

<b>Incident Title</b>		<b>Crude Oil Freight Train Runaway and Derailment</b>	
<b>Incident Type</b>		Fire	
<b>Date</b>		6 <sup>th</sup> July 2013	
<b>Country</b>		Canada	
<b>Location</b>		Lac Mégantic, QC	
<b>Fatalities</b>		<b>Injuries</b>	<b>Cost</b>
47		Unknown	Unknown
<b>Incident Description</b>		A freight train with 5 locomotives, a control car, a buffer car and 72 Class 111 tank cars containing 7.7 million litres (48,400 barrels) of Bakken crude oil had been parked on the main line at a dedicated crew change point. The track at this point had a downward slope of 1.2%. The solitary locomotive “engineer” applied hand brakes on all 5 locomotives and 2 other cars and shut down all but the front locomotive. The engineer tested the hand brakes as required by railway regulations, but the air brakes had been left on during this test. Soon after the engineer left, a fire was reported in the front locomotive. Firefighters turned off electrical breakers in the locomotive to stop fuel circulation feeding the fire. 2 hours after the firefighters and track foreman departed the scene, the train began to roll downhill, reaching a speed of 101 km/h (63 mph) over a distance of 11 km (7 miles). 63 of the 72 tank cars derailed in downtown Lac Mégantic and many of them ruptured releasing ~ 6 million litres (37,700 barrels) of crude oil. A huge fire and several explosions followed, killing 47 people. The lake and river were polluted with crude oil.	
 <p>Credit: The Canadian Press/Alamy</p>			
<b>Incident Analysis</b>		<p><b>Basic cause</b> was rupture of dozens of tank cars due to damaged sustained when the runaway train derailed at high speed in the downtown area.</p> <p><b>Critical factors</b> included: 1) Bakken crude is more volatile than conventional crudes, 2) The train had been parked on the main line (siding occupied by empty boxcars; not prohibited by regulations), 3) Air brakes had been left on during hand brake test (giving false impression hand brakes alone could hold the train), 4) The front locomotive engine caught fire (defective repair leaked oil into hot turbocharge unit), 5) The train had been left unattended overnight (to avoid exceeding engineer’s hours worked limit), 6) Firefighters shut down the front locomotive per regulations (inadvertently disabling the air brakes), 7) Absence of track signals (to alert rail traffic controller of runaway train).</p> <p><b>Root causes</b> included: 1) Inadequate (non-standard) engine repair using inappropriate epoxy-like material, 2) Violation of procedures (hand brakes tested with air brakes still applied), 3) Inadequate training (hand brake operation, securement of trains), 4) Inadequate safety management system (poor supervision and testing of employees), 5) Inadequate risk assessment (inappropriate test method used for determining crude volatility and shipping risk classification, single crew train operation), 6) Inadequate emergency response plan and communication strategy (for dealing with major spills), 7) Inadequate regulatory oversight (failure to audit train operator’s activities).</p>	
<b>Lessons Learned</b>		<p>1) Tank cars used for transporting highly volatile and flammable goods should have safety features such as head shields (reinforcement), tank jacket (leak protection), top fitting housing (impact protection), insulation (to maintain contents at appropriate temperature), thermal blanket (fire protection) and fail-safe braking systems or wheel chocks (runaway prevention), 2) Trains carrying dangerous goods should not be left unattended, 3) Mutual aid firefighting teams should use standardised fire hose sizes and connections and compatible frequencies for radio communication, 4) Single crew trains are now prohibited for use in transporting hazardous goods in Canada.</p>	
<b>More Information</b>		<p>1) Transportation Safety Board of Canada (TSB) Railway Investigation Report No. R13D0054 (2014). 2) “The Lac Mégantic Railway Disaster – A Closer Look At The Cargo”, R. Abhari, IChemE Loss Prevention Bulletin 274 (2020).</p>	
<b>Industry Sector</b>		<b>Process Type</b>	<b>Incident Type</b>
Oil & Gas		Transportation	Fire
<b>Equipment Category</b>		<b>Equipment Class</b>	<b>Equipment Type</b>
Mechanical		Vessel	Tank Car