Crude Oil Transportation by Rail

July 15, 2013

Overview

1. Overview of Montreal, Maine and Atlantic Railway Accident in Lac-Megantic

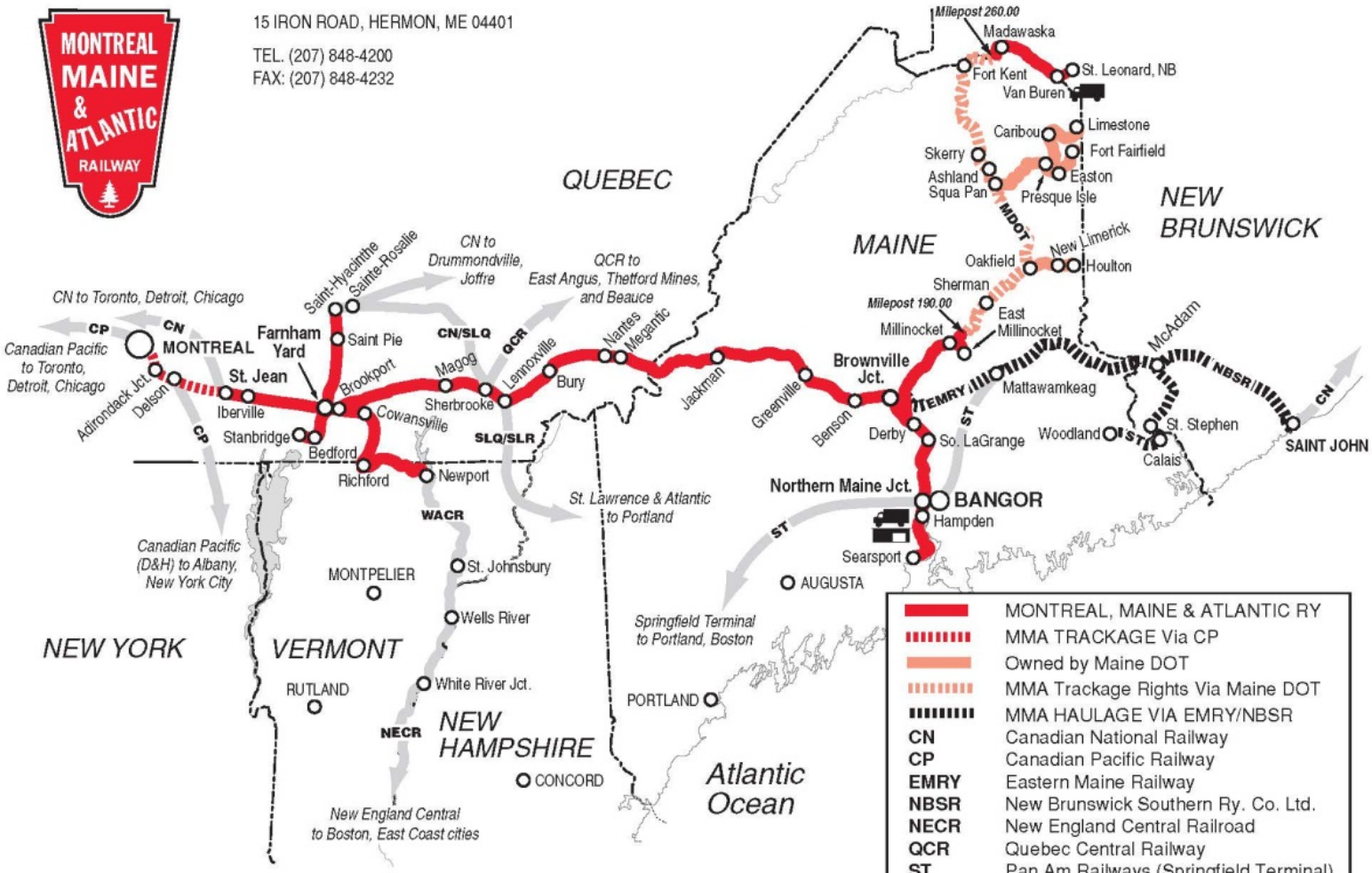
2. Overview of Crude Oil Transportation in North America and Associated Issues

3. Overview of Applicable Regulations and Enforcement Actions in the United States

Section 1:

Overview of Montreal, Maine and Atlantic Railway Accident in Lac-Megantic

MONTREAL, MAINE & ATLANTIC RAILWAY LTD.



