



Eaton Products On Board Alstom High-Speed Tilting Trains

Location:
Savigliano, Italy

Segment:
High-Speed Rail

Problem:
Create a smooth ride for railroad passengers traveling across Europe at high speeds.

Solution:
Rely on products from Eaton to supply the hydraulic muscle for high-speed tilting trains.

Results:
Improved speed, passenger comfort and reduced travel time.

Over the past 16 years, Eaton Italy has supplied Alstom with approximately 500 hydraulic systems that are being used in high-speed railway transit across Europe.

Background

Railroad passengers across Europe are traveling comfortably at high speeds, thanks to the hydraulics expertise of Eaton.

Since 1991, Alstom Ferroviaria SpA of Savigliano, Italy, has been relying on products from Eaton's Hydraulics Operations to supply the hydraulics muscle for its high-speed tilting trains.

Blazing between cities at speeds up to 160 mph, the Alstom trains feature an empowering lineup of Eaton products. On board each railcar are an Eaton power unit; servo, screw-in cartridge and directional valves; piston pump; hose and threadless connectors; and filtration products.

Operating trains at high speeds prior to the 1980s called for a costly investment in tracks with high-curve radii and moderate relief. Wanting to avoid the need for infrastructure investment, Alstom engineers came up with the tilting technology as a way to use existing track, while improving speed and passenger comfort and reducing travel time.

The technology enables trains to be tilted up to a maximum of

eight degrees on bends, making increased speeds and a smooth ride possible.

Challenges

With the tilting system technology on the drawing board, Alstom put the system's hydraulic tilting mechanism out for bids to hydraulics equipment manufacturers, including Eaton's Hydraulics Operations in Pessano, Italy.

A contender for the business proposed a hydraulic system that would be strung out from front to back on the undercarriage of each railcar. Besides being concerned about the maintenance that would be required for the spaghetti-like system, Alstom engineers had many other valid concerns that they shared with Eaton's Alessandro Piccolini, industrial application engineering manager.

"I learned that the proposed design called for a servo valve at the front of the railcar and one at the rear, a setup that Alstom feared could cause the railcar to twist while traveling along curves," Piccolini says.



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"Alstom was also concerned that the proposed piston pump and valves would not offer long service life, due to the performance and safety demands of the tilting technology, and the fact that the system would be equipped with components from many different suppliers."

Solutions

Determined that there must be a better way, Piccolini designed a system that would bring much needed order to each railcar's undercarriage.

"We proposed using a centralized, lightweight Eaton power unit that would be easy to maintain and would feature all Eaton components," Piccolini says.

In order to eliminate the possibility of twisting, Piccolini proposed the use of one servo valve, along with a standby servo valve, for controlling four cylinders in each corner of the railcar for the lifting and lowering functions that facilitate tilting.

Piccolini addressed Alstom's need for a long-life pump by proposing Eaton's Vickers® PVQ piston pump initially and later its PVM piston pump that would be configured to operate in high-pressure mode during the six-second charging accumulator

cycle and switch to low-pressure mode during the 60-second discharging accumulator cycle, thereby increasing service life. He also recommended equipping the piston control circuit with two Vickers SM4 servo valves. During maintenance or in the event of an emergency, the circuit could be switched easily to the safety backup valve.

Results

Impressed with the streamlined design of Eaton's proposed hydraulic tilting system and its attention to detail, Alstom awarded Eaton a contract to supply 103 systems for a train it was developing for the Italian market.

During the ensuing 16 years, Eaton Italy has supplied Alstom with approximately 500 hydraulic systems that are being used in high-speed railway transit across Europe.

In addition, Eaton Italy recently worked with Alstom to replace electromechanical controls on the pantograph of its high-speed Pendolino-brand trains with Eaton servo valves.



Alstom high-speed tilting trains are charging across Europe with an empowering lineup of Eaton products.