Tank Car Safety and Security
“NextGen” Project to the Present

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The FRA is the agency within the Department of Transportation responsible for ensuring the safety and security of rail chemical transportation for the protection of our nation.

90+ Safety Professionals Specific to HM
Overview

Presentation Approach
Motivation
Industry
Next Gen Rail Tank Car Project
Regulators
Current Efforts
Look Forward
Presentation Approach

- Review four primary efforts
- Distinct, parallel paths taken to current state (although there is some intersection/overlap)
- Review efforts individually and explain the influence of each effort on the others
- 2006 to the present
- Look at current efforts and forward
Motivation

- Since 2001, a number of events have heightened our nation’s awareness of safety and security issues related to transportation of hazardous material by rail.
  - September 11, 2001 demonstrated the harsh reality of the terrorist threat in this country and our vulnerability to such an attack.
  - Minot, ND (2002), Macdonia, TX (2004), Graniteville, SC (2005) were reminders of the deadly potential of the hazardous material transported by rail around the United States.
- The rail community, including regulators, industry organizations, shippers, builders, and service providers, have refocused their efforts to improve safety and security in transportation of hazardous material by rail.
Motivation (cont.)

- **NTSB recommendations**
  - Minot report
    - Pre-1989 steel
    - Validate prediction model
    - Fracture toughness standard
  - Macdonia report
    - Tank car positioning
    - Train speed
Introduction of Protagonists

Four primary efforts to improve the safety and security in the transportation by rail of hazardous materials:

- Industry
- NGRTC Project
- Regulators - Safety (FRA)
- Regulators – Security (DHS)
Industry effort lead by three groups

- **Tank Car Builder**
  - Understood need for improved crashworthiness
  - 105J600W tank car
  - Special Permit (286K GRL)

- **RSI Safety Project/UIUC**
  - Conditional Probability of Release (CPR)
  - Tank Improvement Factor (TIF)
Industry (cont.)

- **AAR**
  - Safety & Operations Management Committee (SOMC) charge to the Tank Car Committee (TCC)
    - 65% reduction in CPR
  - Casualty Prevention Circulars (CPC)
    - CPC1175 Chlorine and Anhydrous Ammonia
    - CPC1187 All other TIH Commodities ([effective April 2008](#))
    - Tank car specifications
    - Implementation period
    - Retirement of pre-1989 tank cars
  - Rescinded CPC1187 after PIH rule was published
Next Gen Rail Tank Car Project (NGRTCP)

- Original members included Dow, Union Tank Car Corporation, Union Pacific Railroad.
- The participant list grew to include shipping organizations, regulators and other railroads.
- 2006 – 4Q2008
- Develop a tank car design with improved crashworthiness capabilities through an engineering approach
  - Foams
  - Composites
  - Steels
  - Energy absorbing and dissipation systems
  - Design platform
  - Thermal Protection (research performed by TC)
- Modeling, simulations, and testing (component, scale and full scale)
Regulators - Safety

- Department of Transportation (DOT)
  - Federal Railroad Administration (FRA)
  - Volpe National Transportation System Center (Volpe)
- Transport Canada (TC)
- Address TSB’s recommendations and develop performance standards that will result in improved crashworthiness of tank cars transporting TIH commodities.
- Authority to develop specifications conferred on DOT
  - Federal Railroad Safety Act
  - Hazardous Materials Transportation Act
- Approval authority exercised by AAR was delegated to it by DOT and does not include the final approval of a new tank car specifications.
- FRA also concerned with the amount of improvement in crashworthiness of tank cars built per CPC-1187.
Engineering approach
- Energy absorption and dissipation
- Testing performed in conjunction with the NGRTC Project

Volpe Concept Car
- Questioned by industry
  - Un-tried design, constructability, practicality, maintenance

NPRM HM-246 published April 1, 2008
- Performance Standard (1/2 initial train speed)
  - Side impact - 25 mph
  - Head Impact - 30 mph
- Normalized steel
- Speed restrictions
NGRTC Project design versus the proposed performance standard

Regulators – Safety (cont.)
Public Hearings in Washington, DC
- Proposed performance standard was prohibitive
  - Unachievable given current technology
  - Needed to replace older cars
  - Does not address the commodity specific requirements

Industry submitted a petition for an interim standard
- Existing “buildable” specification
- Improved crashworthiness

<table>
<thead>
<tr>
<th>Puncture velocity for Chlorine car</th>
<th>105J500W</th>
<th>105I600W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head impact</td>
<td>13.1 mph</td>
<td>16.4 mph</td>
</tr>
<tr>
<td>Shell Impact</td>
<td>20.1 mph</td>
<td>22.0 mph</td>
</tr>
</tbody>
</table>

January 13, 2009 published HM-246 Interim Final Rule
- I-car specification
  - Similar to CPC 1187
- Maximum speeds in signaled and non-signaled territory
- Preferential retirement of pre-1989 tank cars

FRA will publish a performance standard based on current efforts.
Regulators - Security

- **Department of Homeland Security**
  - Worked with other Agencies to identify likely terrorist threats.
    - Kinetic energy (ballistic)
    - Bulk Charge
  - Modeling, simulations and testing
  - Identified measures to defeat the suspected threats
  - Research to understand the development and movement of a plume of hazardous vapors.
Current Efforts

- Advanced Tank Car Collaborative Research Project
  - Evolution of the NGRTC Project
  - Identified 3 key areas of research
    - Puncture Scenario (items and conditions)
      - Performance standard and Standardized modeling and testing requirements
      - Compatibility of safety and security measures
    - Correlation of steel properties with puncture performance
    - CPR/EQR
  - UTC PIH Car
Current Research Efforts

- **FRA Research (Francisco Gonzalez)**
  - Sandwich panels
  - Roll-over protection
  - Liquid flow through relief valves (AFFTAC)
  - Risk analysis
  - Tank car operating environment/Coupling speed
    - Informed by previous TC research

- **TC Research**
  - Emissivity
  - Multiple tank car roll-over derailments
Improvements of DOT111A100W tank cars
- Triggered by the derailment of ethanol tank cars in Rockford, IL
- AAR Task Force 87.5
● Continue to develop relationship between FRA/TC and the regulated community
● Continue current research efforts informed and guided by the expertise in the industry.
● Continue to advance technology regarding TC design.
● Pay close attention to maintenance and operation of the tank car of the future.
Questions?

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Thank you!