTMS onboard units are supplied by different companies.

Does ERTMS provide a solution to all cross-border traffic problems?

In 2018 Deutsche Bahn has launched its ambitious program "Digitale Schiene Deutschland" (digital rail Germany) which is based on the rollout plan of ERTMS on the railway network in Germany. The main target of this program is to achieve performance increase – by increased throughput of the lines, a higher level of quality – by reducing delays and last but not least an improved efficiency of the rail infrastructure. With the digitization of the entire rail network, Deutsche Bahn aims to increase train capacity by up to 20 percent and thus allow thousands of additional trains per day. This target can only be achieved if the infrastructure is equipped with the most modern control and safety technology - ERTMS. Deutsche Bahn sees this program as a key element in implementing the transport policy goal of getting more traffic onto the rails.

From 2023 to 2030 Deutsche Bahn plans to equip large parts of the network with digital interlockings and ETCS Level 2. The remaining infrastructure shall be modernized by 2037. Automatic train operation (ATO) is also an important pillar of the digitalization strategy of Deutsche Bahn. In 2018 a project for S-Bahn Hamburg has been started with the aim to implement ATO over ETCS on a 23 km segment of the S-Bahn's rail network. The project comprises the installation of ETCS Level 2 including adaptations on the trackside as well as equipping 4 trains for automated operation. The realisation date of the project is planned for 2021. The project is seen to contribute to the further roll out of the ATO over ETCS technology in Germany. The pilot and lighthouse project for the implementation of ETCS Level 2 and ATO in Germany will be the Stuttgart-Ulm Rail Project (a.k.a. "Digital Rail Node Stuttgart") which comprises the equipment of commuter ("S-Bahn") and regional railway lines and the corresponding rail vehicles in the Stuttgart region.

The spark that ignited the considerations around 2015 was the increasing load on the already heavily loaded S-Bahn main line. Instead of the costly replacement of conventional light signal technology, as initially planned as part of Stuttgart 21, the fundamental decision was made after a thorough investigation in 2019 to use ETCS Level 2 and ATO in order to run more trains with less delays. Building on this, the Stuttgart 21 project partners jointly decided on April 24, 2020 to equip the adjacent long-distance and regional lines with ETCS Level 2 and ATO as well. This will involve the retrofitting of several hundred traction units and also include a tender for the supply of 128 additional trains for the Stuttgart-Bodensee network. In a first step, around 125 kilometers of track will be equipped with ETCS Level 2 and ATO by 2025 - twice as much as previously planned with Stuttgart 21. The rest of the region will follow by 2030, at least as far as today's S-Bahn terminal stations. Step by step, new technology will be installed and successively further optimized to enable more trains to run with less delays.

Automated Train Operation (ATO) is used in the Digital Node Stuttgart in Grade of Automation 2 (GoA 2). The ATO system works like a kind of remote-controlled cruise control: The track tells the train when it should be at which location. The on-board unit regulates the speed accordingly. In the event of a delay, the train is driven at the maximum permitted speed; if the train is running according to schedule, the system saves as much energy as possible. At platforms, ATO enables high-precision stops. The driver is on board, monitors the journey and can intervene at any time. Based on ETCS, ATO enables high-precision driving. This prevents delays and shortens the distance between two trains. ATO is put into service according to ETCS. For both ETCS and ATO, trains and lines are in constant communication via encrypted radio links. The continuously transmitted data enables much more precise control of railroad operations. For ETCS Level 2, the existing GSM-R mobile radio system of the railroad will be used first. In areas "without signals" the system will be completely redundant - the first time in Germany: Both the failure of a radio station (BTS) and the failure of a higher-level switching center (BSC) have no effect on operations. For ATO, public mobile radio (4G/5G) is used initially. By 2030, both ETCS and ATO are to run via the new 5G-based railroad operations radio FRMCS.

In addition to the Digital Rail Node Stuttgart project, the following two projects are on top of the agenda of the digital rail Germany programme:

- The highspeed line Cologne Rhine Main
- The TEN-T corridor SCAN-MED

According to a feasibility study by the Federal Government, the digital rail Germany programme will require investments of around 4.7 billion Euros by 2030. The first three projects mentioned above will start in 2023 and require 570 million Euro.

SUPPLIERS