Improving hazmat transportation

An industry-wide collaboration forms to streamline and more-tightly focus hazmat shipping research

In brief, this is how the collaboration is re-thinking everything the industry currently believes about tank car designs.

- As wide-ranging an effort as the collaboration is, it’s building on past research, such as the Next Generation Rail Tank Car project, which began as a collaboration between Dow Chemical Co., Union Pacific Railroad, and Union Tank Car. Over the course of its 2.5 year existence, the group welcomed others from the government and industry to participate in discussions and research. Eventually, that cooperative spirit formed the basis for the new, wider-ranging collaboration.

LOOKING WITH NEW EYES

The groups top priority for 2010 is to do: prioritize, and select which research projects to pursue, then develop a multi-year plan to execute them.

Areas under consideration for further research include:
- Seeking and incorporating newer steels
- Modifying couplers to have fewer sharp corners
- Adding layers around the tank to absorb and distribute energy in the event of a derailment or collision
- Installing foam between the layers to absorb energy
- Reconfiguring tank car designs
- Think of a tank car as a three-dimensional jigsaw puzzle with each layer separated from the whole and laid out on a table. What would happen if you swapped some material for another and put the layers back together in the same order? What if you used the same material, but put them together in a different way? What if you changed the material and the arrangement?

In mid-November, the two plan to conduct a similar test at 18 mph, this time with “lead” protection: that is, reinforced steel plates welded alongside and around the top fittings. Ideally, the plates will protect the fittings in case of an accident. Failures of valves and fittings account for a third of all accident-caused hazmat releases, albeit a small quantity of lading lost. Although these tests apply to fittings and valves on nonpressurized tank cars, the next step would be to run similar tests on pressurized cars.

In the meantime, Midland Manufacturing offers an improvement for current chlorine tank car designs. The primary seals on Midland’s new Advanced Chlorine Rail Car Assembly are all below the surface of the pressure plate, and designed to contain chlorine lading if the valves are shorn off in a wreck. Specifically, “we know it will handle pressure without the valves on up to 375 pounds of pressure,” says David Clugg, regional sales manager for the Eastern U.S. at Midland. Under normal shipping conditions, chlorine exerts only about 100 pounds of pressure per square inch. If the valves are shorn off an existing chlorine car, however, a release is almost inevitable.

Twenty-five cars fitted with the new assembly are operating in revenue service, the earliest having been deployed last February. The assembly costs about $60 percent more than standard fittings, but it does meet the industry requirement to withstand a 9-mph rollover without unintentional release.

THE BIG PICTURE

Even research begun in the 1970s continues to contribute to the industry’s understanding of tank car safety. The RSI AAR Railroad Tank Car Safety Research and Test Project, for instance, developed new standards in tank car designs and created a database of tank cars that had been in derailing (but not all damaged) that now totals more than 43,000.

University of Illinois at Urbana-Champaign’s M. Kapil Saat conducted a statistical analysis of the database as his doctorate dissertation. Using a model he created, Saat could plug in a single alteration or combinations of alterations that would change the safety by as much as 99 percent.

And rolled it over on a concrete pad. As the car crashed at 24 mph, the fittings and valves broke off, releasing the water. This test provided baseline figures illustrating the forces acting on a tank car’s components in a controlled rollover.

Minot, N.D., Jan. 18, 2002; Hacketta, Texas, June 28, 2004; and Graniteville, S.C., Jan. 6, 2005. Each of these accidents resulted in fatalities and uncontrolled release of hazardous materials.

Through the years, organizations have worked alone or together. Collaborations have included the Railroad Tank Car Safety Research and Test Project, and the Next Generation Rail Tank Car Project, seeking ways to improve the safety of hazmat transportation. But as individuals and groups pursued the same goal, their independently developed work others were doing.

This autumn, though, representatives from every industry segment involved in shipping toxic by inhalation hazardous material by rail in the U.S. and Canada formed the Advanced Tank Car Collaborative Research Program. The nine participants include the Association of American Railroads, Railway Supply Institute, Federal Railroad Administration, Transport Canada, Department of Homeland Security (including the Transportation Security Administration), American Chemistry Council, Chlorine Institute, and The Fermi Institute.

Although the participants in late October had yet to formalize the collaboration’s guidelines, they had agreed to open an exchange of information—a huge step, considering the proprietary information regarding tank car designs that will be a critical part of the research. Members will share the research they’ve been conducting, then the group will decide collectively which projects show the most promise and should be funded. Participants will also find an anticipated annual budget ranging from $3 million to $5 million, although the amount that each contributes could vary by project. Philip Daum, senior consultant at Engineering Systems Inc., has agreed to serve as the group’s project director.

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