

Rail industry Clean public transport experiences a revival



The effective movement of goods and people is essential for economic growth and prosperity. Electric railways can provide cities and industries with affordable, dependable transportation, while at the same time minimizing CO₂ emissions and pollution. ABB provides reliable, innovative and energy-efficient technologies to rail suppliers including rail infrastructure, rolling stock, signaling and telecommunication systems.

The rail industry is benefiting from environmental concerns, rapid urbanization and the need for greater and faster mobility of people and freight, especially in emerging economies. Rail is also proving a popular alternative to road transport in a climate of volatile fuel prices.

Studies on the impact of different modes of transport show that railways perform best on a wide range of measures. These include CO₂ emissions, energy consumption, noise pollution, capacity in urban and intercity transport, footprint and security. Such benefits have triggered renewed interest in the rail industry, providing governments and private investors with an impetus to invest further in infrastructure, rolling stock, control systems and services in recent years. As a consequence the world market for the rail supply industry has increased to an average of \$175 billion a year during the period 2007-09, as compared with an average of \$157 billion a year over the period 2005-07.¹ This growth is expected to continue in the coming years, reaching \$198 billion by 2016.²

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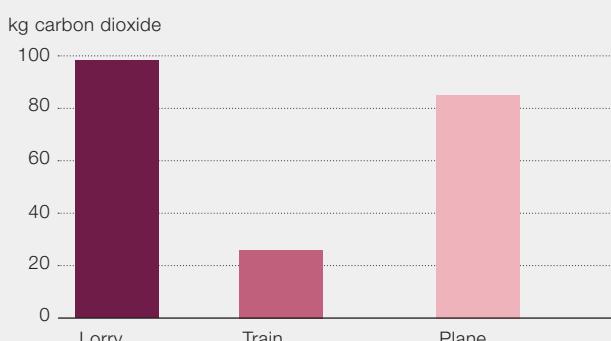
The main drivers for this 12 percent increase are massive orders in China for the build-up of VHS (very high speed), mainline and urban networks. Many other countries, notably France, Italy and Spain, have also expanded their VHS networks, while countries such as Russia and Turkey have initiated the construction of theirs. It is, however, the accelerated expansion of China's network that has had the greatest impact. So rapid is the growth in the Asia/Pacific region, that it has not only overtaken North America but also Western Europe to become the largest total market for rail supply, a development thought unlikely before 2015/16. However, since only about 70 percent of the current market is accessible to non-domestic companies, Western Europe remains the largest rail supply market in the world, followed by Asia/Pacific, where China and India show limited accessibility for some product segments. Overall, the Commonwealth of Independent States (CIS) ie, former Soviet Republics, exhibits the lowest accessibility rates.¹

A compelling environmental case

Global CO₂ emissions from transport have grown by 45 percent from 1990 to 2007, led by emissions from the road sector in terms of volume and by shipping and aviation in terms of highest growth rates. The transport sector represents 23 percent (globally) and 30 percent (OECD) of overall CO₂ emissions generated by fossil fuel combustion. The sector accounts for approximately 15 percent of global greenhouse gas emissions and is expected to continue to grow by approximately 40 percent from 2007 to 2030.³

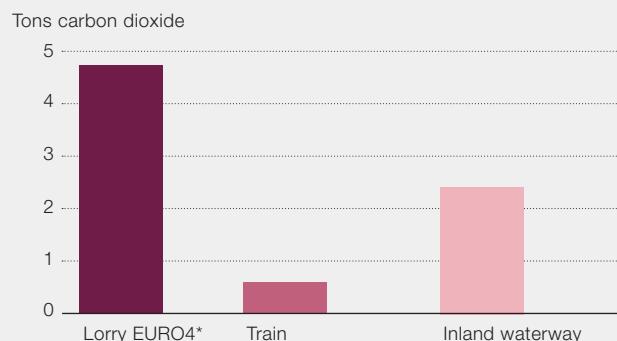
In the European Union, transport is responsible for about one quarter of all CO₂ emissions, and more than 90 percent of total domestic transport emissions are due to road traffic.⁴ Transport is the only sector in the EU as a whole that shows increased greenhouse gas emissions since 1990.

CO₂ (1 person Berlin - Frankfurt, 545 km)



Note: Plane emissions include travel to and from the airport; they are not increased to take into account the effect of emissions at high altitude. Source:www.ecopassenger.org, 2008

CO₂ (100 metric tons cargo, Basel-Rotterdam, 700km)



EURO4: EU emissions standard for light commercial vehicles, defined December 2006 Source: www.ecotransit.org, 2008

Studies have also shown that rail is by far the most energy-efficient form of transport. In a study of freight and passenger transport on two European routes, CO₂ emissions generated by passenger rail travel were found to be at least three times lower than those of either road or air transport, and the savings were even greater on freight transport (see graphic). In Europe, 80 percent of rail transport is powered by electricity (measured in passenger-km and metric-ton-km), which increasingly comes from renewable sources.

