

1 Problem

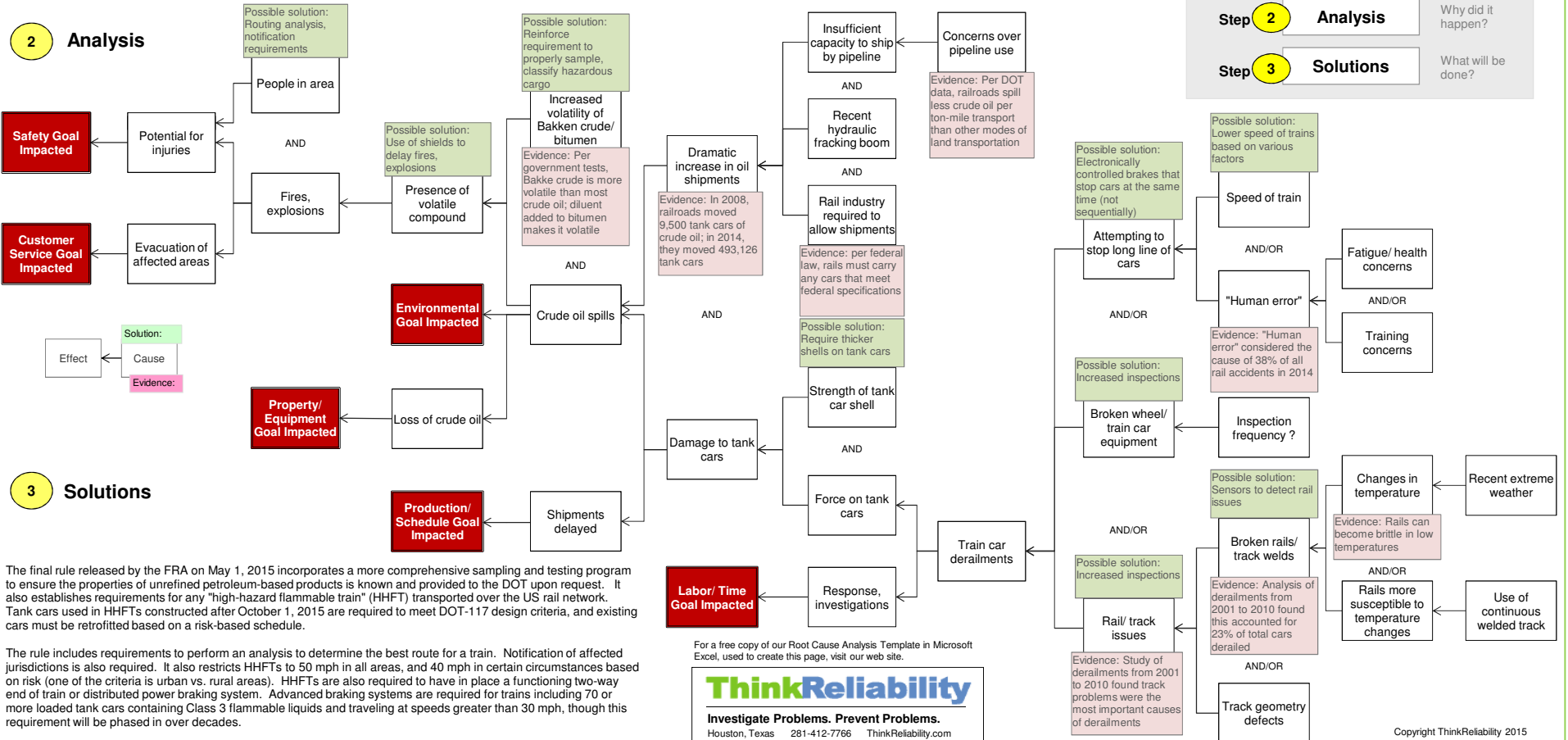
What	Problem(s)	Train derailments, fires, explosions, leaks
When	Date	See timeline (following page)
	Different, unusual, unique	New design tank cars still leaking
Where	Facility, site	US and Canada
	Unit, area, equipment	Tank car trains
	Task being performed	Transporting crude oil

Impact to the Goals

Safety	Potential for injuries
Environmental	Crude oil spills
Customer Service	Evacuation of affected areas
Production/ Schedule	Shipments delayed
Property/ Equipment	Loss of crude oil
Labor/ Time	Response, investigations

Frequency: 12 accidents that resulted in spills since August 2013

2 Analysis



3 Solutions

The final rule released by the FRA on May 1, 2015 incorporates a more comprehensive sampling and testing program to ensure the properties of unrefined petroleum-based products is known and provided to the DOT upon request. It also establishes requirements for any "high-hazard flammable train" (HHFT) transported over the US rail network. Tank cars used in HHFTs constructed after October 1, 2015 are required to meet DOT-117 design criteria, and existing cars must be retrofitted based on a risk-based schedule.

The rule includes requirements to perform an analysis to determine the best route for a train. Notification of affected jurisdictions is also required. It also restricts HHFTs to 50 mph in all areas, and 40 mph in certain circumstances based on risk (one of the criteria is urban vs. rural areas). HHFTs are also required to have in place a functioning two-way end of train or distributed power braking system. Advanced braking systems are required for trains including 70 or more loaded tank cars containing Class 3 flammable liquids and traveling at speeds greater than 30 mph, though this requirement will be phased in over decades.