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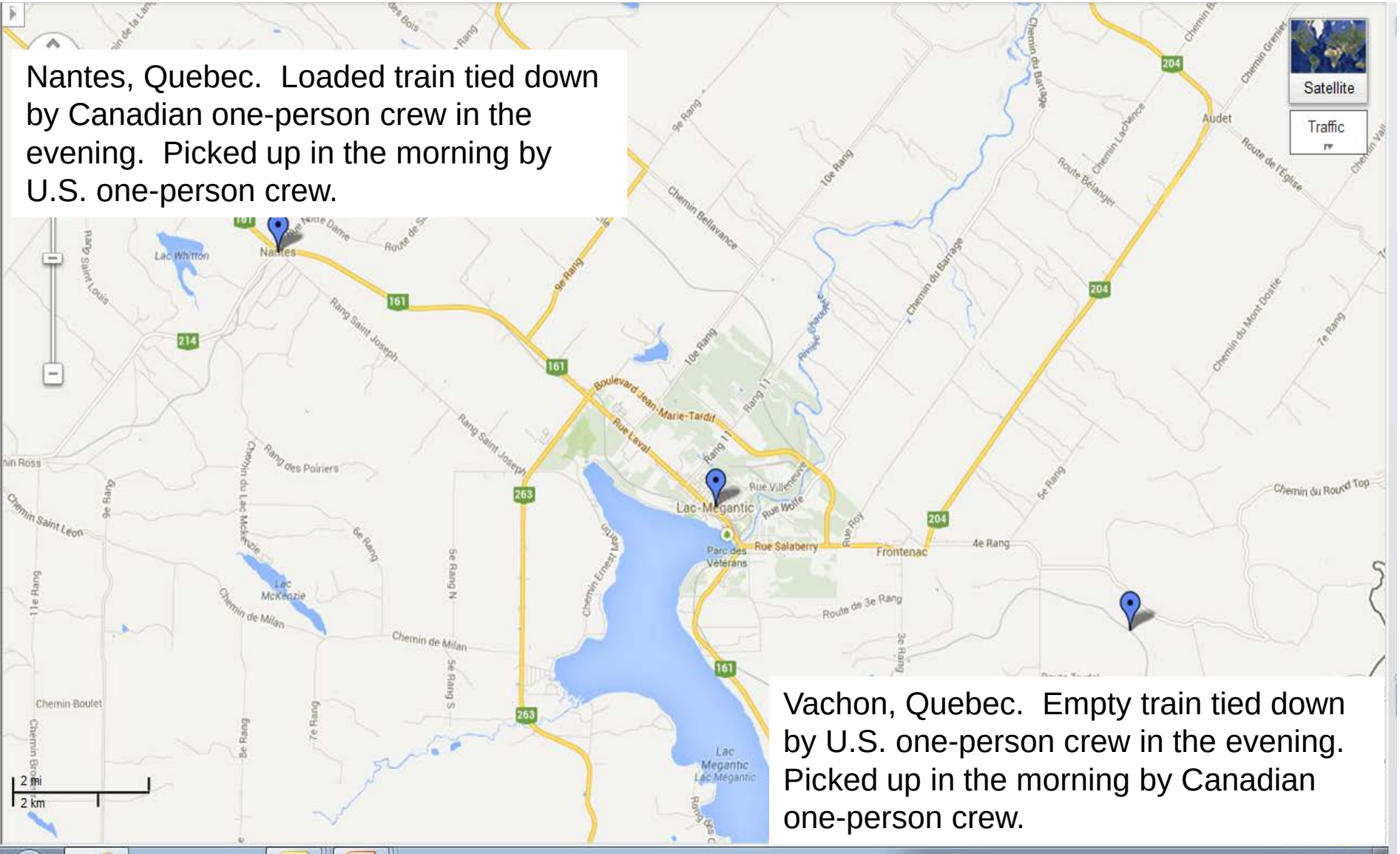
Reset
Homes destroyed
Dollarama
Burnt-out cars
Firefighters
Library
Crashed oil containers

Reuters

AP

Rue Frontenac
After
AP

Typical Montreal, Maine and Atlantic Railway Operation



Nantes, Quebec. Loaded train tied down by Canadian one-person crew in the evening. Picked up in the morning by U.S. one-person crew.

Vachon, Quebec. Empty train tied down by U.S. one-person crew in the evening. Picked up in the morning by Canadian one-person crew.

Accident Timeline (1 of 2)

Friday, July 5 at 11:25 p.m. EDT

Eastward oil train consisting of (from east to west) locomotive (GE C30-7), remote control caboose, four locomotives, stone car, and 72 crude oil tank cars, arrives at Nantes, Quebec (about 6 miles (10 kilometers) from Lac-Megantic). The train engineer finishes his shift and departs to take rest in a local hotel, leaving the train unattended. It is unclear how many hand brakes were set.

11:30 p.m. EDT

A resident in Nantes calls 911 to report a fire in the parked train.

Midnight

Firefighters and an employee of the train operator, Montreal, Maine and Atlantic Railway, arrive on the scene. Firefighters douse the blaze and the train engine is shut down. Canada's Transportation Safety Board at a news conference on Tuesday did not say who shut down the engine or who was last in the locomotive.

Accident Timeline (2 of 2)

Saturday, July 6 at 12:56 a.m. EDT

After firefighters depart, the train starts to move. It begins rolling down a slope away from Nantes and toward Lac-Megantic.