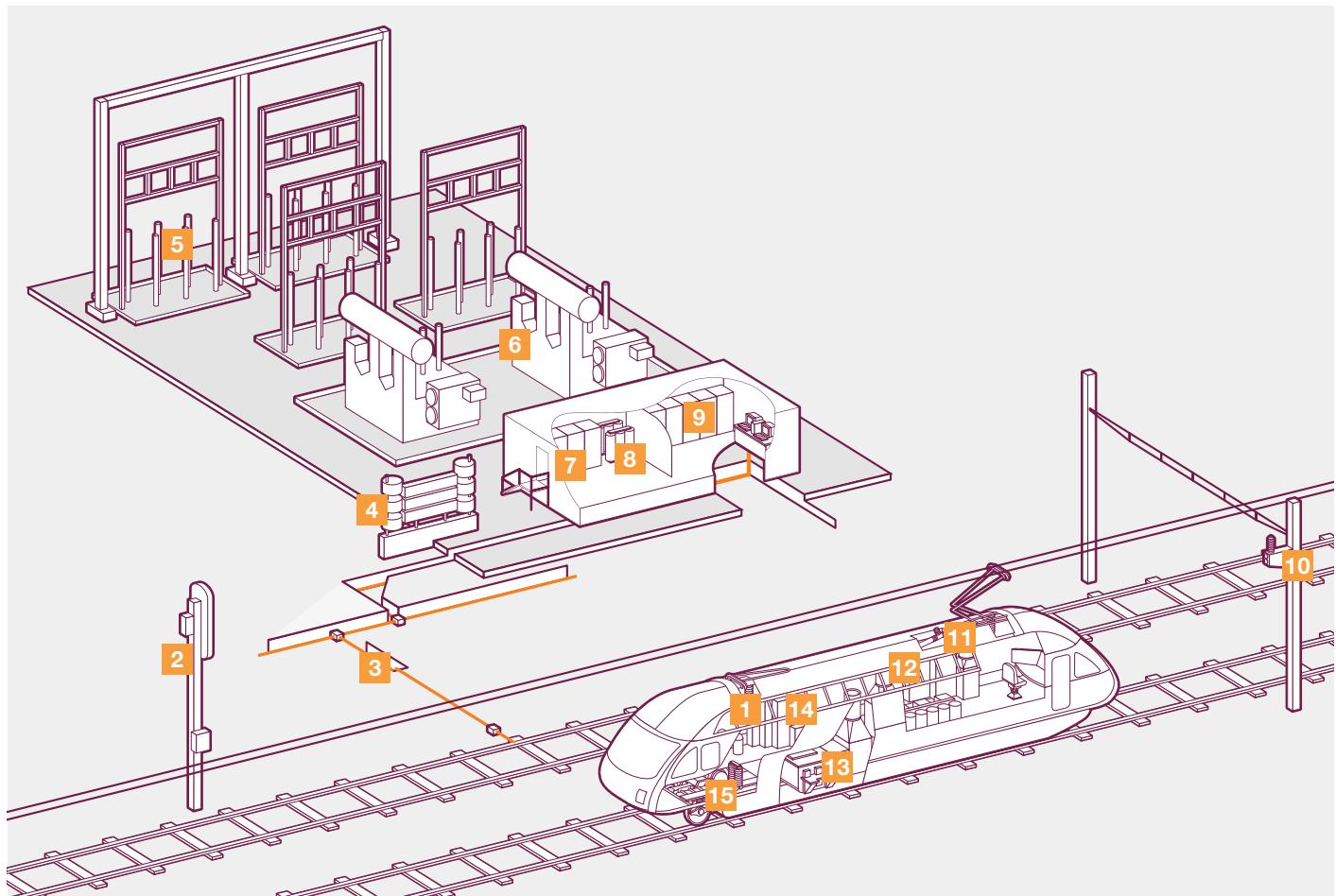
Rail facilitates urbanization and cuts in urban pollution

Between 2005 and 2030, the world's urban population is expected to grow by an average of 1.78 percent annually, nearly twice the rate of the world's total population.⁵ One hundred cities now have populations exceeding 3 million people; by 2015, an estimated 560 cities will have more than one million people, and 300 of these cities will be in Asia. Over the last 30 years Europe has experienced a very strong growth in mobility. Every European citizen now travels an average of 35 km per day, compared with 17 km per day in 1970. This increased mobility can be attributed mainly to road travel and is having a detrimental effect on air quality, especially in urban areas. Emissions from road vehicles, such as nitrogen oxides (NOx) and particulate matter less than 10 microns in size (PM10), are harmful to both the environment and to health. The big advantage of electric train systems is that they generate no local emissions and can meet mass transportation needs in a variety of urban situations, from local tram networks, to commuter systems and high-speed rail links.

New combustion technologies, efficient transmission systems and exhaust after-treatment also ensure that rail diesel traction will remain more environmentally friendly than transport by road or inland waterways.

