



# ACKNOWLEDGEMENTS



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## Key Findings

This report details the changes in the composition of the tank car fleet carrying Class 3 flammable liquids during the last 5 years (2013-2017), as well as projections of new and retrofitted rail tank cars during 2018. Highlighted findings outlined below:

### **FAST Act Section 7308(b):**

- The overall number of rail tank cars carrying Class 3 flammable liquids in 2017 (77,216) is the lowest overall number from 2013-2017, as compared to a 5-year high of 92,358 in 2015.
- Nearly 20 percent of the tank cars used to carry Class 3 flammable liquids in 2017 met the new safety requirements (DOT-117 and DOT-117R), a significant increase from the 2 percent in 2015.
- Non-jacketed DOT-111 rail tank cars, representing the largest share of tank cars carrying Class 3 flammable liquids, have decreased by 31 percent between 2014 and 2017.
- Non-jacketed CPC-1232 rail tank cars carrying Class 3 flammable liquids have decreased by 59 percent between just 2015 and 2017.

### **FAST Act Section 7308(c):**

- Tank Car Shops certified to build or retrofit rail tank cars to DOT-117 or safer standards expect to build 3,817 tank cars and retrofit 7,910 tank cars in 2018.

## Introduction

Section 7308 of the Fixing America's Surface Transportation Act (FAST Act; P. L. 114-94; Dec. 4, 2015) requires the U.S. Department of Transportation (DOT) to assemble and collect data on rail tank cars transporting Class 3 flammable liquids (box A). The objective of this legislation is to track the progress in upgrading the rail tank car fleet to meet new safety requirements and to provide an annual status report to Congress with the following information required in Section 7308(b):

- the total number of rail tank cars modified, or retrofitted, to meet the DOT-117R specification or equivalent;

### **Box A What is a Class 3 Flammable Liquid?**

A *flammable liquid* (Class 3) means a liquid having a flash point of not more than 60 °C (140 °F), or any material in a liquid phase with a flash point at or above 37.8 °C (100 °F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging. This includes liquids such as refined petroleum products, crude oil, and ethanol. Class 3 flammable liquids are designated by four-digit United Nations (UN) Numbers or North American (NA) Numbers, used to identify hazardous materials worldwide and are required for the shipment of hazardous materials. In all, there are over 400 UN or NA numbers that fall within Class 3 flammable liquids.

*Flash point* is the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Source: <https://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol2/pdf/CFR-2011-title49-vol2-part173.pdf> Accessed July 27, 2018

- the total number of tank cars built to meet the DOT-117 specification or equivalent; and
- the total number of tank cars used or likely to be used to transport Class 3 flammable liquids that have not been modified.

The first report was submitted to the *Senate Committee on Commerce, Science and Transportation and the House Committee on Transportation and Infrastructure* on Sept. 5, 2017 and included information on the fleet of tank cars carrying flammable liquids in the years 2013 to 2016. This second annual report similarly addresses Section 7308(b) by summarizing the progress of tank car safety upgrades from 2013 through 2017 by tank car type and flammable liquid type. See box B for more detail on the different types of tank cars referenced in this report.

Section 7308(c) requires BTS to “conduct a survey of tank car facilities modifying tank cars to the DOT–117R specification, or equivalent, or building new tank cars to the DOT–117 specification, or equivalent, to generate statistically-valid estimates of the anticipated number of tank cars those facilities expect to modify to DOT–117R

## Box B Tank Car Type Definitions

**DOT-111:** A non-pressurized tank car with a thinner shell (7/16 of an inch) than is now required for the DOT 117 tank cars. These tank cars can carry both hazardous and non-hazardous liquids. These cars are not required to have head shields to protect the tank car from an adjacent car in an incident. The top fittings and valves are not protected and are vulnerable to being sheared off in an incident leading to a release of contents. These tank cars also do not have a pressure relief device sized to protect against rupture in the event of a fire. DOT-111s do have pressure relief valves that offer some protection in some fires.

**DOT-117 (TC-117 in Canada):** A non-pressurized tank car with a shell thickness of 9/16 of an inch and insulating material providing thermal protection. The tank cars have protected top fittings, a fully protected head shield, and a bottom outlet valve with an enhanced handle designed to prevent the tank car from emptying its contents in an incident. All the enhancements are designed to protect the tank from being punctured and to prevent the valves from being disrupted. DOT-117R tank cars are cars that have been retrofitted to meet the 117 specifications.

**CPC-1232:** Industry-sponsored specification, intended to be safer than DOT-111 tank cars for carrying petroleum crude oil and ethanol. Cars ordered after October 2011 were required to meet this specification. These tank cars include a pressure relief valve, more extensive top fittings than on the DOT-111 rail tank cars and a full height or half-height head shield. The shell of non-jacketed tank cars must be ½ inch thick, and for jacketed tank cars must be 7/16 inch thick.

**\*DOT-105:** A pressurized tank car that has additional safety features than what is required on DOT-111 class non-pressurized tank cars.

**\*DOT-112:** A pressurized tank car that has additional safety features than what is required on DOT-111 class non-pressurized tank cars.

**\*DOT-114:** A pressurized tank car that has additional safety features than what is required on DOT-111 class non-pressurized tank cars. There are few of these cars actively operating in the fleet carrying Class 3 flammable liquids.

**\*DOT-115:** A non-pressurized tank car that is similar to the DOT-111 but includes an inner container surrounded by an outer shell. The inner container may be split into multiple compartments. There are few of these tank cars actively operating in the fleet carrying Class 3 flammable liquids.

**\*DOT-120:** A pressurized tank car that has additional safety features than what is required on non-pressurized tank cars. There are few of these tank cars actively operating in the fleet carrying Class 3 flammable liquids.

