RAIL TRANSPORTATION OF ENERGY MATERIALS (HAZARDOUS MATERIALS)

Patrick J. Student, Association of American Railroads

The rail transportation of energy materials that are hazardous materials is growing. More carloads of energy materials in larger capacity tank cars are moving on our railroads to provide needed fuel to industry and the consumer. Energy materials can move in approximately 55 percent of the current tank car fleet due to practical or regulatory considerations with some specific commodities such as ethylene requiring specialized equipment. Energy materials represented 16 percent (approximately 200,000 carloads) of all hazardous materials traffic in 1978 and this can be expected to increase. In terms of accidents and incidents involving energy materials, the picture is improving with fewer leaks, fewer tanks derailed and those with any lading loss. The largest single impact on the future movement of energy materials appears to be the conflict between regulations of DOT and other federal agencies and state and local jurisdictions.

I wish to discuss rail transport of those energy materials that are hazardous materials, the liquefied petroleum gases, gasoline, fuel oil and crude oil.

I. Tank Car

First I would like to talk about the vehicle in which these commodities are shipped, the tank car. If this conference were being held during THE crisis of transportation of energy materials of thirty-five or so years ago, I'd mention two tank cars and that the problem of producing more cars depends on manpower and materials allocations.

Figure 1 shows an ICC 103 specification tank car used for the transportation of gasoline, fuel oil, and crude oil, as well as other commodities. These cars were of typical 8,10,or 12,000 gallon capacity, though there were a few 16,000 gallon tank cars around. Fusion welded cars similar to these were built beginning in 1941. The car builders would build these cars in large lots, typically 1,000 to 2,000 cars including speculative building to attain these large lots.

Figure 2 shows an ICC 105 specification tank car used for the transportation of liquefied petroleum gases, natural gasoline and certain other liquefied gases. These cars were of 11,000 gallon capacity. Like the 103 specification tank cars these too were built in large lots.

Now, if this were my imaginary conference of the war years, I'd finish by saying that to move more oil etc. more cars are needed and this is up to the allocation boards.

Continuing with the typical cars of today figure 3 shows a 21,000 gallon 111A specification tank car used for transporting gasoline, fuel oil or crude oil. Cost of this car is $41,500. The same but insulated and with 12 lines of exterior heater coils is $51,200. A 30,000 gallon tank car noncoiled and uninsulated for transporting alcohol or gasohol would cost $44,000.

Figure 4 shows a 33,000 gallon 112A specification tank car used for transporting liquefied petroleum gas. It is uninsulated and was the typical car used for transporting this commodity. Among other items the regulations are now requiring this class of tank cars to be retrofitted with a thermal protection system if it is used to transport flammable compressed gases.

Figure 5 shows a 33,000 gallon 105A specification tank car which is the current new construction for transporting liquefied petroleum gas. The cost of one of these tank cars is $53,000.

I was told that I would be asked about rail transport of liquefied natural gas. Figure 6 shows the tank car that would be used to transport this commodity. The only commodities transported in this class of tank cars so far are liquid ethylene and liquid hydrogen. It is a specification 113C tank car. It is constructed as a tank within a tank with 10 inches of insulation. When the car is shipped, a vacuum of at least 75 microns is pulled in the insulation space. Because of the elaborate insulation/vacuum system these cars are maintenance heavy. One can count on these cars being out of service 1 to 3 months a year. The cost for a 113A tank car used to transport liquid hydrogen is $250,000, for a 113C for liquid ethylene service is $200,000.

The current tank car fleet is about 180,000 tank cars, and not all tank cars from either a practical or a regulatory stand point can be used to transport energy materials. For transporting these commodities only about 20,000 103's, 50,000 111A's, 15,000 105A's (including about 5,000 of the size shown on figure 5) and 15,000 112A's can be utilized. Of the 113's there are 26 113A's and 55 113C's.

Almost all of the tank cars are owned by private companies, not the railroads. The railroads own

Figure 1.

Figure 2.

Figure 3.

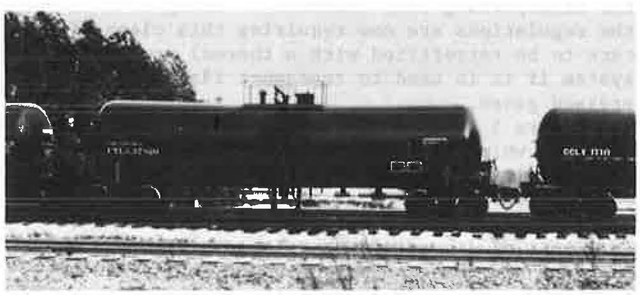

Figure 4.