1:15 a.m. EDT

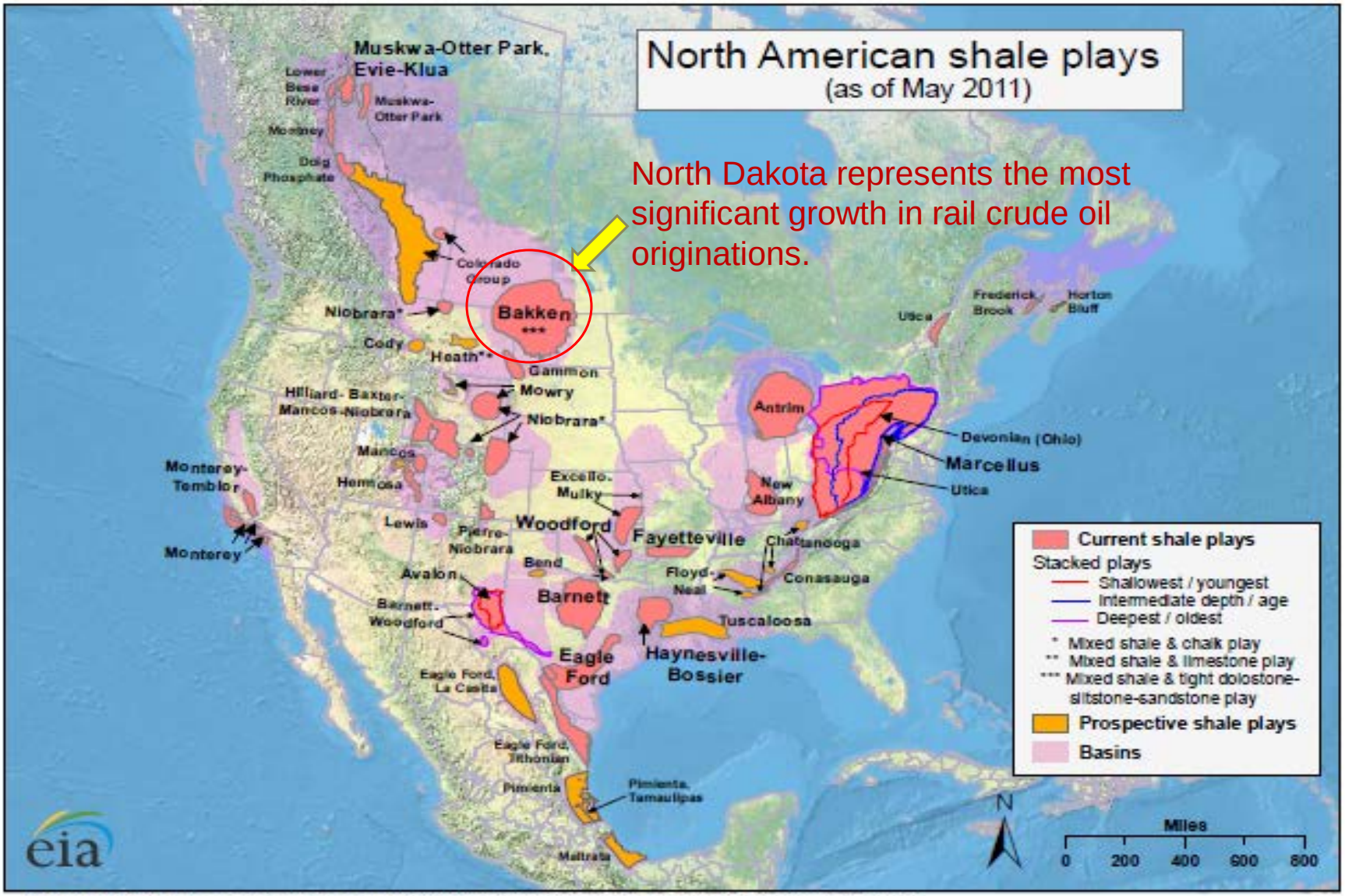
The first explosion is reported as the train derails in Lac-Megantic. The locomotive detaches and continues through town for nearly a mile (kilometer). Residents report a series of explosions with fireballs shooting into the sky over the next several hours and a wall of flames that destroys the downtown, including a bar filled with patrons, the library, and a waterside park, along with dozens of other buildings.

2:00 a.m. EDT (approximately)

One of the engineers (unclear if Canadian or American) hears the commotion and gets a track mobile and pulls the rear nine cars clear of the derailment site.

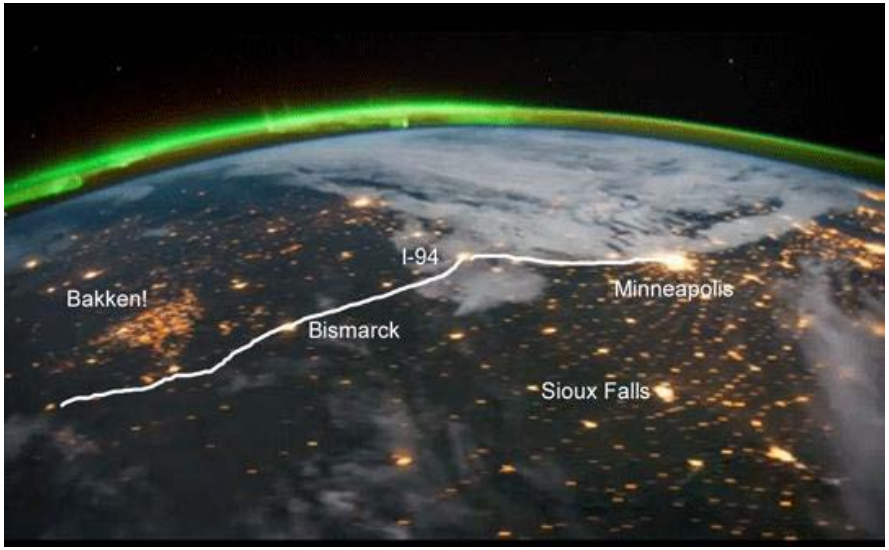
Section 2:

Overview of Crude Oil Transportation in North America and Associated Issues



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

The Bakken Region from Space



Unit Train Loading Operations in North Dakota

Rail Movement of Crude Oil and Ethanol

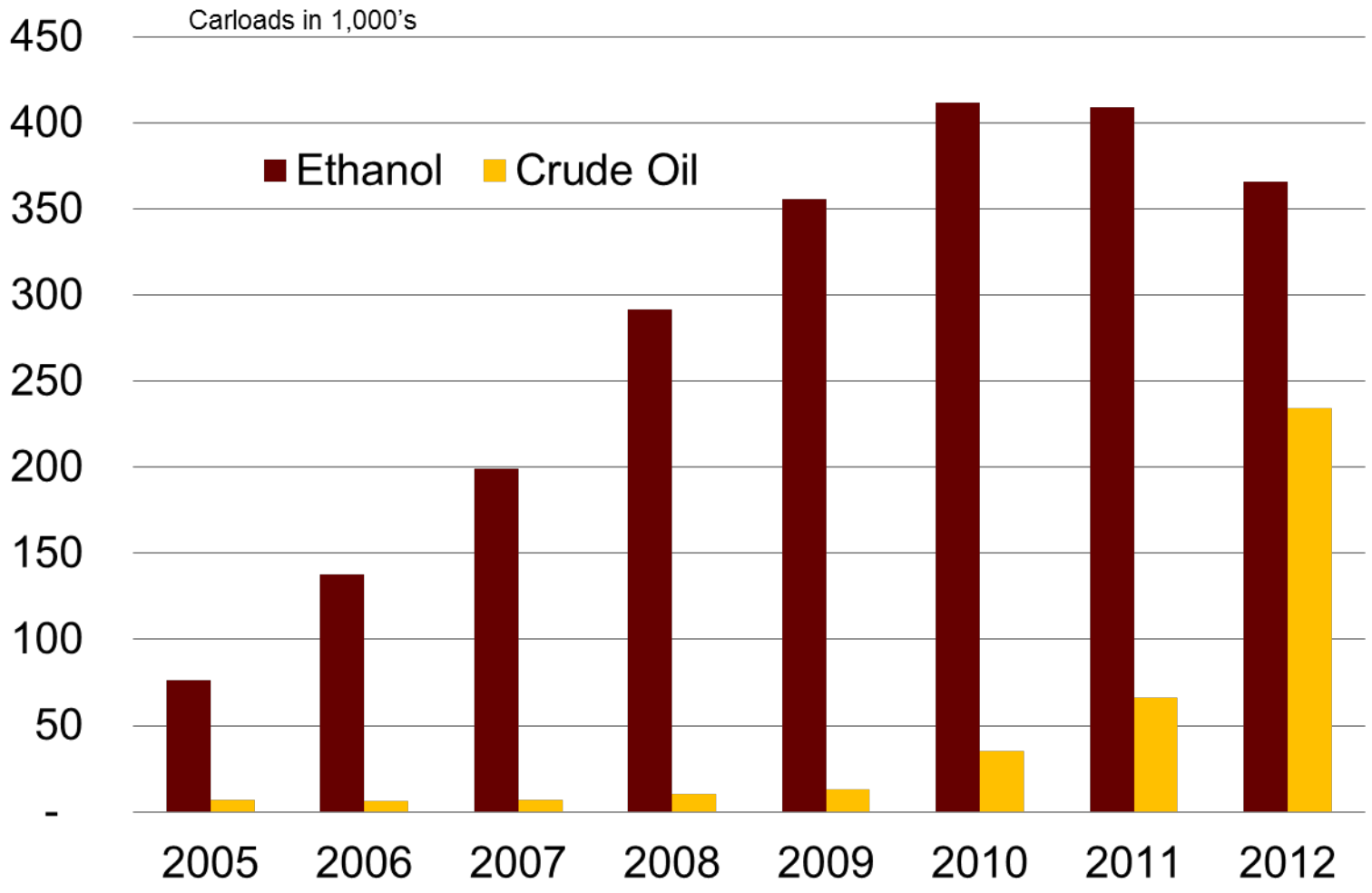
Crude Oil

- From 2005 through 2012, crude oil traffic increased by 443%.
- The number of carloads originated held steady until 2010 when growth began.
- In 2012, crude oil originations by rail increased by 256% over the previous year.
- Carloads originated increased from 65,600 in 2011 to 233,500 in 2012.
- Growth is expected to continue for the foreseeable future.
- Issues center on supply of tank cars.

Ethanol

- From 2005 through 2010, ethanol traffic increased by 442%.
- The number of carloads increased from 76,000 per year to nearly 421,000 per year.
- Traffic recently dropped to 366,000 carloads per year from 2010 levels, an 11% decrease.
- In 2012, remained the commodity with the most originalations.