**\*DOT-211:** A non-pressurized tank car which is similar to the DOT-111 rail tank cars. There are few of these tank cars actively operating in the fleet carrying Class 3 flammable liquids.

Jacketed vs. non-jacketed tank cars: Jacketed tank cars have a layer of insulation/thermal protection between the tank shell and jacket that stabilizes the temperature of the liquid contained in the tank car and reduces the conductivity of heat from outside sources to the contents of the tank car.

\* Tank car types included in the “other” category for analysis purposes in this report.

- DOT-105, DOT-112, DOT-114, and DOT-120 rail tank cars that are grouped because they are pressurized and already meet a more intense set of regulations than the DOT-117 specification,
- DOT-115 and DOT-211 rail tank cars that are grouped because they do not typically carry crude oil or ethanol.

specification, or equivalent, or build to the DOT-117 specification, or equivalent.” This second report includes the first survey results from tank car shops on the projected number of new builds and retrofits for the current year, satisfying Section 7308(c).

## Background

DOT’s Pipeline and Hazardous Materials Safety Administration (PHMSA) and Federal Railroad Administration (FRA) issued a final rule on May 8, 2015,



with the intent of making the transportation of flammable liquids safer. This rule, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (HM-251), included regulations to upgrade those cars operating in high-hazard flammable trains (HHFT)<sup>1</sup>. The FAST Act further included provisions to make the transport of hazardous materials safer by modifying a timeline when tank cars built to lower safety standards will be phased out and prohibited over the next 11 years for all flammable liquid movement. Most notably, by 2025 petroleum crude oil must only be carried in DOT-117 or 117R rail tank cars.

After the HM-251 rule was issued in May 2015, the FAST Act legislation revised the phase-out timeline in December 2015. In response to the FAST Act, PHMSA revised its rule so the phase-out dates in HM-251 matched the FAST Act via the HM-251C rule<sup>2</sup>, eliminating any confusion of when the phase-out is required to occur. The current dates can be seen in Table 1. By the end of the transition period in 2029, rail tank cars may be switched from service carrying flammable liquids to non-flammable liquid service and continue to operate without modification or be retired.

## Current Fleet Composition (Section 7308(b))

### Data Sources

To provide a complete picture of the tank cars carrying Class 3 flammable liquids in meeting the safety requirements, BTS uses data from the Association of American Railroads (AAR). AAR maintains two databases:

- UMLER<sup>®3</sup>: an inventory of individual tank cars (active or scheduled to be built) and their specifications such as tank wall thickness or types of valves, and
- TRAIN II<sup>®4</sup>: a comprehensive listing of railcar movements.

<sup>1</sup> A single train transporting 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train.

<sup>2</sup> For the full text of the Hazardous Materials: FAST Act Requirements for Flammable Liquids and Rail Tank Cars (HM-251C), see: <https://www.federalregister.gov/documents/2016/08/15/2016-19406/hazardous-materials-fast-act-requirements-for-flammable-liquids-and-rail-tank-cars>; accessed on August 14, 2018.

<sup>3</sup> UMLER<sup>®</sup>: Universal Machine Language Equipment Register

<sup>4</sup> TRAIN II<sup>®</sup>: TeleRail Automated Information Network

**Table 1 FAST Act Phase Out Schedule for Rail Tank Cars Carrying Class 3 Flammable Liquids**

Flammable Liquid	Tank Car Type	Date for Phase-Out
Petroleum crude oil	Non-jacketed DOT-111	January 1, 2018
	Jacketed DOT-111	March 1, 2018
	Non-jacketed CPC-1232	April 1, 2020
	Jacketed CPC-1232	May 1, 2025
Ethanol	Non-jacketed DOT-111	May 1, 2023
	Jacketed DOT-111	May 1, 2023
	Non-jacketed CPC-1232	July 1, 2023
	Jacketed CPC-1232	May 1, 2025
Other Flammable Liquids, Packing Group I	Non-jacketed DOT-111	May 1, 2025
	Jacketed DOT-111	May 1, 2025
	Non-jacketed CPC-1232	May 1, 2025
	Jacketed CPC-1232	May 1, 2025
Other Flammable Liquids, Packing Group II/III	Non-jacketed DOT-111	May 1, 2029
	Jacketed DOT-111	May 1, 2029
	Non-jacketed CPC-1232	May 1, 2029
	Jacketed CPC-1232	May 1, 2029

**SOURCE:** Final Rule, <https://www.phmsa.dot.gov/news/hm-251c-final-rule-pdf>, accessed July 31, 2018

These AAR databases consist of information on all rail tank cars in North America. Each car has a unique identification number used to identify the specifications of each car, as well as to track commodities transported over the North American rail network.

The UMLER<sup>®</sup> file is a database, managed by Railinc Corp., a subsidiary corporation of AAR, that includes the railcars in use in North America, each identified by a unique number. UMLER<sup>®</sup> includes railcars in operation or soon to be in operation. It also includes the designated tank car specification with all the features of each tank car, such as the thickness of the wall tank and the types of valves on the top and bottom of the car. UMLER<sup>®</sup> also designates cars that have been retrofitted to meet the DOT-117R specification.

The TRAIN II<sup>®</sup> database, also maintained by AAR, tracks the movements of railcars on the North American rail network. A movement is a trip made by any rail car as a shipment of a commodity or a rail car being transferred without a commodity from one location to another. TRAIN II<sup>®</sup> also provides information on each commodity a rail car carries for any movement. For tank cars that carry Class 3 flammable liquids, the specific type of flammable liquid (UN/ NA) carried is

tracked for each movement. Thus, any rail tank car that switches between carrying one flammable liquid and another flammable liquid will be counted twice within the database. For the purposes of this report, the counts are uniquely presented as single- and multiple-flammable liquid services.

