DOT-111 Tank Car Design

Paul L. Stancil, CHMM
Previous Investigations

• 1991 Safety Study
• 1992 Superior, Wisconsin
• 2003 Tamaroa, Illinois
• 2006 New Brighton, Pennsylvania
• High incidence of tank failure
Need for Better Tank Cars

- 69% of tank cars are DOT-111
- Transports wide spectrum of hazmat commodities
- 40,000 DOT-111’s used to transport denatured fuel ethanol
- Ethanol is the most frequently transported hazardous material
Top Fittings Protection

- DOT-111 housings not effective in preventing impact damage
Post Accident AAR Actions

• All new DOT-111 for ethanol and crude oil service beginning October 1, 2011:
  – Increase head and shell thickness
  – Normalized steel
  – ½-inch thick head shield
  – Top fitting protection
Hazmat Unit Train Operations

- Certain hazardous materials are transported by unit train
- Virtual pipeline
- Risks are greater because of high concentration of hazardous materials
- Increasing number of unit train shipments
Existing Tank Cars Not Addressed

- AAR actions do not address existing fleet
- Impediments to retrofitting or phase out
- Long service life
- Safety benefits not realized if old and new tank cars are commingled
DOT-111 Design Inadequacies

- Tank head and shell puncture resistance systems and increased materials thickness may have reduced the severity of the accident.
- Housings for protection of DOT-111 top fittings are inadequate to withstand the forces of a derailment.
Bottom Outlet Valves

• 3 bottom outlet valves opened and released product

• Handles supposed to remain closed during transit and break free in an accident

• Alternatively handles can be located above the skid structure
Operating Handle Failures

CIT Configuration

GE/Trinity Configuration
Operating Handle Failures (Cont.)

- Valve operating mechanisms compliant with current design requirements
- Handles became caught by objects and debris and caused valves to open
- Operating handles too robust and did not break free on impact
- Existing standards and regulations insufficient to ensure that bottom outlet valves remain closed during accidents