Tank Cars 101 for Model Railroaders

Text and Photos by Rich Mahaney, Superintendent EID

Recently I did a clinic for the Eastern Iowa Division on this topic. Let me share some information with those of you who could not attend.

Those of us who teach tank car training to emergency responders and others group or divide tank cars into three families for presentations. They are: general service or low pressure tank cars, high pressure tank cars and cryogenic tank cars.

General Service or Low Pressure Tank Cars are estimated to be about 78% of the tank car fleet in North America. They operate with a pressure range of 0 to 100psi.

They have capacities that range from 4,000 to 45,000 gallons. They come in many colors, have a variety of top and bottom valves, fittings and inlets/outlets and are built by a number of manufacturers. They use both spring loaded pressure relief devices (PRD's) and frangible disks (also known as rupture discs) to relieve over-pressurization when exposed to heat or some other reason that there would be an internal pressure increase.

The pressure relief devices typically operate at 75% of the tank car test pressure, which is shown in the tank cars specifications (found printed on the right side of the tank car when you are facing it). But an interesting note for the person that really studies the details of tank cars, which maybe confusing to the tank car interested person, is that frangible disk equipped cars can have a pressure range of up to 165 PSI (but a tank test pressure of only 100 PSI.) Something to think about. General service tank cars transport both hazardous and non-hazardous products.

High Pressure Tank Cars are estimated to be about 22% of the tank car fleet in North America. They have a tank hydrostatic pressure test of 100 to 600psi. They have capacities that range from 4,000 to 45,000 gallons. They come in many colors, have a variety of top valves, fittings and inlets/outlets, gauging devices and are built by a number of manufacturers. They only use spring operated PRD's to release or decrease internal pressure when exposed to heat or for some other reason there is an internal pressure build up. Again it is common for the PRD to be set to operate at 75% of the tank test pressure like the general service tank, but that is not always true. Many DOT 112 tank cars will have PRD's set for 82.5% of the tank test pressure. High pressure tank cars are built to transport hazardous materials. The DOT 105 tank car is considered to be the best/safest "container package" of the tank cars types.

Cryogenic Tank Cars are estimated to be less than 1% of the tank car fleet in North America; there maybe less than actually 200 of this style of tank cars. They operate with a pressure range of 0 to 25psi. They have capacities that range from about 16,000 gallons to 30,000 gallons. They are generally white in color, and have a variety of valves, fittings and inlets/outlets, and gauging devices on the sides or ends. They transport “cryogenic” products (minus 130 degrees F or below), all of which fall into the hazardous material classifications.