Specifically, these databases were used to count the tank cars utilized in each of the years, from 2013 to 2017, by tank car type as well as type of flammable liquid being carried. These data have allowed for analysis of the changes in the composition of the fleet along with the overall fleet size and what is being carried by each car type. This satisfies Section 7308(b) of the FAST Act.

### **Methodology**

The flammable liquid tank car fleet accounts for about 20 percent of all tank cars. These include tank cars built to specifications designated as (See box B for a detailed description of these specifications):

- DOT-117,
- DOT-117R,
- Non-jacketed DOT-111,
- Jacketed DOT-111,
- Jacketed CPC-1232,
- Non-jacketed CPC-1232,
- Other tank cars<sup>5</sup> include DOT-105, DOT-112, DOT-114, DOT-115, DOT-120, and DOT-211.

Most flammable liquids were carried in DOT-111 and CPC-1232 tank cars; however, the newer DOT-117 cars are becoming more prevalent in the fleet of rail tank cars that carry flammable liquids.

For the purposes of this analysis, flammable liquids were placed into three categories: petroleum crude oil, ethanol, and other flammable liquids, such as refined petroleum products and chemicals. Sometimes a rail tank car will be used to ship multiple flammable liquids. As a result, a “multiple” category was added

<sup>5</sup> Other tank cars include DOT-105, DOT-112, DOT-114, and DOT-120 rail tank cars, which are pressurized and already exceed the DOT-117 specification, and DOT-115 and DOT-211 rail tank cars which do not typically carry crude oil or ethanol, but may carry other flammable liquids.

to include those tank cars that carried multiple types of flammable liquids in a given year. Rail tank cars that meet the less stringent criteria are either being phased out of carrying Class 3 flammable liquids or switching to liquids that are less volatile or less likely to be in high-hazard flammable trains.

If an individual tank car made at least one trip carrying a specific Class 3 flammable liquid, then it is counted as a single tank car in this report; whereas if a tank car carried at least two different flammable liquids in the course of one year, then it is counted under multiple service. This unit of analysis allows us to look at the changes in the composition of the fleet of rail tank cars that carry Class 3 flammable liquids from year to year. This report contains those unique combinations of individual rail tank car by the four flammable liquid categories and seven tank car types. BTS has worked closely with AAR to ensure that the data used in this analysis are as accurate and thorough as possible. Because these counts could comprise one movement or many movements during a single year, the data in this report cannot be compared to the reports of tank car loadings and movements produced by AAR or other analyses.

### **Analysis Results**

Between 2013 and 2017, the number of rail tank cars carrying Class 3 flammable liquids has varied. There are numerous factors that determine whether a tank car will be used to transport Class 3 flammable liquids. Among these factors are the demand for each Class 3 flammable liquid along with pipeline capacity in North America for transporting crude oil as an alternative to using rail tank cars. In addition, some tank cars can carry multiple flammable liquids and will change their cargoes throughout the course of the year based on need. While the total number of cars carrying Class 3 flammable liquids decreased from the recent peak in 2015 by 16 percent to 2017, the number of rail tank cars that carry multiple liquid types in one year increased almost 46 percent during the same time period.

It is expected that by the end of the transition period, in 2029, all Class 3 flammable liquids will be carried in rail tank cars that meet or exceed the DOT-117 or DOT-117R specification. The total fleet of rail tank cars that actively carry Class 3 flammable liquids



increased from 2013 to 2015 and then started to decrease in 2016 (figure 1). There were 78,512 rail tank cars in this service in 2013, rising to 92,358 by 2015. However, in 2016 the number fell to 81,027, and in 2017 the fleet that carried Class 3 flammable liquids declined further to 77,216.

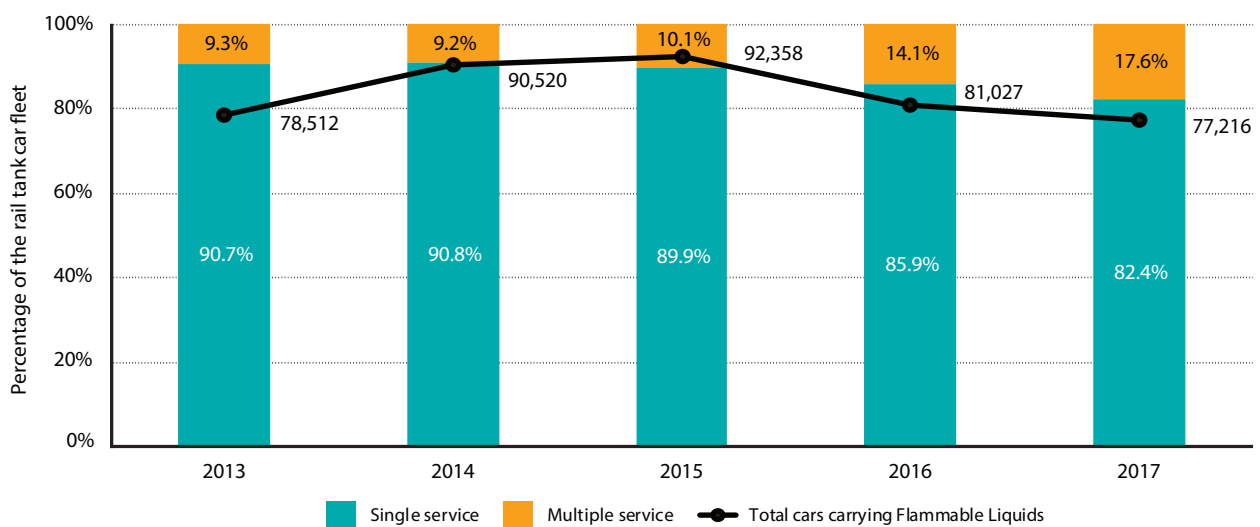
From 2013 to 2017, the composition of the fleet also changed. The DOT-117s, both new and retrofitted, grew from zero to 7,181 tank cars between 2013 and 2016, representing 9 percent of the fleet. In 2017, the numbers grew to 15,064, representing a 110 percent increase from 2016. The largest percentage of tank cars in this service remains the non-jacketed DOT-111 rail tank cars. However, their share of the fleet has dropped by nearly 19 percent, from 66 percent in 2013 to 47 percent of the 2017 fleet, a decrease of almost 16,000 rail tank cars. Compared with 2013, the number of jacketed CPC-1232 rail tank cars increased to 11,689 in 2015 and then decreased to 7,363 tank cars in 2017. The grouping of *Other Rail Tank Cars*, including specifications of DOT-105, DOT-112, DOT-114, DOT-115, DOT-120, and DOT-211 (figure 2), has shown a gradual increase from 4,519 rail tank cars in 2013 to 6,339 rail tank cars in 2017. Most of the tank cars in the *Other Rail Tank Car* category carrying any flammable liquids are DOT-105, DOT-112, or DOT-120 specifications which exceed the DOT-117 specification.