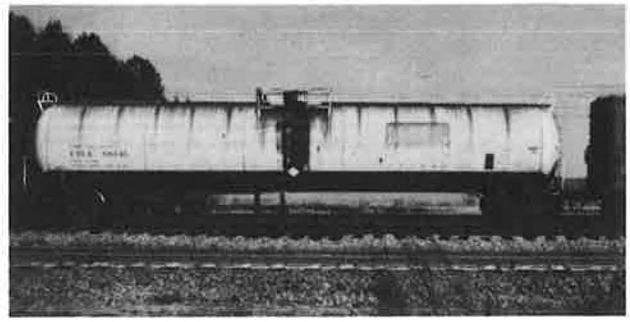

Figure 5.

Figure 6.

about 5,000 tank cars which are mainly used to haul fuel oil about their systems.

II. Traffic

The railroads move between 23 and 24 million revenue carloads per year. Of these between 1.1 and 1.2 million are hazardous materials. The growth of hazardous materials traffic is between 4.5 to 5 percent per year. A little more than 80 percent of this traffic is in tank cars.

Energy materials (liquefied petroleum gases, gasoline, fuel oil) accounted for 18.5 percent of the hazardous materials traffic in 1977 and 16 percent in 1978. This decline should not be considered significant since carloads increased and the quantity of materials transported increased at an even greater rate. This latter fact is due to the increasing average capacity of the tank cars used for transporting energy materials.

Over half of the revenue carloads of energy materials is liquefied petroleum gas (propane, butane, propylene, etc.) While the commodity is shipped year round it does exhibit a definite shipping season - September through March with a peak of November - December. With the opening of several gas fields in the West, the railroad industry has been advised of approximately a 50 percent increase in the revenue carloads of liquefied petroleum gas in the next year.

Gasoline now only accounts for 10 percent of the energy materials carloads and only originates from a few points in the western United States.

Fuel oil appears to be growing in carloadings from 1977 to 1978. The number of carloads increased almost 4 fold to 20 percent of the energy materials revenue carloads. This increase may be somewhat misleading as fuel oil was considered nonregulated up to 1976 and many people still don't consider it so, and hence, don't properly describe it to the rail carriers when the material is tendered. Further this does not count fuel oil moving as company material. As the railroad is moving the material from one point to another on its own line for its own use, there is no charge for its move and it is not reported outside the company.

In terms of car miles a typical carload of hazardous material (energy materials) is hauled about 50 percent farther than the average for all commodities.

III. Accidents and Incidents

Accident as used in the following discussion is any derailment or fire involving a hazardous material. An incident is a leaking tank car of hazardous materials (energy materials).

The numbers given for accidents and incidents are those as reported to the Bureau of Explosives. The Bureau feels that it receives most of the reports on incidents and almost all of the reports on accidents. Further the Bureau feels that there are many more leaking tank cars that are not discovered and hence not reported.

For all hazardous materials in 1977 the Bureau received reports of 765 leaking tank cars, 475 tank cars involved in derailments of which 103 lost some lading. For 1978 these number were 863, 734 and 157 respectively. These numbers do not necessarily represent more accidents but better reporting. After the weekend of Waverly and Youngstown the railroads seemingly went out of their way to report accidents and incidents to the Bureau. A large number of these cars only had a wheel set or truck derailed.

With regard to energy materials in 1977 there were 138 leaking tank cars, 107 tank cars derailed and 22 of these lost some lading. For 1978 these numbers were 106, 121, 14.

In these cases where a car is indicated as losing lading, this could be a dripping about an unsecured valve, the amount that seeped into a bottom outlet chamber that was sheared off in the derailment, or the loss of the entire contents due to a valve being sheared off or the tank being punctured.

Leaking tank cars of liquefied petroleum gases constitute one of the largest groups for all commodities. If the shipping season is taken into account along with the fact that most of the loading rack personnel are last hired - first fired, then the reason for this problem is somewhat understable. In an attempt to counter this the Bureau maintains a field force of 19 inspectors in the United States and Canada who among their other duties visit plants where cars that have been discovered leaking were shipped in order to work with the shippers personnel by showing then what was wrong with the car and how to prevent it from reoccurring.

IV. Future Consideration

An increase in traffic of hazardous materials (energy materials) beyond the historical growth rate does not present a problem to the railroads. Problems involving hazardous materials do arise because local jurisdictions and federal agencies other than the Department of Transportation issue regulations which conflict with or are more restrictive than those of the DOT.

Examples of these would be local routing restrictions similar to the New York City ban on highway transport of radioactive materials or the proposed requirements to "pre-notify" local/state authorities of the movement of hazardous materials through a state. On the federal level, the EPA Hazardous Substances Regulations are conflicting with the DOT Hazardous Materials Regulations.

In the case of local regulations, the Department of Transportation can preempt, but beyond this, the problems that have been arising are two fold:

First, the shipper can specify the routing of his shipment and the railroads are obligated to follow such orders. The problem is even more difficult than appears because shippers in one state are not governed by the requirements of another state. Second, a railroad is required to move expeditiously any carload of hazardous materials it receives. The delaying of a shipment in order to report its movement to a political jurisdiction goes against this requirement. Also, in many locations one railroad turns a complete train over to another railroad just before a governmental boundary. Finally, there is the inescapable question of what is the political jurisdiction going to do with all the reports it would receive?

