A CLOSER LOOK SERIES

NORTH AMERICAN RAIL TANK CARS

July 2017
# TABLE OF CONTENTS

Executive Summary .................................................................................................................. 2  
Market Overview ...................................................................................................................... 3  
Fleet Overview ........................................................................................................................ 9  
Fleet Segmentation .................................................................................................................. 10  
  All Tank Cars ....................................................................................................................... 11  
  General Purpose Tank Cars ................................................................................................. 15  
  Small General Purpose Tank Cars ....................................................................................... 19  
  20,000 gallon General Purpose Tank Cars ........................................................................... 23  
  23,500 gallon General Purpose Tank Cars ........................................................................... 27  
  25,500 gallon General Purpose Tank Cars ........................................................................... 31  
  Large General Purpose Tank Cars ....................................................................................... 35  
  Pressure Tank Cars ............................................................................................................... 39  
  Small Pressure Tank Cars ................................................................................................... 43  
  Medium Pressure Tank Cars ............................................................................................... 47  
  Large Pressure Tank Cars ................................................................................................... 51  
  Specialty Tank Cars ............................................................................................................ 55  
Fleet Ownership ...................................................................................................................... 60  
Fleet Age Profile ..................................................................................................................... 62  
Fleet Utilization and Surpluses ............................................................................................... 65  
Retirements and Attrition ....................................................................................................... 66  
New Tank Car Deliveries ........................................................................................................ 68  
Features and Components Glossary ....................................................................................... 75
EXECUTIVE SUMMARY

The North American tank car fleet currently totals approximately X cars.

The General Purpose fleet is the largest and most broadly used segment, totaling X, or X% of all tank cars.

The Pressure fleet totals X cars, or X% of the fleet and is used to transport liquids and gases under pressure.

The remaining X% of the fleet, or X cars, are Specialty tank cars.

Over the last ten years, tank car traffic has grown at a X% AAGR and currently exceeds X million carloads per year.

The petro-chemical industry is the largest user of tank cars, accounting for X% of the total traffic base.

The agricultural industry generates X% of tank car shipments and the mining industry accounts for X%.

Ethanol surpassed crude petroleum as the single largest commodity shipped in tank cars, representing X% and X% of commodities traffic respectively.

Crude petroleum shipments fell significantly in 2016 to X car loads, versus X carloads in 2014.

Retirements averaged X cars per year from 1990 to 2007, but increased to X cars per year due to recession effects over 2008-2011. Retirements are projected to jump to X cars per year over 2017-2021.

The surplus increased dramatically between 2014 and 2016 with totals of X and X, respectively. Crude oil traffic weakness is responsible for the current surplus. It is expected to remain relatively consistent over the 2017-2021 forecast period to X by 2021.

The tank car fleet has an average age of X years.

Leasing companies and shippers own X% of all tank cars. Lessor s have grown their share from X% to X% in the last ten years. Shippers own the balance of the fleet. The few railroad-owned tank cars are used for company materials only.

New tank car deliveries totaled X cars in 2016, down from X in 2015. Over 2017-2019, deliveries are projected to average X units per year.
CLOSER LOOK SERIES: Tank Cars

23,500 GALLON GENERAL PURPOSE TANK CARS

CHARACTERISTICS. The 23,500 gallon General Purpose Tank Car fleet includes cars with shell capacities of between 21,500-24,499 gallons.

This fleet consists of X cars, or X% of all tank cars, and was the largest tank car segment fleet until it was overtaken by the Large GP fleet due to the build-up of the ethanol and crude fleets.

Exterior coiled/insulated cars account for X% of this fleet segment with the balance being mainly non-coiled/non-insulated cars.

**Fleet Demographics**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP 23.5k Tank Car</td>
<td></td>
</tr>
</tbody>
</table>

**Capacity.** All of the cars have gallonage capacities that fall between 22,000-24,499 gallons.

Most cars in this segment, X%, have 263k grl tonnage capacities with the remaining portion of the fleet features 286k grl capacity.

**Age.** The median car in the 23.5k GP fleet was built in the year X and the average age of this segment is X years. About X% of the cars are over X years old. Cars under ten years of age make up X% of the 23.5k cars. The age profile for this segment is older than the GP fleet as a whole.