Because it will take time to upgrade the fleet of rail tank cars that carry flammable liquids, it is useful to look at the variation in flammable liquids carried by the different types of rail tank cars between 2013 and 2017. The following figures (3–8) show the variation in the flammable liquids carried by each rail tank car classification during the 2013 to 2017 time-period.

DOT-117 rail tank cars are tank cars built to the new technical and safety specifications that were finalized in 2015. All tank cars, carrying Class 3 flammable liquids, will be required at the end of the transition period in 2029 to meet or exceed the DOT-117 specification. In 2014 just 11 of these new tank cars were introduced, but by 2016 nearly 5,000 were in use carrying Class 3 flammable liquids as is shown in figure 3. Between 2016 and 2017 the number of DOT-117 rail tank cars nearly doubled to 9,211. These new tank cars were primarily used to carry crude oil and ethanol (figure 3), accounting for 86 percent of the total DOT-117 fleet.

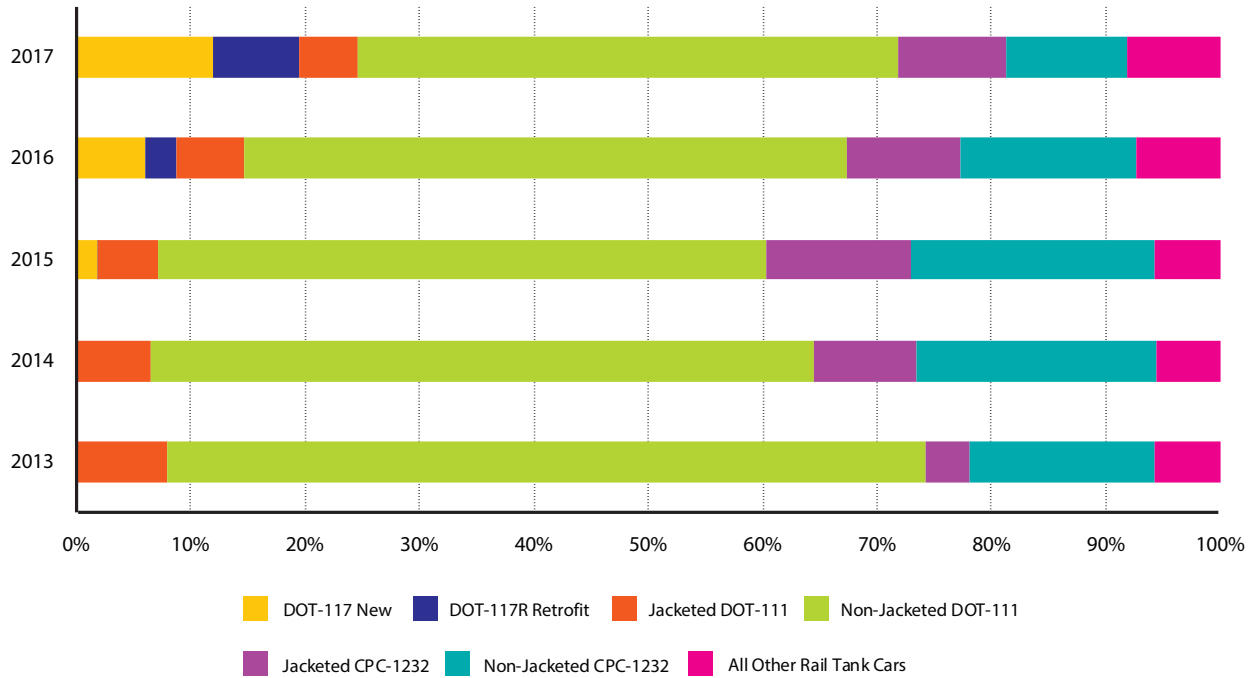
While new DOT-117 rail tank cars were being built, 5,853 existing rail tank cars have been retrofitted to meet the DOT-117R requirements. The bulk of retrofits, over 5,800 of them, started actively carrying flammable liquids on the nation’s rail system in 2016 and 2017, with 59 percent of those cars carrying various types of ethanol and crude oil (figure 3).