Rail Crude Oil Growth



Sources of Rail Originations of Crude Oil

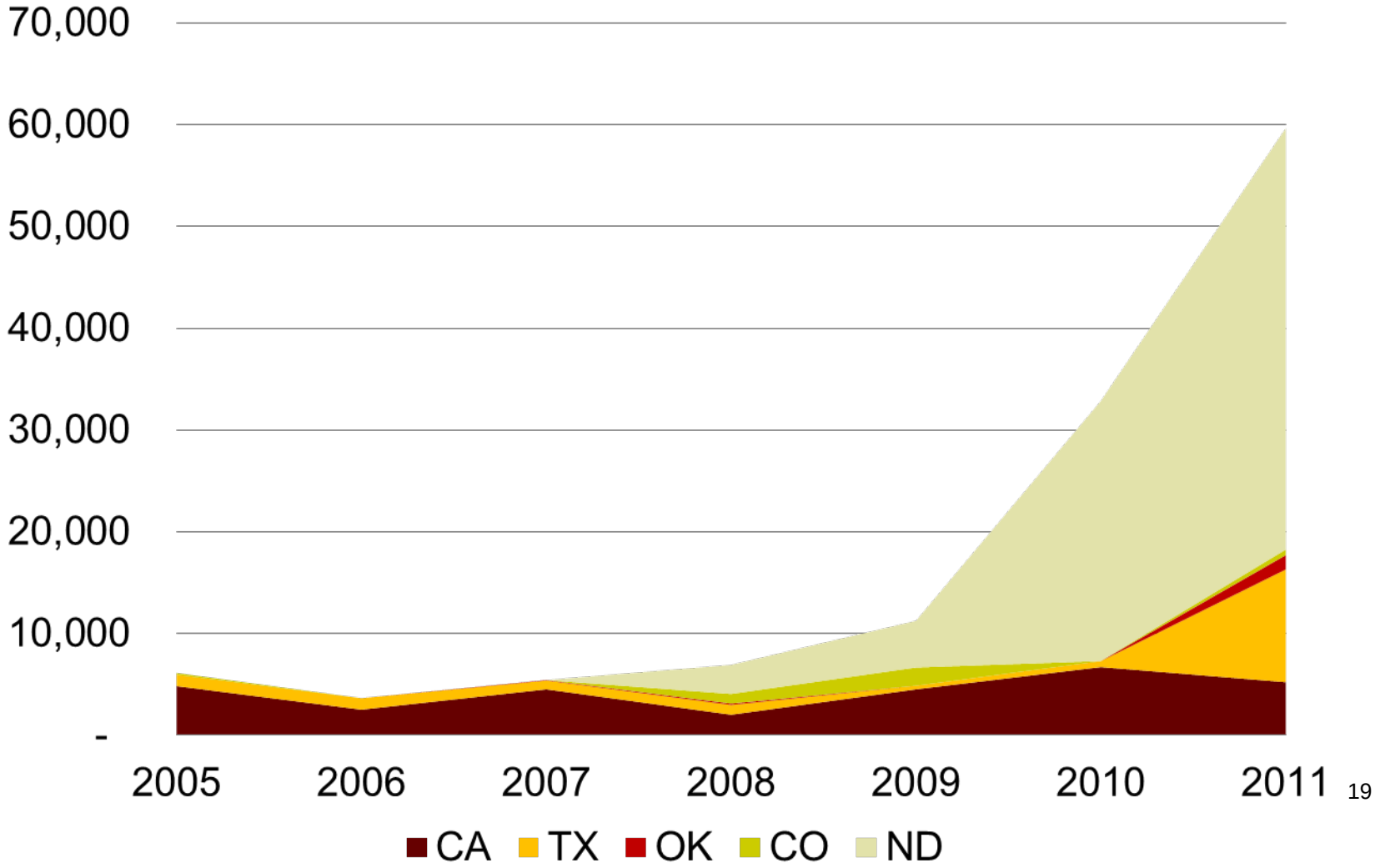
Crude Oil Originations

- Prior to 2008, California accounted the most rail originations of crude oil.
- Beginning in 2008, North Dakota surpassed California.
- In 2010, North Dakota originations were significantly above any of the Nation's producer States.
- Texas crude oil originations have grown from 600 in 2010 to 11,000 in 2011 (the last year that detailed data is available).

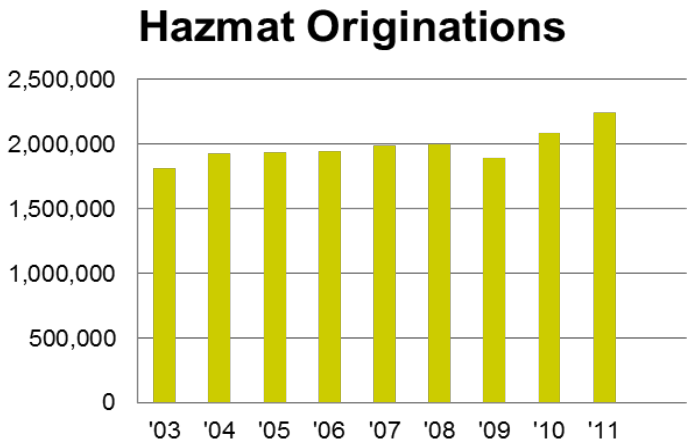
Destinations

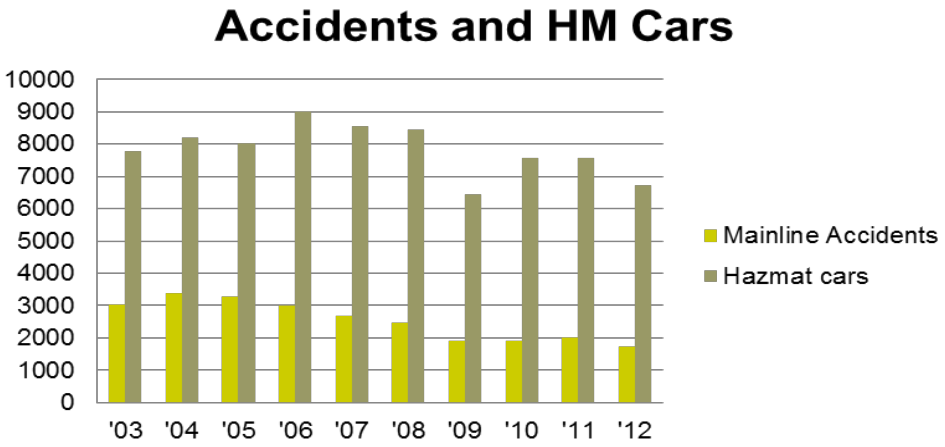
- For 2011, the major crude oil rail destinations by State are Louisiana, Oklahoma, and Texas.
- Crude oil from North Dakota travels by rail to the Gulf refineries or picks up the pipeline in Cushing or Stroud, Oklahoma.
- Crude is also being shipped by rail to the refineries in East.

