Customer Success Story:
SBB

Market Served
Rail

Eaton power units help smooth the way for Swiss high speed trains

Location:
Switzerland, Europe

Segment:
Rail

Challenge:
Optimisation of train's dynamic performance and reduction of sensitivity to track irregularities

Solution:
Alstom trains equipped with powerful Hydraulic Power Units

Results:
Enhanced train's dynamic performance and passenger comfort

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Mauro Mezzina, Eaton Regional Sales Manager for Italy and Middle East

Background

Switzerland's national railway company, SBB CFF FFS is operating high speed trains on conventional track improving customer service and comfort thanks to hydraulics solutions from Eaton.

Train operators have three goals when getting passengers from one destination to another – safety, comfort and speed.

Challenge

Running high speed train a speeds up to 250kph provides the perfect solution to this trilemma but the cost of installing dedicated high speed track, with gentle curves and gradients, is prohibitive for all but the most profitable routes.

In the case of Switzerland, with its numerous mountains and lakes that crisscross the major routes, building a dedicated high-speed rail infrastructure is impractical. The alternate solution of running the high speed trains on conventional track would compromise passenger safety and comfort.

Solution

SBB have found the perfect solution by ordering nineteen ETR 610 trains, manufactured by Alstom. Each ETR 610 train comprises seven carriages, which can accommodate up to 430 passengers, and travels at speeds up to 250kph on regular rail routes.

Anyone travelling within a vehicle will experience the effects of inertia when rounding a bend – the centripetal force will press the passenger into the seat causing discomfort, while those standing can lose their balance. Tilting trains are designed to counteract the effects of inertia by compensating this g-force. Early 'passive tilt' trains relied on the

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inertial force to produce the tilt motion. More recently, however, a computer-controlled power mechanism is used to perform an 'active tilt' motion.

In reactive mode, bends in the track are detected by gyroscopes, which determine their precise angle, and by accelerometers situated on the first bogie of the lead car. The on-board computer ascertains the tilt angle required and transmits an order to each carriage's bogie cylinders, timed according to their position and the speed of the train.

From its factory in Pessano, Italy, Eaton provided the powerful Hydraulic Power Units for each of the bogies. The power units contains PVM piston pumps, slip-in cartridge valves, servo vales and Eaton's filtration products.

Results

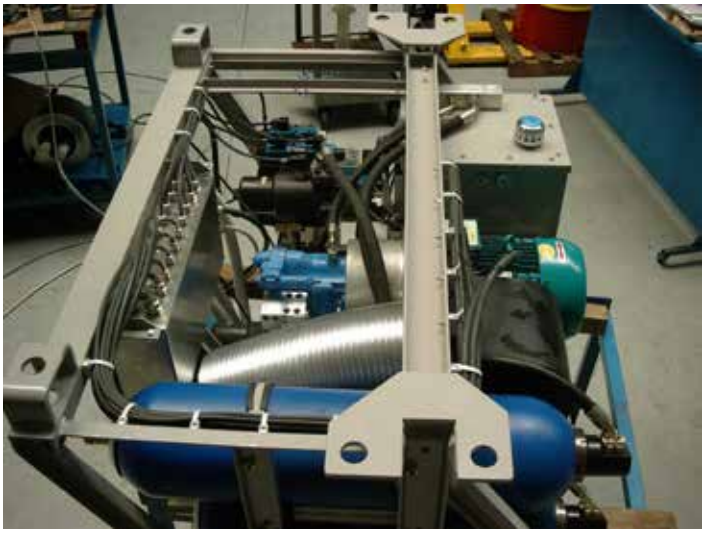
This hydraulic tilting bogie activates the body shell's tilting. To improve the train's dynamic performance and passenger comfort, an active lateral air suspension system keeps the body shell centred. By reducing unsprung and simple suspended masses, the train's dynamic behaviour has been optimised, and its wheel forces minimised.

"Our experience and high reputation on high speed trains, together with our competency to deliver a total hydraulic solution to meet stringent regulatory and performance parameters were instrumental in our selection as a partner for these trains," Mauro Mezzina, Eaton Regional Sales Manager for Italy and Middle East explained.

The tilting pantograph is mounted on a sliding carriage that is fixed firmly to the train roof and also features Eaton hydraulic components. When the train tilts, an active counter-translation hydraulic system slides the carriage sideways to compensate for the tilt, allowing the pantograph to remain in its central position.

In anticipative mode, the system relies on a database of the line's parameters. By comparing the data to information received by on-board sensors, the system can pinpoint the train's exact position on the line at any moment and order the corresponding tilt for the route as it is reached. By reacting quicker at approaching bends, it is less sensitive to track irregularities and so can offer a smoother transition.

The first train is currently undergoing homologation runs in Germany, as well as acceptance runs in Switzerland and Italy. The first three trains were delivered in 2014 with the next delivery due to be handed over to SBB



Eaton's powerful Hydraulic Power Unit containing PVM piston pumps, slip-in cartridge valves, servo vales and Eaton's filtration products.

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