**Figure 1 Rail Tank Cars by Single or Multiple Flammable Liquid Service: 2013–2017**



**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

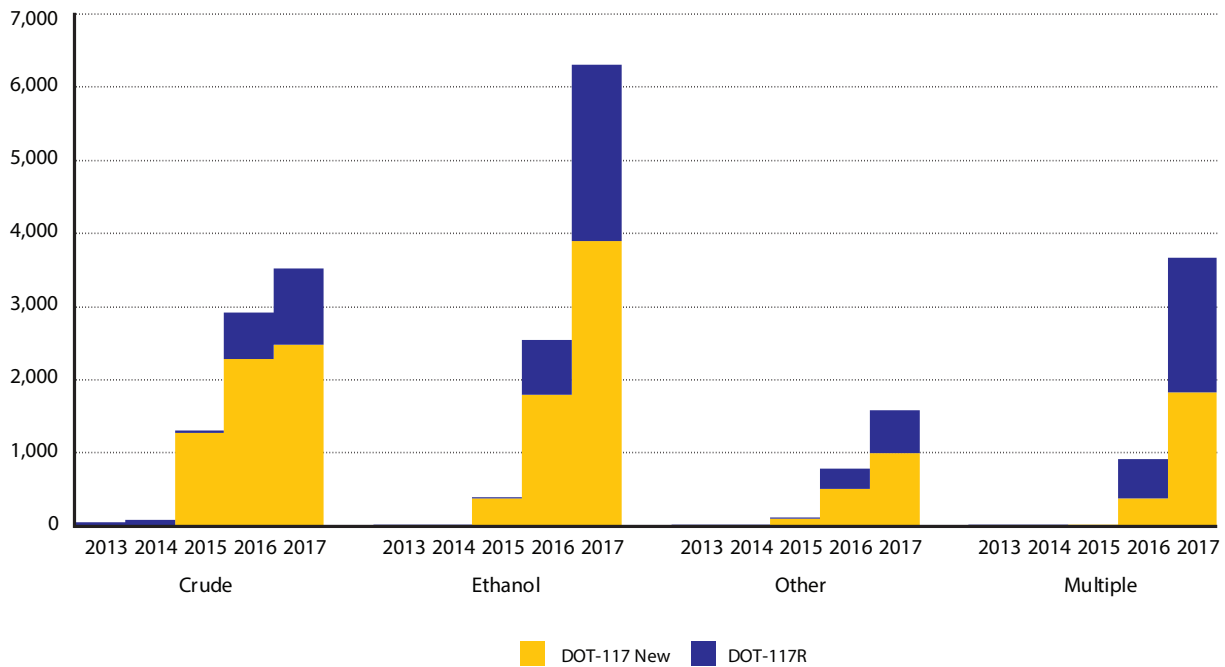
**Figure 2 Fleet Composition of Rail Tank Cars carrying Class 3 Flammable Liquids: 2013–2017**



**NOTE:** All Other Rail Tank Cars includes DOT-105, DOT-112, DOT-114, DOT-115, DOT-120, and DOT-211.

**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

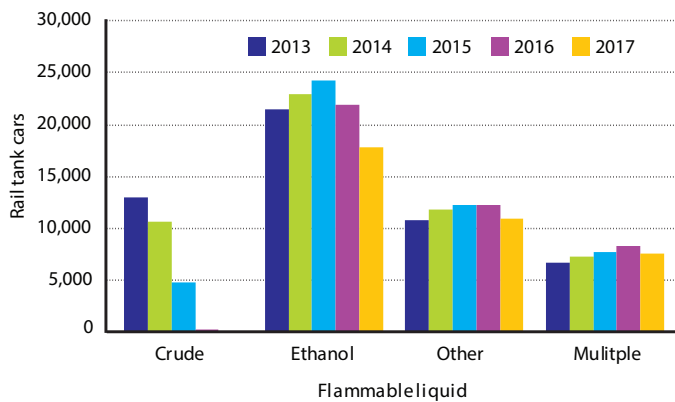
**Figure 3 DOT-117 (both new and retrofit) Rail Tank Cars by Liquid Type for 2013–2017**



**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

As of Jan. 1, 2018, non-jacketed DOT-111 rail tank cars are prohibited from carrying crude oil as mandated in HM-251 (table 1). Prior to 2018 non-jacketed DOT-111 rail tank cars have had a significant presence in the fleet of rail tank cars that carry Class 3 flammable liquids. But the number of these tank cars has been in decline, dropping from 52,521 in 2014 to 36,343 in 2017 (Appendix A)—a 31 percent decrease. The biggest decline has been in the rail tank cars that carry crude oil, down from about 25 percent of the non-jacketed DOT-111s (13,022 tank cars) in 2013 to about 0.2 percent (58 tank cars) in 2017 (figure 4). Despite the declines of non-jacketed DOT-111s carrying crude oil, the number of them carrying ethanol increased slightly between 2013 and 2015, peaking at 24,329 cars, but then started to decline in 2016 to 21,854, and in 2017 to 17,826.