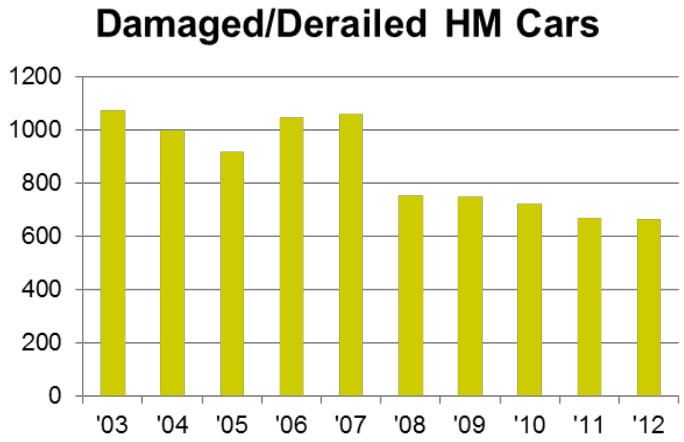
Crude Oil – Rail Carload Originations by State

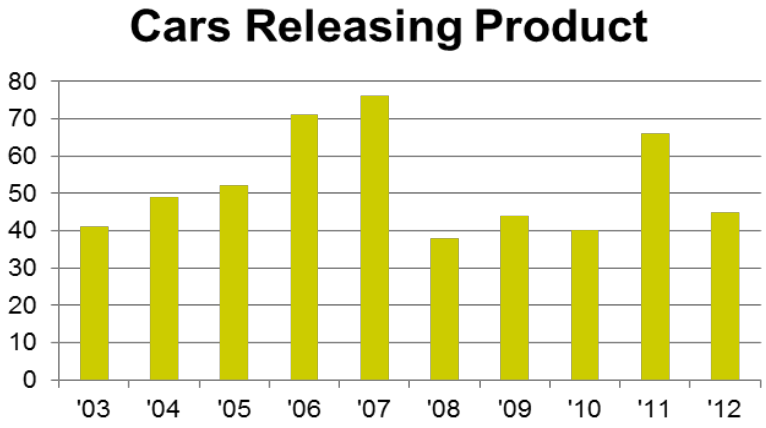


FRA Safety Statistics

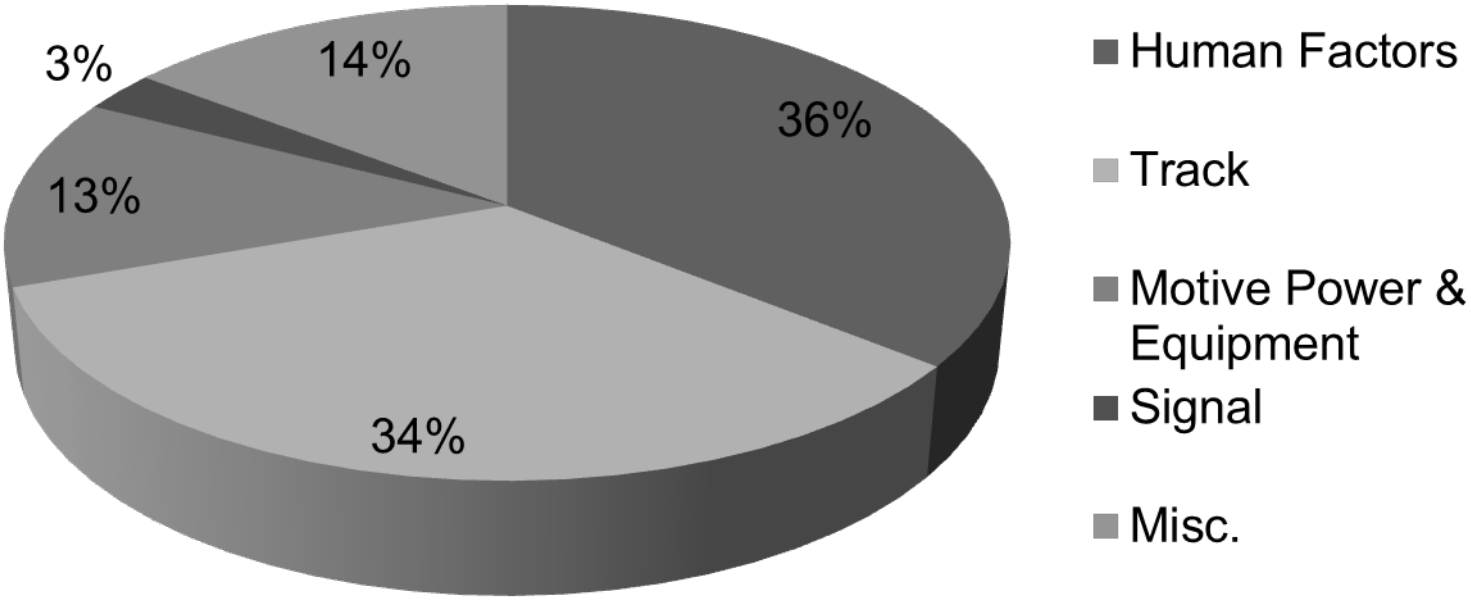








FRA Reportable Accidents (2009 — Present)



Section 3:

