CANADIAN RAILWAY HALL OF FAME

TECHNOLOGICAL INNOVATION: 2002

Automatic air brake

The automatic air brake — a braking concept invented by George Westinghouse over a century ago — remains the most practical and efficient system to safely control the speed of long and heavy trains.

Developed in response to the industry's need for a safe and reliable air brake system, the automatic air brake replaced "straight air" systems that were previously employed on early Canadian railway operations. The implementation of the automatic air brake system allowed railways to operate longer trains safer, eliminating among other factors the need for "brakemen" to run from car to car on the top of each train to manually adjust individual handbrakes. This practice, employed in particular on heavy gradients, was highly risky and often resulted in "run-aways."

Using a pneumatically (air) activated system, the automatic air brake system spreads braking force out over each brake shoe on each car marshalled together on a train. A "brake pipe" - made up of underslung pipes and hoses, together with specialized reservoirs on each car — runs the length of the train using the automatic air brake system. The brake shoes on each car release when the "brake pipe" is pressurized to a specific pounds-per-square-inch level with air supplied by large reservoirs located on the locomotive. The brake shoes apply to slow or stop a train when a reduction of "brake pipe" pressure is made using the automatic air brake valve on the controlling locomotive, or emergency air brake valves.

The Canadian Railway Hall of Fame has recognized the revolutionary aspect of this invention and its role in the safe and efficient operation of North American railways for over one hundred years.

Centralized traffic control

Centralized traffic control is a means of controlling railway movements through signals and switches remotely controlled by a train dispatcher at a central office. The system is partially automated, in that only one train at a time can be given signal permission to occupy of a block of track, and that signals never permit operating over a diverging switch at an unsafe speed.

Centralized traffic control greatly increases the capacity and safety of a railway line, especially compared to the older system where trains were authorized by complicated time tables modified by written messages picked up by train crews at stations along their trip. However, the system was mainly a theoretical concept in the 1920s and 1930s, having been implemented only on a few short sections scattered around North America. It had never been installed on long stretches of mainline.

In the early years of the Second World War, the Dominion faced a transportation crisis. The United Kingdom was depending on vast shipments of food and materiel from Canada, and large numbers of Canadian sailors, soldiers and airmen were moving overseas as well. The activities of German submarines were threatening to block the Gulf of St. Lawrence and cut off the port of Montréal. Military personnel could not travel on the Canadian Pacific Railway to the Maritimes, as the line passed through the United States, which was neutral at the time. Canadian National's line from Moncton to Halifax was becoming the narrow end of a nation-wide funnel, and the demands on it were starting to exceed its capacity. Something had to be done, quickly.

The railway had two ways to increase capacity. First, it could build a second main track. This would be almost as big an engineering challenge as the initial construction and would consume a lot of labour, steel and other materiel needed for the war effort; however, it was proven technology and would certainly alleviate the capacity problems. The second choice would be to install centralized traffic control. This would use less labour and steel, but the choice was fraught with risk. As no one had undertaken such a project before, no one could safely predict how long it would take, how well it would work or how much it would increase the line's capacity.

Canadian National Railways undertook the risk, and through the diligent efforts of a dedicated team, centralized traffic control was installed on a 160 km section of the worst part of the bottleneck — Moncton, New Brunswick, to Truro, Nova Scotia — in only six months. The results were immediate: the capacity of the line improved nearly as much as what double tracking would have provided, but at only a small fraction of the cost and in a small fraction of the time. Trans-Atlantic shipping out of Halifax was able to meet the demands and keep the United Kingdom in the war until the tide was turned.

The success of this centralized traffic control project was a great contribution towards victory and the peace we have enjoyed for most of the last fifty years, and therefore we are pleased to induct centralized traffic control into the technology category of the Canadian Railway Hall of Fame.