**Figure 4 Non-Jacketed DOT-111 Rail Tank Cars by Liquid Type for 2013–2017**

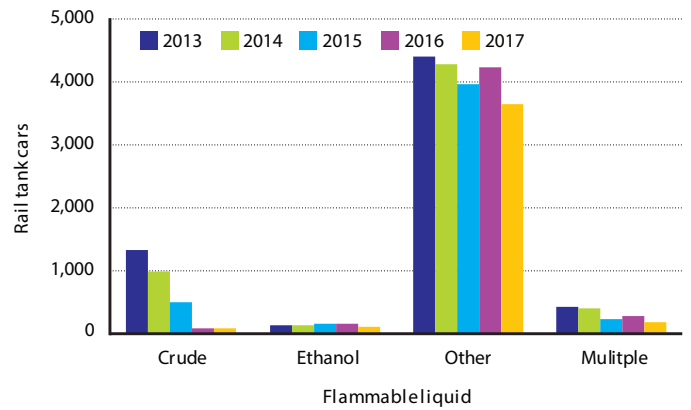


**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

Similar to the non-jacketed DOT-111s, jacketed DOT-111 tank cars are prohibited from carrying crude oil as of Mar. 1, 2018 (table 1). The total number of jacketed DOT-111 rail tank cars declined overall, between 2013 and 2017, representing nearly a 36 percent decrease. With the March 2018 phase-out date, those tank cars carrying crude oil experienced the greatest decline (figure 5), down to just 80 tank cars in 2017, a 94 percent decrease from 2013.

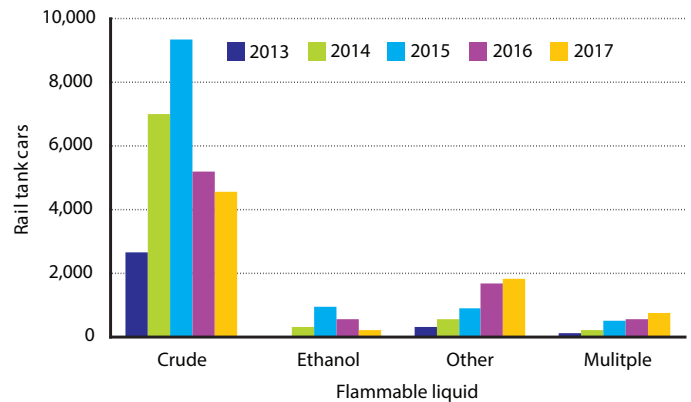
Figure 6 shows more detail on how many jacketed CPC-1232 rail tank cars were used to transport Class 3 flammable liquids. The number of these rail tank cars carrying flammable liquids increased significantly

**Figure 5 Jacketed DOT-111 Rail Tank Cars by Liquid Type for 2013–2017**



**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

**Figure 6 Jacketed CPC 1232 Rail Tank Cars by Liquid Type for 2013–2017**



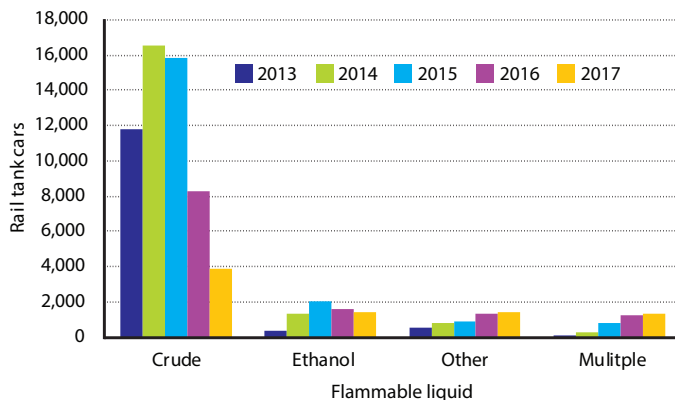
**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

between 2013 and 2015, growing from 3,011 tank cars to 11,689 cars, a nearly 300 percent increase. However, by 2017 the number of these rail tank cars used dropped to 7,363, a 37 percent decrease from the peak in 2015, but still more than twice as many in 2017 than in 2013. Of the liquids carried, crude oil follows the same pattern observed in the overall fleet with a 256 percent increase from 2013 to 2015 in the number of cars used. This increase was followed by a drop in 2017 to a level of 4,551 jacketed CPC-1232 tank cars which was still nearly twice the number of cars used in 2013 (2,624 tank cars). However, the increase in using jacketed CPC-1232 tank cars to carry for other flammable liquids has been more consistent,

in contrast to crude oil or ethanol, over the 2013 to 2017 period, ranging from 296 in 2013 to 1,824 in 2017.

The number of non-jacketed CPC-1232 rail tank cars carrying Class 3 flammable liquids increased from 12,633 in 2013 to 19,586 in 2015, a rise of about 55 percent before dropping to 8,096 cars in 2017 (figure 7). However, for the individual flammable liquid types carried by non-jacketed CPC-1232 tank cars, the trend is more varied. While the number of non-jacketed CPC-1232 rail tank cars carrying crude oil rose from 2013 to 2014, that number started to drop in 2015, and by 2017 there were two-thirds fewer tank cars carrying crude oil than in 2013. Other flammable liquids, not including ethanol, have continuously increased their usage of the non-jacketed CPC-1232 rail tank cars over the period ending in 2017, with a 65 percent increase as compared to 2015.

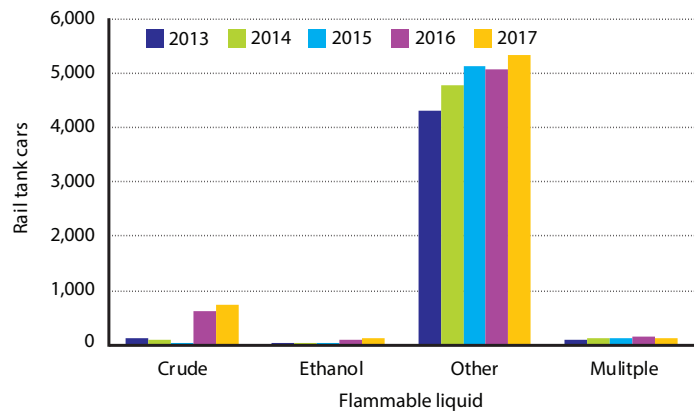
**Figure 7 Non-Jacketed CPC 1232 Rail Tank Cars by Liquid Type for 2013–2017**



**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

While there are several other types of rail tank cars capable of carrying Class 3 flammable liquids, their numbers are notably lower, particularly for transporting crude oil and ethanol (874 combined). Therefore, for analysis purposes, they are grouped together and include DOT-105, DOT-112, DOT-114, DOT-115, DOT-120, and DOT-211 rail tank cars. As seen in figure 8, there was an increase to 734 cars carrying crude oil in 2017, compared to 113 in 2013. Between 2013 and 2017, there was a 24 percent increase in the number of these tank cars (to 5,328 rail tank cars) carrying other flammable liquids.

