MOVING THE AMERICAN ECONOMY

Federal Railroad Administration
Electronically Controlled Pneumatic Brakes
Fact Sheet

Background on ECP Brakes

With current freight train braking systems originally developed by George Westinghouse in the 1870's, brakes on individual rail cars are applied sequentially at the speed of air pressure moving from car to car, along trains that are often well over a mile in length. This conventional braking method can contribute to excessive in-train forces (buff and draft), sometimes making train handling more difficult, requiring longer stopping distances, and may prematurely deplete air brake reservoirs. Such problems are greatly reduced with the use of Electronically Controlled Pneumatic (ECP) brakes, where the brakes on all train cars are applied simultaneously.

ECP brake systems still employ an automatic air brake system in which the locomotive supplies compressed air to each car's reservoir via a brake pipe. Each car's brake valve reacts to an electronic signal to apply the brakes by directing compressed air from the car's reservoir to the brake cylinder or to release the brakes by releasing air from the brake cylinder. However, unlike conventional air brake systems, with ECP brake technology the brake pipe is constantly charged with compressed air from the locomotive whether the brakes are applied or released. In addition, ECP brake-equipped trains offer graduated release, where a partial brake release command that enable a proportional brake release which conventional brake systems are unable to provide.

Safety and Operational Benefits of ECP Brakes

Better train control. With ECP brakes, locomotive engineers have better control of their trains because they have the ability to gradually apply or release the brakes.

Improved safety. ECP brakes are a proven technology that can reduce or prevent current problems such as derailments caused by sudden emergency brake applications and runaway trains caused by loss of brake air pressure.

Shorter stopping distances. Under some conditions, trains operating with ECP brake systems can stop in approximately half the time and half the distance than trains equipped with conventional brakes.

Continuous air pressure. Compressed air in conventional brake systems depletes quickly in certain hilly territories, reducing or eliminating the ability to brake – a major cause of runaway trains. ECP brake systems continuously charge the brake pipe to eliminate this possibility.

Reduced brake system wear. ECP braking reduces the chance of brake shoes and wheels overheating, which can cause a runaway train or derailment.

Self-monitoring capabilities. The use of a train line cable allows real-time self-diagnostic 'health check' functions to be incorporated into the brake system which inform the train crew when maintenance is needed.

Improved fuel efficiency and reduced emissions. Due to the improved train handling capabilities, and reduced wear on the brake systems, ECP brake help to save fuel and reduce emissions.

Improved rail system capacity. Over the long term, and in part because of shorter stopping distances, ECP brakes will allow longer freight trains to safely operate closer together, permitting greater fluidity and traffic flow which may help expand the capacity of existing rail lines.

Role of FRA in ECP Brake System Implementation

FRA has been an active advocate and consistent proponent of ECP brake technology development and implementation. In 1997, FRA participated in an Association of American Railroad (AAR) initiative to develop ECP brake standards, and in 1999, FRA funded a *Failure Modes, Effects, and Criticality Analysis* of ECP brake systems based on the AAR standards. FRA also took part in programs to develop and enhance advanced components for ECP brake systems. In 2006, FRA issued a report that assesses the benefits and costs of ECP brakes for the U.S. freight rail industry. And in September 2007, FRA issued a proposed rule and a Final Rule in October 2008, designed to facilitate the widespread voluntary deployment of this technology by railroads and railcar owners by establishing a performance standard and requirements for its use.

Also, under FRA approved waivers, Norfolk Southern Railway (Oct. 2007) and BNSF Railway (Jan. 2008) began operating ECP brake-equipped coal trains, and the Union Pacific Railroad (Oct. 2008) began operating ECP brake-equipped intermodal container trains.

FRA regulations permit trains to travel up to 3,500 miles without stopping for certain routine brake inspections – more than double the previous limit – because ECP brake systems continual electronic self-diagnostic 'health check' capabilities alert train crews when maintenance is required. For example, an ECP brake-equipped intermodal container train originating from the ports of Los Angeles-Long Beach may safely travel all the way to Chicago without stopping for routine brake tests. Similarly, ECP brake-equipped coal trains will be able to make quicker deliveries from western coal fields to power plants in the eastern and southern states.

Major provisions of the ECP brakes final rule include:

- requiring ECP brake systems to comply with existing AAR standards and receive AAR approval prior to use;
- requiring that current railroad operating rules and employee training programs be updated to reflect the unique characteristics of ECP brake systems; and
- inspection, testing and maintenance requirements for ECP brake systems, including inspections by a qualified mechanical inspector.

For more information contact:
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October 2008