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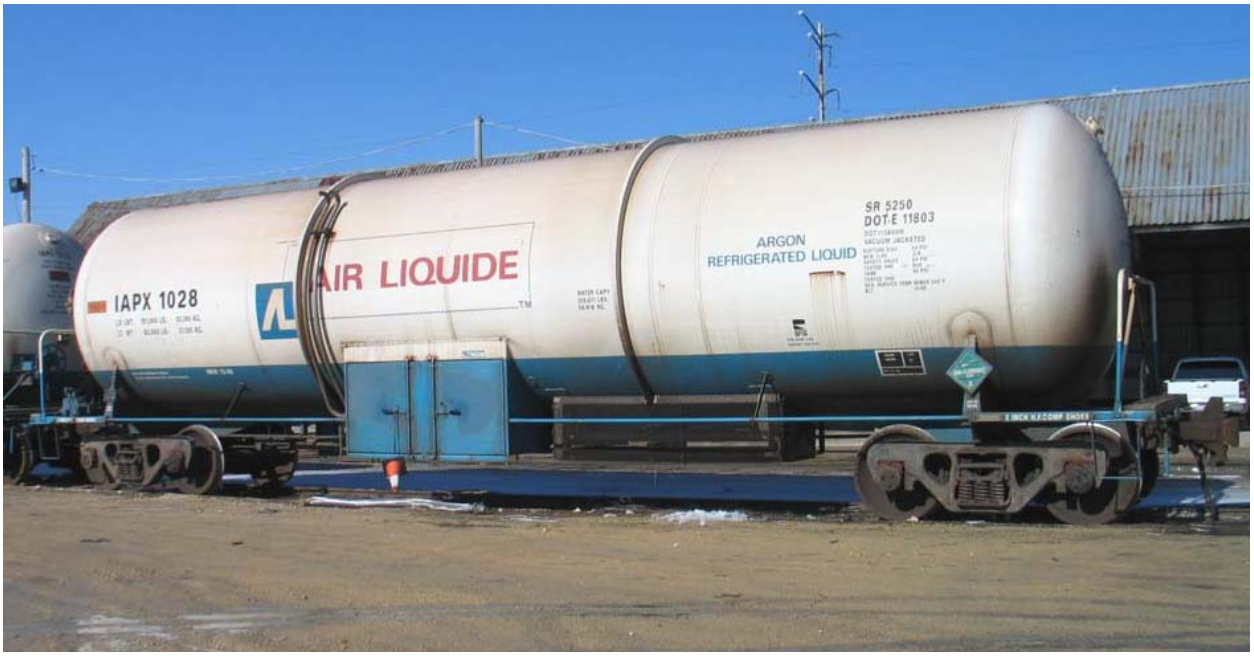
AIR LIQUIDE
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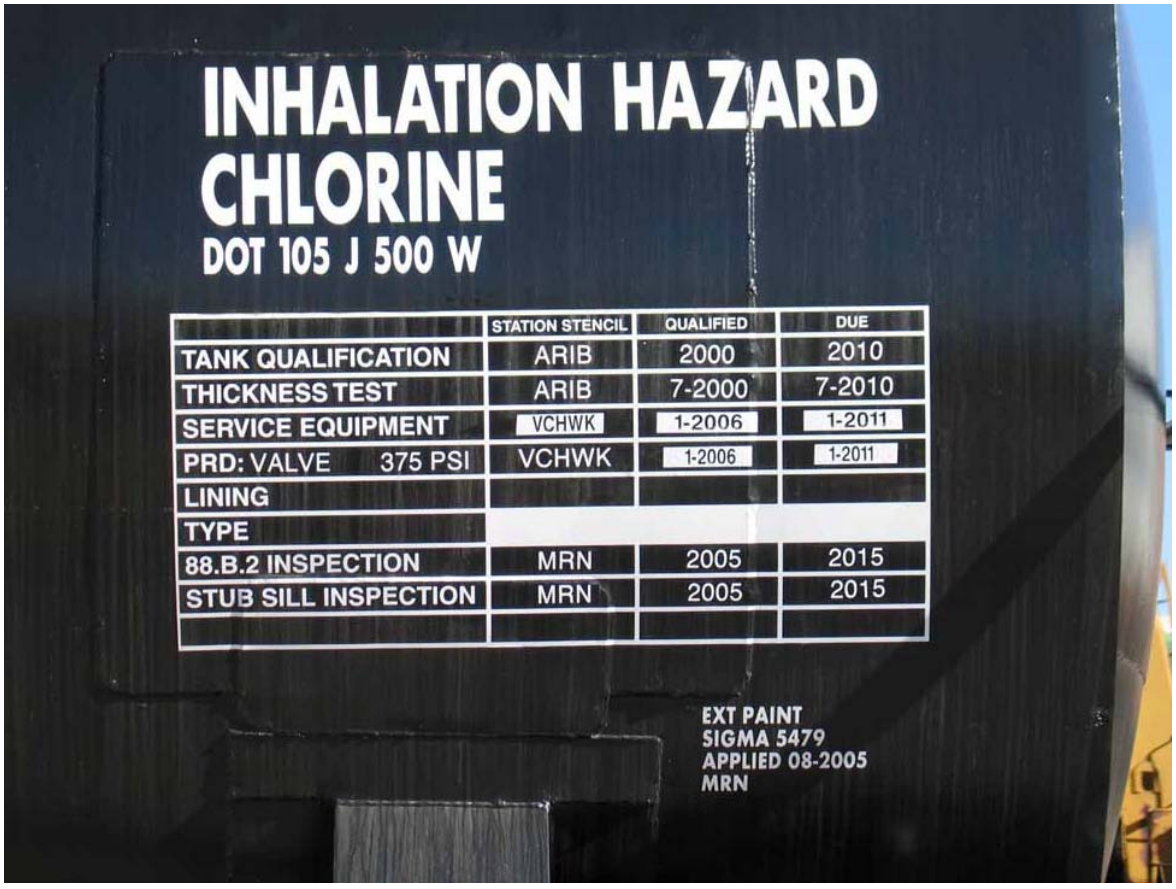
REFRIGERATED LIQUID
SR 5250
DOT-E 11803