**Figure 8 All Other Rail Tank Cars by Liquid Type for 2013–2017**



**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II® rail tank car and annualized rail tank car movements, 2013–2017, as of June 11, 2018.

## Anticipated Number of Rail Tank Cars Meeting New Safety Standard (Section 7308(c))

### Data Sources

Section 7308(c) requires DOT to estimate the anticipated number of DOT-117 and DOT-117R tank cars for each year from 2018 through 2029 by collecting data from tank car shops that build or retrofit tank cars. In June 2018 BTS initiated the first *Annual Tank Car Facility Survey*. This survey collected information from tank car retrofitting and manufacturing facilities on planned and projected number of tank cars to be retrofitted or manufactured in 2018. Any facility identified with the capacity to build new DOT-117 tank cars or modify tank cars to the DOT-117R specification, as described in Section 7308(c) of the FAST Act, was included in the survey. Since not all tank car shops, or facilities, are capable or certified to build or retrofit tank cars to the DOT-117 or DOT-117R specifications; AAR and the Railway Supply Institute<sup>6</sup>, assisted BTS in identifying facilities with the capabilities and certifications to build or retrofit tank cars to the DOT-117 specification. The data collected from this effort is summarized in this report.

<sup>6</sup> The Railway Supply Institute is a trade association representing rail tank car manufacturers and facilities performing repairs and maintenance.

## Survey Method

The 2018 Annual Tank Car Facility Survey, conducted from June-August 2018, included U.S. owned or operated facilities, known as tank car shops, with the capability of retrofitting and/or manufacturing rail tank cars to the new safer standards. In total, 148 tank car shops were identified and included in the survey frame. Responses were obtained from 111 shops. Due to non-response from 37 tank car shops, this number potentially underestimates the projected numbers. Each tank car shop was initially contacted by a letter to inform them of the data collection request and the purpose and use of the collected information. Furthermore, the letter provided assurance of confidentiality for their reported data. The letter included the link and individual credentials to the website for online data submission. Once logged into the electronic reporting tool, respondents were prompted to provide the number of tank cars they were expecting and/or certified to build (DOT-117) in 2018, as well as the number of cars to be retrofitted (DOT-117R) from previous specification type (e.g., DOT-111). The information collected from the survey is protected by the Confidential Information Protection and Statistical Efficiency Act of 2002 (CIPSEA); therefore, only aggregate statistics are provided in this report to ensure the confidentiality of individual participants and responses.

The data collected from this survey will not match future counts of rail tank car movements in the AAR data. Tank car movements account for all tank cars that carried a shipment, regardless of when they were built or retrofitted to meet a different specification. Newly built or retrofitted cars may enter service at any point and may or may not be counted for that year. Furthermore, facilities in North America not owned by an American company are not included in the survey.

## Survey Results

Based on results from the Annual Tank Car Facility Survey, U.S. owned and operated tank car shops reported that they expect to build 3,817 new rail tank cars in 2018 to meet the DOT-117 specification or safer standard. This could include DOT-117 and DOT-120 cars. Of these, 1,796 currently have AAR approval, indicating they are certified to be built. Additionally, tank car shops plan to retrofit existing rail tank cars to meet the more rigorous DOT-117 safety

standards. As seen in table 2, 6,125 rail tank cars are expected to be retrofitted from DOT-111s and an additional 1,785 CPC-1232 cars are anticipated to be retrofitted to DOT-117R tank cars. Due to fluctuations in the business environment and market conditions, it is impossible to precisely predict the final numbers of new and retrofitted rail tank cars, meeting the DOT-117 specification, in 2018.

**Table 2 Projections of Rail Tank Cars, 2018**

	Projected to be built in 2018
DOT-117	3,817 (1,796 approved)
DOT-120	0

	Projected to be retrofit in 2018
DOT-111	6,125
CPC-1232	1,785

**NOTE:** DOT-120 rail tank cars exceed the DOT-117 safety standard. For the existing fleet, they are included with Other Rail Tank Cars for analysis. See Box B in the report for more information on the tank cars.

## Summary

In 2017, 77,216 tank cars were used to transport Class 3 flammable liquids (appendix A). This represents a decline of 16 percent from the recent peak in 2015 when 92,358 tank cars carried at least one shipment of a flammable liquid. The tank car fleet has also changed in composition and the types of flammable liquids transported. There has been growth in the number of DOT-117 and 117R tank cars despite the overall reduction in the fleet from 2015 through 2017.

While new DOT-117 tank cars are being built, more than 5,800 existing cars have also been retrofitted through 2017, to meet the new safety standards. As of the end of 2017, nearly 20 percent of all tank cars used to carry Class 3 flammable liquids met the new safety requirements, a significant increase from 2 percent in 2015. Based on the 2018 survey of tank car facilities, U.S. tank car facilities plan to build or modify nearly 12,000 tank cars during 2018 to meet the new safety requirements. At the same time, industry is also responding by carrying crude oil in the rail tank cars meeting or exceeding the DOT-117 safety requirement.