Overview of Applicable Regulations and Enforcement Actions in the United States

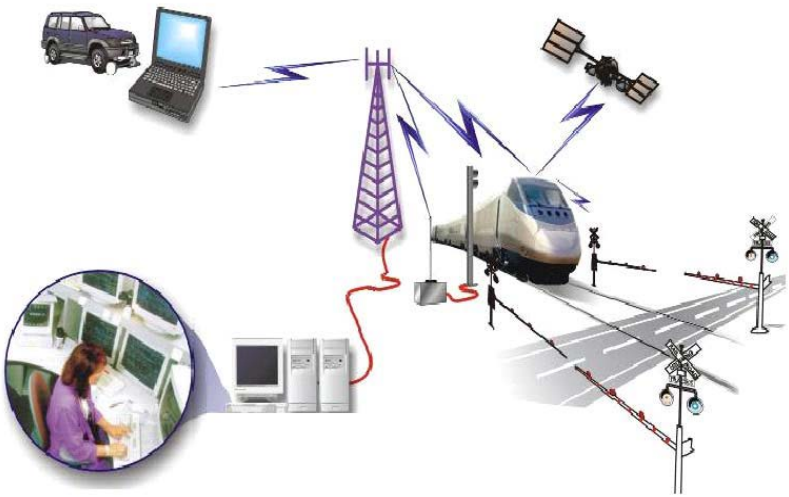
PHMSA and FRA Safety Regulations

- Three approaches to minimizing the risk of transportation of hazardous materials by rail:
  - Accident prevention
  - Operational controls
  - Improving the integrity (survivability) of rail cars
- A number of existing rules as well as current rulemakings and initiatives are intended to address these issues.

Accident Prevention

Positive Train Control

- Rail Safety Improvement Act
- Core features
  - Prevent train-to-train collisions
  - Prevent overspeed derailments
  - Switch protection
  - Railway worker protection
- 37 host railroads
  - 7 Class I railroads
  - 30 Passenger/commuter lines
  - All have submitted implementation plans
- Scope – ½ of all route miles of track in the United States
- Status
  - 6 System Type Approvals
  - 2 System Certificates



Accident Prevention

Rail Integrity

- Notice of Proposed Rulemaking: 2012
- Core features
  - Inspection frequency
  - Remedial actions
  - Reporting requirements
  - Detector car operator qualifications
- Final Rule: 2013–2014

Accident Prevention

Human Factors Rule

- Final Rule: 2008
- Codified longstanding operational practices
- Core features
  - Misaligned switches
  - Equipment left out to foul track
  - Protection of shove moves
  - Placement of derails

Operational Controls

- Hazardous Materials Regulations – Routing and Security
  - Final Rule: 2008
  - Poisonous-inhalation-hazard materials and explosives
  - Route Corridor Risk Management System (Class I Railroads)
  - Hazmat Transportation Risk Analytical Model (Shortlines)

- FRA Regulations – Securement of Unattended Equipment (2003)
  - Freight cars
  - Locomotives
  - Railroad to develop procedures and processes
  - MP&E Technical Bulletin 10-01

- Hazardous Materials Regulations – Securement at Loading/Unloading Facility
  - Minimum number of hand brakes and wheel chocks
  - Number of hand brakes to be determined by facility

Title 49 Code of Federal Regulations
Section 232.103(n)
Securement – Unattended Equipment

- **General requirements for all train brake systems**
- (n) *Securement of unattended equipment.* A train's air brake shall not be depended upon to hold equipment standing unattended on a grade (including a locomotive, a car, or a train whether or not locomotive is attached). For purposes of this section, **"unattended equipment" means equipment left standing and unmanned in such a manner that the brake system of the equipment cannot be readily controlled by a qualified person.**

Equipment – Hand Brakes

Equipment – Hand Brakes

- A sufficient number of hand brakes shall be applied to hold the equipment. Railroads shall develop and implement a process or procedure to verify that the applied hand brakes will sufficiently hold the equipment with the air brakes released.

- Railroad rules usually provide a specific minimum number of hand brakes to be applied and then add to the calculation, if needed. Since topography, grade, weight of train, etc., there is no predetermined number that would fit all. Example: at one location, four hand brakes might be sufficient, where at another location, eight hand brakes would be needed for the same train.

Locomotive Specific Securement Is Further Defined in the Regulation

Locomotive Securement – Hand Brake Requirements

Except for distributed power units, the following requirements apply to unattended locomotives:

- All hand brakes shall be fully applied on all locomotives in the lead locomotive consist when attached to cars, *whether they are located inside or outside of a yard.*

- At a minimum, the hand brake shall be fully applied on the lead locomotive in an unattended locomotive consist that **is not** attached to any railroad cars and *it is located on a yard track.*

- All hand brakes shall be fully applied on all locomotives of an unattended locomotive consist, regardless of if they are attached to cars, *outside of the yard*.

Integrity of Tank Cars

Hazardous Materials Regulations

- Classification of materials based on chemical and physical properties
  - Proper shipping name
    - UN1267, Petroleum Crude Oil, 3, Packing Group I, II, or III
  - Required packaging
    - Packing Group I or II – DOT 111A100W1
    - Packing Group III – AAR 211A100W
- Packaging specifications
  - Minimum requirements

