



PRELIMINARY REPORT

HAZARDOUS MATERIALS

Accident Performance of DOT-117R Tank Cars

Doon, Iowa
June 22, 2018
HMD18LR002

The information in this report is preliminary and will be either supplemented or corrected during the course of the investigation.

On June 22, 2018, about 4:35 a.m. central daylight time, southbound BNSF Railway (BNSF) freight train U-CPGSAP-059 derailed 33 jacketed DOT-117R tank cars at milepost 165.3 on the BNSF Marshall Subdivision in Doon, Lyon County, Iowa. The train was being operated in a distributed power configuration with 2 head-end locomotives, 2 head-end buffer cars, 98 tank cars, 1 rear-end buffer car, and 1 trailing distributed power unit (DPU) locomotive loaded with about 2,426,325 gallons of UN1267 petroleum crude oil. Maximum authorized speed on the territory was 49 mph. The Federal Railroad Administration (FRA) determined the train speed was about 48 mph when the train encountered the emergency brake application. A total of 10 tank cars were breached, releasing about 160,000 gallons of crude oil. The area received 5 to 7 inches of rain during the 48 hours prior to the accident, washing out track and flooding a tributary of the Little Rock River and farm fields adjacent to the derailment location. (See figure 1.) Released crude oil reached the Little Rock River and prompted the evacuation of 18 to 20 people. No injuries were reported. A unified command consisting of BNSF, U.S. Environmental Protection Agency, Iowa Department of Natural Resources, and Lyon County, Iowa, was established to mitigate and recover the released crude oil.

ConocoPhillips Canada Marketing & Trading ULC originated the shipment from the Hardesty Terminal at Rosyth, Alberta, Canada, and its destination was the ConocoPhillips Company in Houston, Texas. The hazardous material released in this accident was identified as Surmont Mix A, a heavy crude oil and diluent mixture that exhibited an American Petroleum Institute (API) gravity of 19.9, initial boiling point of 115.0°F, flash point of -31°F, and vapor pressure of 4.7 psi. While these characteristics would have placed the material in Packing Group II (flash point less than 73°F and initial boiling point greater than 95°F), the shipper classified the material as Hazard Class 3, Packing Group I (highest degree of danger).

On July 10, 2018, National Transportation Safety Board (NTSB) investigators completed on-scene work in Doon, Iowa, where tank car wreckage was staged after the accident. Additional investigative work to examine parts removed from one of the tank cars is planned at the NTSB laboratories in Washington D.C.



Figure 1. Accident scene. (Photo courtesy of BNSF Railway)

The derailed tank cars were originally specification DOT-111A100W1 that were built to the Association of American Railroads CPC-1232 industry standard for tank cars ordered after October 1, 2011, for use in crude oil and ethanol service. Each tank car had about 29,000 gallons capacity and was equipped with a jacket, insulation, and full-height headshields. From 2016 through 2017, the tank cars were retrofitted to specification DOT-117R in accordance with Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations, by replacing the bottom outlet valve operating handle with a disengaging mechanism designed to prevent unintended opening in accidents.¹ Preliminary findings from the examination revealed breaching damage in 10, or about one-third, of the derailed tank cars. (See table 1.)

¹ Pipeline and Hazardous Materials Safety Administration final rule HM-251C, FAST Act Requirements for Flammable Liquids and Rail Tank Cars, *Federal Register* 81, no. 157 (August 15, 2016): 53935.

Table 1. Tank Car Breaching Damage.

Consist Line Number	Car Mark	Car Number	Breaching Damage
17	CTCX	716781	Circumferential shell tear separated the B end head and stub sill assembly from the car.
18	CTCX	716860	Bottom outlet valve handle was damaged, and the ball valve opened 2 1/4 in., draining the tank contents.
20	CTCX	717997	Circumferential shell tear separated the A end head and stub sill assembly from the car.
22	CTCX	716898	Puncture to the center right bottom tank shell measuring 1 ft. X 1 ft. Puncture in the A end right shell adjacent to the head measuring 3 ft. X 3 ft.
23	CTCX	716624	Tear measuring 7.5 in. X 12 in. in the center-right top shell.
26	CTCX	717904	Tear measuring 2 ft. X 3 ft. to the B end center-right shell.
28	CTCX	716530	Puncture measuring 5 in. X 12 in. to the B end bottom head (through headshield).
29	CTCX	717805	Puncture measuring 36 in. X 29 in. to the B end center shell.
32	CTCX	718011	Tear measuring 8 in. X 1 in. in the center top shell at top fittings pad-to-shell interface.
35	CTCX	717041	Puncture measuring 24 in. at A end top shell.

Parties to the investigation include FRA, PHMSA, BNSF, The Greenbrier Companies, and Trinity Tank Car.