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- [1] Traction fuses
- [2] Signaling
- [3] Communication system
- [4] Power quality
- [5] High-voltage products
- [6] Power transformer
- [7] Indoor medium-voltage products
- [8] Distribution and special transformers
- [9] Protection and control
- [10] Outdoor medium-voltage products
- [11] AC breaker
- [12] Low-voltage components
- [13] Traction transformers
- [14] Auxiliary converters
- [15] Motor, generators and turbochargers

ABB: a long and successful history in the rail supply industry

ABB has a long history of providing reliable, innovative and energy-efficient technologies to rail suppliers that manufacture and service all the systems, subsystems and components used in modern urban, conventional and high-speed rail systems. This includes rail infrastructure and rolling stock, as well as signaling and telecommunication systems.

The segment of the rail supply market in which ABB operates is worth around \$14 billion. ABB's rail sector revenues in 2009 were in the range of \$1.3 billion, with a compound annual growth rate of about 40 percent between 2004 and the end of 2009.

Regionally, our biggest market is Europe, where around 60 percent of orders originated in 2009. Growth drivers here include new investments in high-speed passenger lines and new freight capacity.

Mirroring global trends, Asia has in recent years shown the fastest growth for ABB (accounting for more than 30 percent of rail sector orders in 2009), spurred on by new investments

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in mass transit, high-speed passenger networks and added freight capacity.

Among many other contributions, ABB products and systems are in operation on the London Underground and Delhi's new Metro, in the sophisticated high-speed trains of Europe and China, as well as the expanding rail networks of the Americas. ABB offerings encompass equipment for rolling stock as well as fixed installations, and main and auxiliary converters, traction transformers, traction motors, semiconductors, low-voltage products, traction substations and components.

Globally, ABB is number one in rail traction transformers with more than 50 percent market share. Traction transformers step down electrical voltage from overhead catenary so it can be used on board the train to power motors and auxiliary systems such as heating and lighting. ABB's offering of onboard electrical components also includes main and auxiliary converters, and low-voltage products.

The combination and design of traction chain components (generators, circuit breakers, transformers, traction converters and motors) are the main determinants of a train's efficiency. ABB supplies both individual components and complete traction packages to rolling stock manufacturers.

ABB is also the largest independent supplier of modern turbo-chargers for diesel-electric locomotives. Turbochargers boost the performance of diesel engines up to four-fold, which reduces the size of the engines needed to power the trains and leaves more space for passengers and freight.

Turbochargers also help the engines to burn fuel more effectively, producing "cleaner" exhaust emissions: Today's turbocharged diesel engines produce significantly less NOx and CO₂ than naturally aspirated (non-turbocharged) equivalents.

ABB power supply infrastructure enables rail networks to run on electricity from the main grid, which helps lower rail's carbon footprint.

Power electronics monitor and maintain power quality between grid and rail networks. Sophisticated controls such as supervisory control and data acquisition (SCADA) systems monitor rail power networks to ensure they are running as effectively as possible.

ABB communications networks transmit vital data about the network between substations, control rooms and train stations to control centers throughout the system. ABB's signaling solutions ensure safe train movements and help optimize capacity and punctuality.

ABB references

- ABB has installed a SCADA system in the newest extension of the Delhi Metro to monitor, manage and control power to the city's mass transit system, which carries more than one million passengers daily.
- When a very high-speed train built by Alstom set a new world speed record for rail in 2007 (574.8 km/h), a specially designed ABB traction transformer was on board.
- ABB has supplied lightweight transformers for Siemens' Velaro high-speed trains able to operate on international routes across four countries (France, Germany, Belgium and Switzerland) using four different power supplies. The transformers make a significant contribution to the Velaro achieving an operating speed of up to 320 km/h, while carrying 20 percent more passengers than its predecessor and consuming the equivalent of 0.33 liters of gasoline per person per 100 km.
- ABB has supplied roof-mounted BORDLINE Compact Converters destined for tramways and narrow-gauge regional railways in Germany, Switzerland, Austria, China, France and Norway.
- ABB RailManager (Centralized Traffic Control Center) helps the Norwegian Railway Administration to efficiently control one-third of the Norwegian Rail Network.
- ABB has supplied traction transformers and traction motors to Bombardier for 24 electric trains installed in the Gautrain project in South Africa so they can operate at speeds up to 160 km/h.

Further reading: www.abb.com/railway

¹ Based on an analysis conducted by The Boston Consulting Group on behalf of the Association of the European Rail Industry (UNIFE)

² Roland Berger Worldwide Rail Market Study - Status quo and outlook 2016

³ Reducing Transport Greenhouse Gas Emissions: Trends and Data (ITF) 2010

⁴ EC 2007 and UIC Energy / CO₂ database (Domestic transport is defined as transport within national boundaries.)

⁵ UN Habitat, State of the World's Cities, 2006/2007