Prairie wood-crib grain elevator

Railways, inextricably linked to the development of agriculture in the great North West, brought considerable change to the virgin plains of the western interior. They provided the means for settlement on a large scale. Further, settlers were no longer compelled to freight in their provisions by wagon overland over long distances. Railways were the vital link for the community, taking the agricultural produce of the region to market and bringing in the necessities of life that could not be produced locally.

The typical prairie town was a collection of unpainted false-fronted clapboard business and wood-frame houses huddled around a railway depot and dominated by one or more grain elevators.

The vertical grain elevator — of wood crib construction — was proven to be the most efficient means of handling grain. The concept was imported into Canada from the United States.

As in the United States, lacking the capital to develop the grain handling system, the Canadian railways relied on elevator companies to erect and operate line-side grain elevators. In the early 1900s, a yearly production of 35 000 bushels (950 t) in a district was considered the absolute minimum threshold for the establishment and economic operation of a grain elevator. The standard granary of the period had an average capacity of 25 000 bushels (680 t). This had increased to 30 000 (820 t) and 35 000–40 000 bushels (950 t to 1090 t) by the 1910s and 1920s, respectively. In the early 1930s elevators of 60 000-bushel (1600 t) capacity were being constructed. The capacities of rural elevators were also increased, either by rebuilding or by constructing annexes.

The number of elevators at a given station was usually a good indicator of the fertility of the surrounding area, and the community's importance and economic well-being. At its peak in 1938, there were 5758 licensed elevators in western Canada. Most survived the mergers and consolidations of the elevator line companies in the following years. But after the abolition of the Crow's Nest Pass Grain Rate Subsidy in the late 1980s, the number of grain elevators and grain delivery points has dwindled at a rapid pace. The resulting rationalization of the western grain handling system has seen the large-scale removal of line-side elevators and the consequent devolution of many rural towns.

Today, few of the surviving wood-crib elevators remain operational; most are museums or have been acquired by private interests for storage, on or off their original sites. Although now relegated mostly to the pages of history, the grain trade in the West will always be symbolized by the prairie sentinel, the wood-crib elevator.

Rotary snow plow

Historically, winters have proved to present formidable challenges to the Canadian railway industry. As a result, Canada's railways have made great strides using specialized equipment and winter operating plans that have resulted in significant improvements to wintertime operations. A pioneer Canadian invention — the rotary snow plow — is an excellent example of ingenuity developed to help Canada's railway's deal with winter operating challenges.

The rotary snow plow employed a large steam-powered cutting wheel and a specialized fan to blow the snow clear of the right-of-way. The first rotary snow plow was built using the designs of a Mr. Orange Jull and was assembled in the Canadian Pacific Railway (CPR) shops at Parkdale, Ontario in the 1880s. The Leslie brothers of Ontario are credited with spearheading the production and improvement of this machine.

Each rotary snow plow has a steam boiler and a two-cylinder engine to power the snow-cutting mechanism. Each plow had a tender for water and fuel (coal). Steam locomotives were then used to push the plow. The rotary snow plow crew consisted of an engineer and fireman who were in charge of the boiler and engine that powered the massive cutting wheel, and a plow foreman and two assistants who operated the snow cutting mechanism. A plow could burn 3 to 4 tons of coal operating on a 24-hour-per-day basis.

The rotary snow plow was used by railroads in the western United States as well as by the CPR. The first six CPR rotary snow plows were used in the Selkirk Mountains of British Columbia in 1888. The Selkirks were a formidable obstacle for the CPR, with record snow falls and avalanches occurring on a regular basis, closing the main line for days. The plows proved extremely effective in both wet and heavy snow in the clearing of the main track, especially in the snow-bound Rogers Pass. By the winter of 1889, the CPR had a full fleet of rotary plows in service on the Prairies, in northern Ontario, and elsewhere in eastern Canada. Although the rotary snow plows were expensive to operate, they were considered a reliable and effective way of keeping the CPR open across the country on a year round basis until replaced by newer forms of snow removal equipment in the 1950s.