**Ownership.** The 23.5k GP fleet is primarily owned by the leasing companies, who hold an X% share. The shipper
Carloadings in 2016 for the 23.5k GP fleet were X% down X% from 2015.

Asphalt is the largest commodity shipped in this car type, representing X% of shipments, followed by glycols at X%. Residual fuel oils, petroleum lube oil, acids, and cyclic intermediates follow next, combining for X%.

Single car shipments make up X% of the traffic base. Multiple cars shipments of 2-24 cars account for the remainder.
In 2016, this fleet averaged X trips per year, a slight decrease from the X in 2013.

During the 2007-2009 recession period, surplus pressure caused trips per year to fall from X down to X as carloads fell by X% y/y in 2008 followed by X% in 2009.

As the recession ended, carload growth averaged a X% increase per year over 2010-2013, as some GP 23.5k cars moved into crude-by-rail service.

Carloads, which at its lowest point measured X in 2009, also peaked in 2013 with X total. This peak made 2013 not only the highest utilization since the recession, but also the highest peak within the last fifteen years.

In 2016, carloads in this segment declined to X, as equipment moved back into traditional service areas following the build cycle for higher capacity tank cars to service the crude-by-rail market.

New 23.5k GP tank car deliveries are estimated to have totaled about X cars between 2013 and 2016, or X% of the period's new cars. Retirements totaled X, accounting for X% of total OTH retirements.

The 23.5k GP fleet increased from X in January 2013 to X in January 2017.

The 23.5k GP fleet is projected to decline during the 2017-2021 forecast period. Retirements are forecast to exceed new car deliveries at X cars and X cars, respectively. The build to retirement ratio will be X.

By the end of 2021 this fleet will total X cars, a X% decrease for the period, or a X% AAGR. It will make up X% of the total tank car fleet, down from X% in January 2017.

The GP 23.5k tank car fleet has remained in relatively stable supply demand balance over the past decade. Historically considered the workhorse tank car type, this fleet serves a wide variety of the core commodities within the industrial chemicals sector, and has had a long adjustment period over the past 20 years to reach supply/demand balance.

Despite being such an essential part of the tank car fleet, the GP 23.5k segment has experienced less than average investment compared to other general purpose tank car segments. With over 85% of the fleet built to 263k Grl specifications, the segment is due for some new investment attention, particularly upgrading to 286k Grl capacity.
23,500 Gallon General Purpose Tank Cars

Fleet Outlook

Much like the GP 20k tank car, growth in this fleet is dependent on the changeover of carloads from smaller 263k Grl cars to higher capacity 286k Grl equipment.

The fleet is in a position to acquire some carloads graduating from the GP 20k fleet, but will likely transition a larger share of traffic to the GP 25.5k tank car, as a result of the longer term 286k Grl upgrade cycle. This is simply because there are fewer applicable carloads that could be escalated from the GP 20k to the GP 23.5k car type. Commodities moving in cars that are 263k Grl and greater than 23,600 gallons are most susceptible to transition to the GP 25.5k fleet. This transition could affect as much as 40% of GP 23.5k tank car equipment.

Overall, this carload shift to 286k Grl will likely result in a long-term net loss of carload volume for the GP 23.5k fleet, bar any significant freight growth in the segment. However, in the short term, cars are expected to be better utilized as industrial traffic carload volumes normalize over the forecast period, following a 2016 dip in traffic.

Long term carload decline does not equate to the absence of need for new car investment. More than 20% of the fleet is over 30 years old, and only 15% of the fleet currently meets the 286k Grl tonnage standard.

There exists a substantial need for new GP 23.5k equipment at 286k Grl tonnage capacities, but new cars will most likely be delivered in step with retirements, as opposed to a dramatic delivery cycle. Moving forward, these new cars will be built to service products moving in the higher end of the density spectrum for this fleet.

Car Demand Pressure Index

Fleet Size and Carloads Indexed to 2001

Source: Umler, STB Waybill, FTR, AllTransTek

Carloads and fleet size have remained relatively stable over the past several years. Freight traffic hasn’t created significant pressure to build new cars since before the recession. Changeover from smaller capacity cars to 286k Grl cars are causing this fleet to gain carloads from smaller car type segments, while simultaneously losing some traffic for lower density products to higher capacity cars. Because of this position, this fleet expected to remain in balance.