REGULATIONS AIM TO REDUCE RISK OF RAILROAD SPILLS OF CRUDE OIL

Recent derailments, spills and fires cause concern

The tragic train derailment in Lac-Mégantic, Quebec on July 6, 2013 ushered in new concerns about the transport of crude oil by rail in the US and Canada. Unfortunately, the increased attention has highlighted a growing problem: spills of crude oil transported via rail, which can result in fires, explosions, evacuations, and potentially deaths.

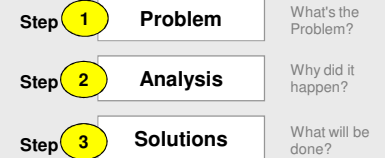
"There will not be a silver bullet for solving this problem. This situation calls for an all-of-the-above approach - one that addresses the product itself, the tank car it is being carried in, and the way the train is being operated."

- Sarah Feinberg, acting administrator, Federal Railroad Administration

Cause Mapping is a Root Cause Analysis method that captures basic cause-and-effect relationships supported with evidence.

CAUSE MAPPING

Problem Solving • Incident Investigation • Root Cause Analysis



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INCIDENTS AND REGULATORY ACTION SINCE THE LAC-MEGANTIC DERAILMENT ON JULY 6, 2013

Timeline

Date	Location	Description	Cars in train	Crude oil tank derailments	Type of tank cars	Leak	Fire	Explosion	Evacuation	Fatalities	Train speed
July 6, 2013	Lac-Megantic, Quebec	Runaway train derails	72	63	DOT-111	Yes	Yes	Yes	2,000	47	65 mph
August 7, 2013		FRA Emergency Order No. 28 stresses train securement; Joint Safety Advisory stresses security planning and causes of July derailment									
October 19, 2013	Gainford, Alberta	Derailment	134	4 (13 total)	CPC-1232	Yes	No	No	106 homes	0	24 mph
November 8, 2013	Aliceville, Alabama	Derailment, fire on line inspected a few days prior	90	26	DOT-111	Yes	Yes	No	1 home	0	39 mph
November 20, 2013		Joint Safety Advisory stresses proper characterization of crude oil and corresponding safety and security planning									
December 30, 2013	Casselton, North Dakota	Derailment, explosion, fire	~111	20 (26 total)	DOT-111	476,436 gallons	Yes	Yes	1,400	0	42 mph
January 2, 2014		PHMSA Safety Alert warning of crude oil variability; emphasizing proper characterization									
January 7, 2014	Plaster Rock, New Brunswick	Derailment likely due to sudden wheel or axle failure, fire and explosion	122	5 (19 total)	2 DOT-111; 3 CPC-1232	Yes	Yes	Yes	150	0	?
January 24, 2014		FRA issues a final rule requiring railroads to achieve a specified track failure rate, prioritize remedial actions									
February 2014		US DOT reaches agreement with railroads to add brake power, reduce train speeds to 40 mph in certain circumstances, install additional wayside wheel bearing detectors and take other actions.									
February 13, 2014	Vandegrift, Pennsylvania	Derailment, leak	120	17 (21 total)	?	10,000 gallons	No	No	?	0	31 mph
February 25, 2014		FRA Emergency order requires all rail shipments of crude oil be treated as packing group I or II material									
April 30, 2014	Lynchburg, Virginia	Derailment, fire		15 (17 total)	Some CPC-1232s	30,000 gallons	Yes	No	Immediate area	0	23 mph
May 7, 2014		FRA emergency order requires railroads that operate trains containing 1 million gallons of Bakken crude to notify about operation through states; safety advisory urges carriers to use highest integrity tank cars to transport crude oil									
May 9, 2014	LaSalle, CO	Derailment, spill	100	6	?	5,000 gallons	No	No	No	0	9 mph
February 14, 2015	Gogama, Ontario	Derailment, fire	100	29	CPC-1232	264,000 gallons	Yes (6 days)	No	No (remote area)	0	38 mph
February 16, 2015	Mount Carbon, WV	Derailment, fire	109	38	CPC-1232	Yes	Yes (2 days)	Yes	>100 for 4 days	0	33 mph
March 5, 2015	Galena, Illinois	Derailment believed to be due to broken rail; fire erupts and can only be reached via bike path; spill threatens Mississippi and Galena rivers	103	21	CPC-1232	Yes	Yes	No	Immediate area; track shut for 4 days	0	23 mph
March 7, 2015	Gogama, Ontario	Derailment, fire destroys bridge	94	39	CPC-1232	Yes	Yes	Yes	No (remote area)	0	43 mph
April 17, 2015		FRA issues Safety Advisory recommending enhancements to mechanical safety of cars in trains transporting large quantities of flammable liquids									
May 1, 2015		Final rule to strengthen safe transportation of flammable liquids by rail announced by the US Department of Transportation and the Canadian Ministry of Transport, includes more stringent standards for tank cars, reduced speeds, and electronic braking (US only)									
May 6, 2015	Heimdahl, North Dakota	Derailment, fire; oil had been treated to reduce volatility	109	6	Unjacketed CCP-1232	Yes	Yes	No	Yes	0	?