In the case of the Federal agencies, in 1978 the EPA issued its regulations on hazardous substances together with a list of designated substances. Many of these commodities were the same materials as on the DOT list but by different names. Even though not requiring the shipper to tell the carrier that a hazardous substance had been tendered, the EPA nevertheless expected the carrier to report any time it spilled one of these substances. This insanity was cited by the Federal judge who enjoined the EPA from enforcing this regulation. This entire subject is now being addressed by the Department of Transportation in its regulations. This problem shows the need for a single set of regulations governing the transportation of hazardous materials. Such a unified code would contain the information that would allow the carrier to satisfy the requirements of each of the several regulatory bodies.

AN ALCOHOL FUELS PROSPECTIVE: THE NATIONAL ALCOHOL FUELS, Edward J. Bentz, Jr. Executive Director National Alcohol Fuels Commission

INTRODUCTION

On July 18, 1979 the National Alcohol Fuels Commission, created by the Surface Transportation Act of 1978, held its first meeting. At the first meeting - open to the public - an organizational framework and work plan were adopted. That work plan attempts to answer the following basic questions enumerated in the enabling legislation creating the Commission: Why study alcohol fuels? What can alcohol fuels provide the nation - in both short and the long term? When will they be available? How much will they cost? What is their relationship with other synthetic fuels and conventional fuels? What current or new technologies hold promise for alcohol fuel development? What has been preventing or impeding their introduction into the fuel mix to other markets? What programs or policies has the Federal government created to realize their potential commercialization? What programs or policies should the Federal government institute to rapidly catalyze the commercialization of these fuels in the most efficient and timely manner? .... and finally, what is the long and short term potential for alcohol fuels to displace foreign crude and promote domestic economic benefit?

MEMBERSHIP

Six U.S. Senators, six U.S. Representatives, and 7 private citizens comprise the 19 member Commission. The Senate members were appointed by the President Pro Tempore. The House members were appointed by the Speaker of the House. The Congressional delegates to the Commission were appointed from the respective committees on appropriations, agriculture, and energy. Senator Birch Bayh (D-Ind.) chairs the Commission. Representative Robert A. Roe (D-N.J.) serves as Vice Chairman. The seven public members were appointed by President Carter and formally inaugurated on June 27, 1979 at a White House ceremony conducted by Vice President Mondale.

MANDATE (from enabling legislation P.L. 95-599 Section 170)

SECTION 170(2) reads

"The Commission shall make a full and complete investigation and study of the long- and short-term potential for alcohol fuels, from biomass (including but not limited to animal, crop and wood waste, municipal and industrial waste, sewage sludge, and oceanic and terrestrial crops) and coal, to contribute to meeting the Nation's energy needs. It shall take into consideration the technical, economic, legal, environmental, and social factors associated with the production, manufacture, distribution, and use of such fuels. It will evaluate the costs and benefits of alternative feedstocks and their possible end uses, and analyze the feasibility and desirability of converting these resources to alcohol fuels. Based on such study it shall recommend those policies, and their attendant costs and benefits, most likely to minimize our dependence on petroleum, insure adequate energy supplies, and contribute to the economic health of the Nation."

SECTION 170(c) reads:

Such report shall include the Commission's findings and recommendations with respect to --

1. The long- and short-term potential of alcohol fuels contributing to domestic energy supply.

2. The relative costs and benefits of developing alcohol fuels from alternative feedstocks, taking into account technical, economic, legal, competitive, environmental, and social factors associated with their production, distribution, and use; their most appropriate end uses; and a recommended time frame for their introduction into the Nation's energy mix.

3. The existing policies and programs of the Federal Government which affect the development of such alternative fuels; and

4. New Policies and programs required to develop alcohol fuels from coal and alcohol and other fuels from the biomass to meet the Nation's projected short-term and long-term energy needs.

STUDIES PLANNED AND UNDERWAY: (as of 7/18/79 organizational meeting)

° Net Energy Balance, study to assess one, what is the appropriate measurement technique for assessing the net energy balance of fuels; and two, using that technique for obtaining net energy balances for both conventional as well as novel fuel technologies (ethanol and methanol).

° Food vs Fuel, a series of studies assessing the crucial relationships and dependences of alcohol fuel production and food/feed production. Studies will include current relationships as well as projected change due to crude oil price and supply changes, alternate supply feedstocks and agricultural and energy policy variables.

° Distribution Requirements for Alcohol Fuels, assessment of physical and institutional requirements needed and barriers to the inexpensive carriage of alcohol fuels.

° Underutilized Distillery Capacity, an assessment of short-term ethanol production capacity in the U.S. Includes an assessment of current idle distillery capacity as well as additional peripheral industrial buildup.

° Transportation End Use Study, an assessment of the current and projected technologies for use of alcohol fuels in the all important transportation sector.

° Methanol Supply, Demand and Usage, an assessment of the supply, demand and usage of methanol from coal and biomass.