The DOT-117 and DOT-117R tank cars carry a variety of flammable liquids, with 86 percent of these tank cars carrying crude oil or ethanol (26 percent and 60 percent, respectively). Among the fleet of rail tank



cars that meet the DOT117 specification in 2017, 61 percent (9,211 tank cars) are new and 39 percent (5,853 tank cars) are retrofitted.

Despite the reduction in the overall fleet, still nearly half of the tank cars carrying flammable liquids were non-jacketed DOT-111s (47 percent of the fleet); representing a 31 percent drop or 16,178 fewer tank cars in 2017 than in 2014. Throughout 2017, only 58 non-jacketed DOT-111 cars carried any shipments of crude oil. This number is expected to be zero in 2018, meeting the phase-out deadline of Jan. 1, 2018, which will be verified once the 2018 data is complete. Similarly, there has been a decline in the use of jacketed DOT-111 rail tank cars which are to be phased out by Mar. 1, 2018.

The non-jacketed CPC-1232s have seen reductions in their numbers carrying flammable liquids since 2013, and a decline in the percentage of the entire tank car fleet since 2015. However, the jacketed CPC-1232 cars increased between 2013 and 2015 (3,011 to 11,684), and then started to decline in 2016 with 4,551 in service in 2017. The non-jacketed CPC-1232s carrying crude oil are to phase-out by Apr. 1, 2020.

The percentage of jacketed CPC-1232 cars used for transporting crude oil decreased from 87 to 62 percent between 2013 and 2017. The percentage of non-jacketed CPC-1232 cars used for transporting crude oil decreased from 93 to 48 percent, while the percentage carrying ethanol increased from 3 to 17 percent in 2017.

## Appendix A: Data Table To Support Figures 3-8

### Rail Tank Car Type by Flammable Liquid Transported: 2013–2017

DOT-117 New	2013	2014	2015	2016	2017
Crude	0	11	1,279	2,287	2,484
Ethanol	0	0	375	1,793	3,899
Other Flammable Liquids	0	0	103	505	1,004
Multiple Service of Flammable Liquids	0	0	19	381	1,824
<b>Total</b>	<b>0</b>	<b>11</b>	<b>1,776</b>	<b>4,966</b>	<b>9,211</b>
DOT-117 Retrofit	2013	2014	2015	2016	2017
Crude	60	73	24	638	1,029
Ethanol	3	3	3	757	2,399
Other Flammable Liquids	12	14	4	289	576
Multiple Service of Flammable Liquids	1	1	0	531	1,849
<b>Total</b>	<b>76</b>	<b>91</b>	<b>31</b>	<b>2,215</b>	<b>5,853</b>
Jacketed DOT-111	2013	2014	2015	2016	2017
Crude	1,315	982	497	90	80
Ethanol	125	140	147	148	116
Other Flammable Liquids	4,385	4,279	3,955	4,219	3,629
Multiple Service of Flammable Liquids	427	387	236	269	186
<b>Total</b>	<b>6,252</b>	<b>5,788</b>	<b>4,835</b>	<b>4,726</b>	<b>4,011</b>
Non-jacketed DOT-111	2013	2014	2015	2016	2017
Crude	13,022	10,599	4,792	276	58
Ethanol	21,478	22,889	24,329	21,854	17,826
Other Flammable Liquids	10,812	11,787	12,326	12,332	10,926
Multiple Service of Flammable Liquids	6,709	7,246	7,678	8,252	7,533
<b>Total</b>	<b>52,021</b>	<b>52,521</b>	<b>49,125</b>	<b>42,714</b>	<b>36,343</b>
Jacketed CPC-1232	2013	2014	2015	2016	2017
Crude	2,624	6,988	9,342	5,164	4,551
Ethanol	0	308	957	575	226
Other Flammable Liquids	296	545	912	1,684	1,824
Multiple Service of Flammable Liquids	91	229	478	564	762
<b>Total</b>	<b>3,011</b>	<b>8,070</b>	<b>11,689</b>	<b>7,987</b>	<b>7,363</b>
Non-Jacketed CPC-1232	2013	2014	2015	2016	2017
Crude	11,765	16,554	15,834	8,246	3,925
Ethanol	338	1,363	2,088	1,628	1,394
Other Flammable Liquids	528	809	873	1,382	1,453
Multiple Service of Flammable Liquids	2	319	791	1,245	1,324
<b>Total</b>	<b>12,633</b>	<b>19,045</b>	<b>19,586</b>	<b>12,501</b>	<b>8,096</b>
All Other Rail Tank Cars	2013	2014	2015	2016	2017
Crude	113	90	38	611	734
Ethanol	4	20	20	94	140
Other Flammable Liquids	4,299	4,772	5,127	5,060	5,328
Multiple Service of Flammable Liquids	103	112	131	153	137
<b>Total</b>	<b>4,519</b>	<b>4,994</b>	<b>5,316</b>	<b>5,918</b>	<b>6,339</b>
<b>Total Cars Used</b>	<b>78,512</b>	<b>90,520</b>	<b>92,358</b>	<b>81,027</b>	<b>77,216</b>

**NOTES:** "All Other Rail Tank Cars" include DOT-105, DOT-112, DOT-114, DOT-115, DOT-120, and DOT-211. "Other Flammable Liquids" includes all flammable liquids that are not crude oil or ethanol.

**SOURCE:** U.S. Department of Transportation, Bureau of Transportation Statistics. Special analysis based on data provided by the Association of American Railroads: UMLER® and TRAIN II®, 2013–2016, as of June 11, 2018.