The identification of the tank car types (general service/low pressure or high pressure) usually is not too difficult, if you know what you are looking for. The sources of information come from several places or ways to identify tank car types:

First – the specification markings which will be found on the right side of the car, as you are facing it from either side. The specifications come from the Department of Transportation (DOT) in the United States and Transport Canada (TC) in Canada. Older tank cars are will have ICC (Interstate Commerce Commission) specifications, as the ICC was the US' certifying agency prior to creation of the Department of Transportation in the 1960s. There is a string of letters and numbers that make up the specifications, two examples are DOT111A100W-3 or DOT105J500W. Occasionally you will see tank cars with AAR specifications; these tank cars first meet the DOT specifications, but have some type of additional features. As a "nonhazmat responder" person, you would only be interested in the first 6 letters/numbers to help you. Also you need to be close enough to read these markings or be using binoculars.



The most common general service / low pressure tank cars have specifications or design features that cause the tank car to be marked as a: DOT 111, DOT 115, or AAR 211. There are two types of DOT 111's today, and there is a visual difference which we

will discuss below. Out in the field, these are known as either “super 111’s” or just “111’s”. The most common high pressure tank cars have specifications or design features that cause the tank car to be marked as a: DOT 112, DOT 105, or DOT 114. Cryogenic tank car specifications or design features will be marked: DOT 113 or AAR 204.

Second – the second way (but you can get fooled), is to look at the top of the tank car. On a general service/low pressure tank car, all of the valves, fittings, pressure relief devices (PRD), and manway are all exposed across the top of the car (except for the super 111). They may be spread out across the top of the car in the work area (enclosed by a handrail) or the PRD maybe outside of the handrail area. On tank cars that carry certain corrosive liquids have all of the “stuff” (listed above) placed on a plate that covers the access opening into the tank car. On a high pressure tank car, all of the valves, gauging device, PRD and other equipment are placed inside of a protective housing. This housing is designed to protect this equipment during a derailment.

On the DOT “Super 111” (again a general service tank car), all of the “stuff” described above in the general service tank car paragraph will be placed inside a “protective housing” also, but I have seen these types of tank cars with PRD equipment outside the housing. So you must look closely, this type of car may look like a high pressure tank car during a quick glance, which is why it is always best to look at the specification marking. As a hazmat responder, I will look at the top of the car first, because I can see that area from a distance, but I will follow that up with a look at the specification marking to verify.

Third – another source of information, is to check for bottom outlets, only general service/low pressure tank cars have bottom outlets. If you are doing this, you must be pretty close or the tank car is not moving by.

Cryogenic tank cars will normally have features or construction style that makes them stand out from the other types of tank cars. They will normally have their loading/unloading equipment, valves, etc. inside of a compartment on the sides or end of the tank car. They will look like they have a stronger construction, because they have literally a tank built inside of another tank. Also they must be strong enough to be able to handle an insulating vacuum that is drawn on the space between the outside wall and the inside tank of the tank car.