AAR Interchange Requirements

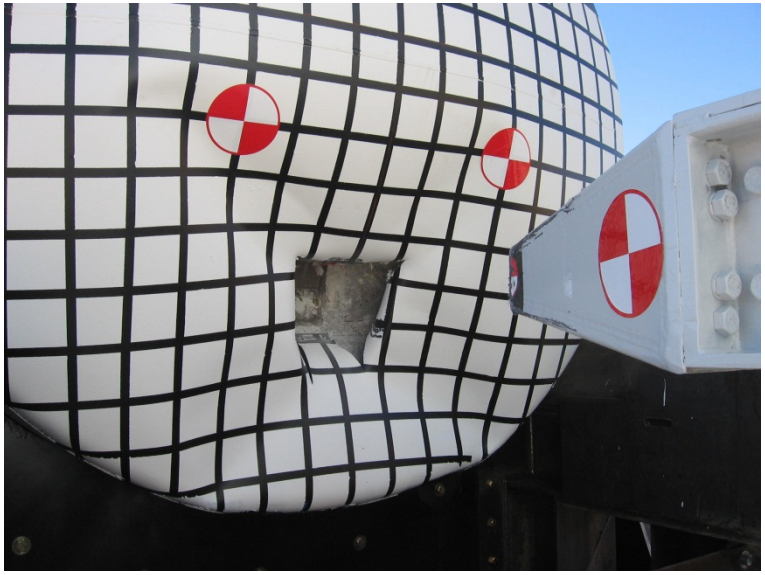
- Tank cars ordered after October 1, 2011
- Thicker head and shell, tougher material, half-height head shield, top fitting protection, high flow pressure relief valve at lower setting
- Basis of petition to DOT for rulemaking

General Purpose Tank Cars

Testing of Tank Cars

Side Impact

- 0.777 inch-thick shell
- 0.1196 inch jacket
- Puncture velocity: 15.2 mph
- Ram: 6 inch x 6 inch face



Head Impact (component test)

- 0.777 inch-thick shell
- 0.5 inch jacket/full head shield
- Puncture velocity: 8.66 mph
- Ram: 6 inch x 6 inch face

Tank Car Manufacturing

- The North American tank car fleet population: 300,000 tank cars
- This comprises approximately 20% of the total rail car fleet
- Current demand for new tank cars: 60,000 tank cars
- Annual manufacturing capacity: 12,000 tank cars
- Tank cars are a 50-year asset
- Cost to purchase: $100,000/car
- Many shippers lease tank cars
- Major manufacturing facilities:
  - Trinity Rail: Texas (2), Oklahoma (1), Mexico (2)
  - Union Tank Car: Louisiana (1), Texas(1)
  - American Railcar Industries: Arkansas (1), Pennsylvania (1)
  - Gunderson Rail: Mexico (1)
- Small manufacturing facilities: 5 (specialty tank cars)
- Foreign manufacturers
  - Mexico
  - No Canadian manufacturing
  - China, Korea, and India are exploring the market.

Inspection of Rail Cars

- Tank Car Facilities – Qualification (life-cycle approach)
  - Manufacturing
  - Periodic inspections and following maintenance activities
- Railroads
  - At time of acceptance for transportation – safety and security
  - Locomotives and freight cars – mechanical
  - Train – brake system
- Shippers
  - Prior to offering for transportation
  - Tank and service equipment (valves, manways, etc.)
- FRA's Tank Car Quality Assurance Team/Field Inspectors

Future Steps

HM-251

- Response to petitions for rulemaking
- Adopt AAR Interchange requirements (Packing Group I and II materials).
- Advanced Notice of Proposed Rulemaking
  - Is the proposal in the petition adequate?
- Consider design enhancements
  - Thermal protection
  - Full head shields
- Consider operational controls
  - Speed restriction for unit trains of flammable liquids
  - Electronically controlled pneumatic brakes
  - Distributed power

Future Steps

- Public Meeting regarding 49 CFR Part 174
  - Executive Order 13563 (Improving Regulation and Regulatory Review 76 FR 3821 (January 21, 2011))
  - Carrier requirements for the handling of hazardous materials
  - Scheduled for August 27–28, 2013
- Letter to API regarding proper classification of commodities
  - Determine proper packaging
  - Outage
  - Additional hazards (sulfur content)

Comparison of FRA Regulations to Transport Canada

- There is a correlation between FRA's safety regulations concerning air brakes and those of Transport Canada (TC), with some differences
  - FRA requires a Class 1 (initial terminal) air brake test with 100% operative brakes
  - TC requires a Number 1 brake test with 85% or greater operative brakes
  - Both FRA and TC require the air brake leakage rate to be at or below 60 cfm

Transport Canada Requirements for Hand Brakes

- TC O-0-93 Section 112. SECURING EQUIPMENT
  - (a) When equipment is left at any point, a sufficient number of hand brakes must be applied to prevent it from moving.
    - Special instructions will indicate the minimum hand brake requirements for all locations where equipment is left.
    - If equipment is left on a siding, it must be coupled to other equipment if any on such track unless it is necessary to provide separation at a public crossing at grade or elsewhere.
  - (b) Before relying on the retarding force of the hand brake(s), whether leaving equipment or riding equipment to rest, the effectiveness of the hand brake(s) must be tested by fully applying the hand brake(s) and moving the cut of cars slightly to ensure sufficient retarding force is present to prevent the equipment from moving.
    - When leaving a cut of cars secured, and after completion of this test, the cut should be observed while pulling away to ensure slack action has settled and that the cars remain in place.
- The requirements between FRA and TC for unattended equipment are functionally identical.

Securement Inspection Activity

- From CY 2011 – April 2013, 8.5% of all human factor train accidents were caused by improper securement of equipment.
- Therefore, FRA inspectors (especially OP and MP&E) consistently prioritize the inspection of unattended equipment for proper securement.
- FRA inspectors conducted 9,419 units of securement inspection activity between 2011 and April 2013, and recorded 3,786 defects and recommended 1,194 violations for prosecution.

Questions?