Realizing the Potential of Diesel Multiple-Unit Technology

Research Overcomes Barriers

THOMAS C. CORNILLIE

Designers of railroad vehicles long have recognized the efficiencies achievable by locating propulsion within a passenger-carrying vehicle, eliminating the need for a separate locomotive. Although various designs of vehicles powered by steam- and gasoline-fueled engines came into service starting in the 1890s, "diesel multiple unit" (DMU) emerged as a term-of-art in the late 1930s to describe vehicles that could operate as single cars or be combined to form a longer train.

For the past 60 years, the rail diesel car (RDC) has epitomized DMU technology in North America. The Budd Company of Philadelphia built nearly 400 RDCs between 1949 and 1962. These cars quickly gained a reputation for reliability, for adaptability to a range of services, and for the ease of making incremental technological upgrades.

As federal policy structures for supporting transit investments solidified in the 1970s, DMU technology offered a way to improve the efficiency of commuter rail service. Revenue service demonstrations of European DMUs were carried out with federal funding; however, these efforts did not lead to the deployment of new technology. Moreover, in 1979, the Budd Company released an updated version of the RDC, dubbed the SPV-2000, but few orders and a checkered mechanical reputation limited the model's role in the North American market.

In other nations, DMU designs continued to advance. By the turn of the 21st century, DMUs were providing the majority of nonelectrified intercity and commuter rail services in Britain, and a significant portion of passenger services across continental Europe and in Japan. Certain Federal Railroad Administration (FRA) regulations affecting North American design practices, however, slowed efforts to import internationally developed vehicle designs.

This situation changed with a confluence of research by the U.S. Department of Transportation's Volpe Center using FRA funding, with input from the American Public Transportation Association's Passenger Rail Equipment Safety Standards task force and with updated research into the relative economies of DMU technology. Salient in these efforts was the consideration of crash energy management (CEM) technologies, a standard in DMU vehicle designs in international applications.

Research proving the effectiveness of CEM in meeting the intent of FRA crashworthiness regulations, coupled with regulatory reforms, has opened the door in American and Canadian cities to DMUs incorporating proven Asian and European designs. Implementation of these vehicles realizes long-sought cost efficiencies and provides other improvements, such as low-floor boarding, which reduces dwell times and improves accessibility.

TRB meetings and publications have provided forums for sharing news about emerging technologies and major trends and for articulating research needs, identifying applications for DMU technology in the United States. Through TRB's Commuter Rail Committee and its Self-Powered Vehicle Subcommittee, research into the economic characteristics of DMU operations and technology innovations continue to be discussed and shared.

PHOTO: THOMAS C. CORNILLIE

The Denton County Transportation Authority operates DMU vehicles between Denton, Texas, and a connection with the Dallas Area Rapid Transit System at Carrollton. Couplings that consolidate power and control connections into a single couple—a standard feature on current DMU designs—facilitate adapting train configuration to ridership demand.

PHOTO: K.WATA, WIKIMEDIA COMMONS

A DMU at an East Japan Railway Company station in Hitachiomiya, Japan. DMUs provide a large share of intercity and commuter rail services in Japan.

The author is Principal, Thomas Cornillie Independent Scholar, Alameda, California, and Chair of the Research Subcommittee of the TRB Commuter Rail Committee.