Tank cars in trains will be either: fully loaded, listed as empty but with some product still inside (known as “residue” cars), or “really” empty. A “residue” car may have as much as 3% of the original product still in it. Tank cars that transport hazardous materials must continue to be placarded until they are completely cleaned out, meaning no trace of product liquid or vapors. Tank cars also don’t just sit in any location in a train, of course they may be placed with a group of cars going to a certain location, but with

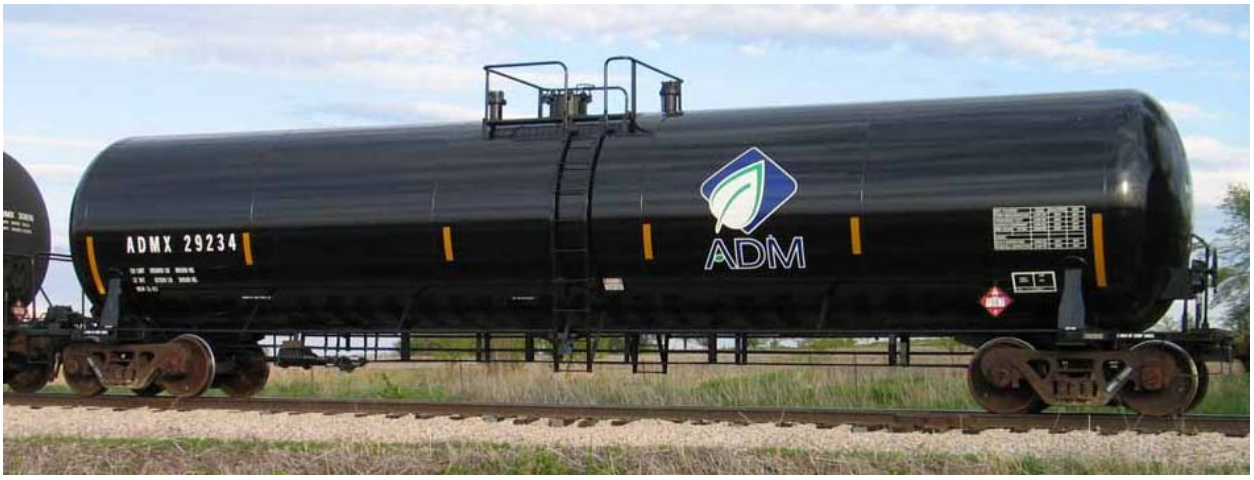
hazardous materials there are some rules. Full placarded tank cars must have five cars between them and the locomotives (for crew safety), residue cars must have one car between them and the locomotive, empty (cleaned out) or non-hazardous materials can go in any location in the train. There are exceptions from these general placement requirements for tank cars placarded “Combustible, Class 9” or simply marked with the identification number of the product (but another article could discuss these considerations). Also, product compatibility can be an issue. Certain products should not be next to each other in case there is a derailment and products get out of their containers. Some “interesting” (and dangerous) things can happen, when non-compatibles get together. Just some things to think about when you are assembling a train and making up the train list or consist.

And as a final few bits of information, the end of the tank car with the brake wheel is known as the “B” end of the car, the other end is known as the “A” end. Also, all tanks cars are required to have “double shelf” couplers and many tank cars will have head shields built either into the tank ends (known as interior) or outside of the tank jacket (known as exterior or external) to prevent tank car tank damage from couplers during derailments.

Now that you have been educated on tank cars, here are a few more photos to ponder:

Factoid: Some people expect ethanol in tank cars to be the number one transported hazmat product in the future by the railroads. Iowa is the number one producer of ethanol at this time, with more plants and production being built, and will be contributing heavily to these load/transport numbers. "Ethanol" in tank cars will be placarded UN 1987 (denatured alcohol), UN 1193/1203 (gasohol) or UN 1170 (pure ethanol/ethyl alcohol).

Look for a newsletter article in the near future on "Reading placards, UN numbers and the 9 DOT hazard classes"



ADM 29234 is placarded UN 1987 for Ethanol.

1,666 words
1.39
16 photos