

Incident Summary #II-757768-2018 (#9165) (FINAL)

SUPPORTING INFORMATION	Incident Date		October 21, 2018	
	Location		Delta, BC	
	Regulated industry sector		Gas - Natural gas system	
	Impact	Injury	Qty injuries	1
			Injury description	2nd Degree burns to hands, and face
			Injury rating	Moderate
	Damage	Damage	Damage description	Localized burn patterns on propane-air mixer and melting of a plastic handle of a gas valve.
			Damage rating	Minor
	Incident rating		Moderate	
Incident overview		A gas fitter was burned when a flammable mixture of propane and air ignited on a piece of equipment they were working on.		
INVESTIGATION CONCLUSIONS	Site, system and components		<p>Fortis offers large industrial clients cheaper rates to have what is known as an “interruptible service”. This means that under peak demand times a customer can be asked to switch to a backup fuel source, decreasing the demand on the natural gas system, and saving more gas for residential and light commercial customers.</p> <p>One backup fuel option is propane, however propane has 2.5 times the calorific value (Energy released from burning a measured amount of fuel) of natural gas. To ensure that appliances do not fire outside of their designed input, a propane air mixer is used to dilute the propane with air. Therefore lowering its calorific value and making conversion much less difficult.</p> <p>A propane air mixer forces high pressure propane through a venturi, which draws in air as the propane passes by, allowing it to mix with the propane. The propane air mixer is always under pressure and the “mixing guns” employ a sealed check valve to only allow air in and not to let anything escape from the appliance.</p> <p>Service interruptions for industrial customers are usually quite rare, so backup systems will sometimes go for quite some time without use. However in this instance, Fortis had curtailed usage of its industrial customers due to a pipeline rupture and concerns around supply capacity for its other customers. Therefore, this back-up system was activated.</p>	
	Failure scenario(s)		One of the mixing guns for the propane-air mixer developed a leak. When the gas fitter went to work on the appliance, an electric impact gun was used to open a service panel on the mixer. This impact gun generated a spark and ignited a flammable mixture of propane and air, which subsequently caused a fireball and burned the gas fitter.	
	Facts and evidence		<p>The gas fitter was working on the appliance the day before and recalls checking for leaks on the appliance before beginning work that day. However on the day of the incident the gas fitter told me they did not check for leaks.</p> <p>The gas fitter returned the following day to fix an unrelated issue that was causing the mixer to lock out on an error.</p>	

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	<p>An interview with a plant service worker, who was supervising the gas fitter, stated that “the gas fitter went to take a bolt off, and all of a sudden there was a big fireball” so they “ran as fast as they could to turn the propane off to the mixer”</p> <p>Localized burn patterns, and melting of a plastic valve handle were found on one of the mixer’s air receivers, indicating that this was the mixing gun that was leaking, and subsequently caused the incident.</p> <p>When asked when the last time was that this system had been put into use, I was told by plant staff that “it probably hadn’t been used in 5-10 years”</p> <p>After the incident the gas contractor attempted to find parts to repair the leak on the mixing gun check valve seal, but the manufacturer refused to supply repair parts. The manufacturer stated that the appliance was deemed to be “past its service life and needed to be replaced”</p> <p>No other propane leaks were identified on the unit or surrounding area, and there were no other flammable materials in the area.</p>
<p>Causes and contributing factors</p>	<p>Based on the evidence found on site, it is likely that a failed seal within the mixing gun check valve caused the leak which ignited.</p> <p>It is likely that the age of the equipment, and operation past its expected service life contributed to this incident.</p> <p>A second contributing factor was likely, the gas fitter’s failure to check for leaks on the day of the incident before beginning work on the mixer.</p> <p>A third contributing factor was likely, the type of tool used to open the access cover on the mixer. Electrical tools are considered a potential source of ignition, which should be avoided in potentially flammable environments, unless certified for usage in such environments.</p>



Figure 1. Propane air mixer on day of investigation.

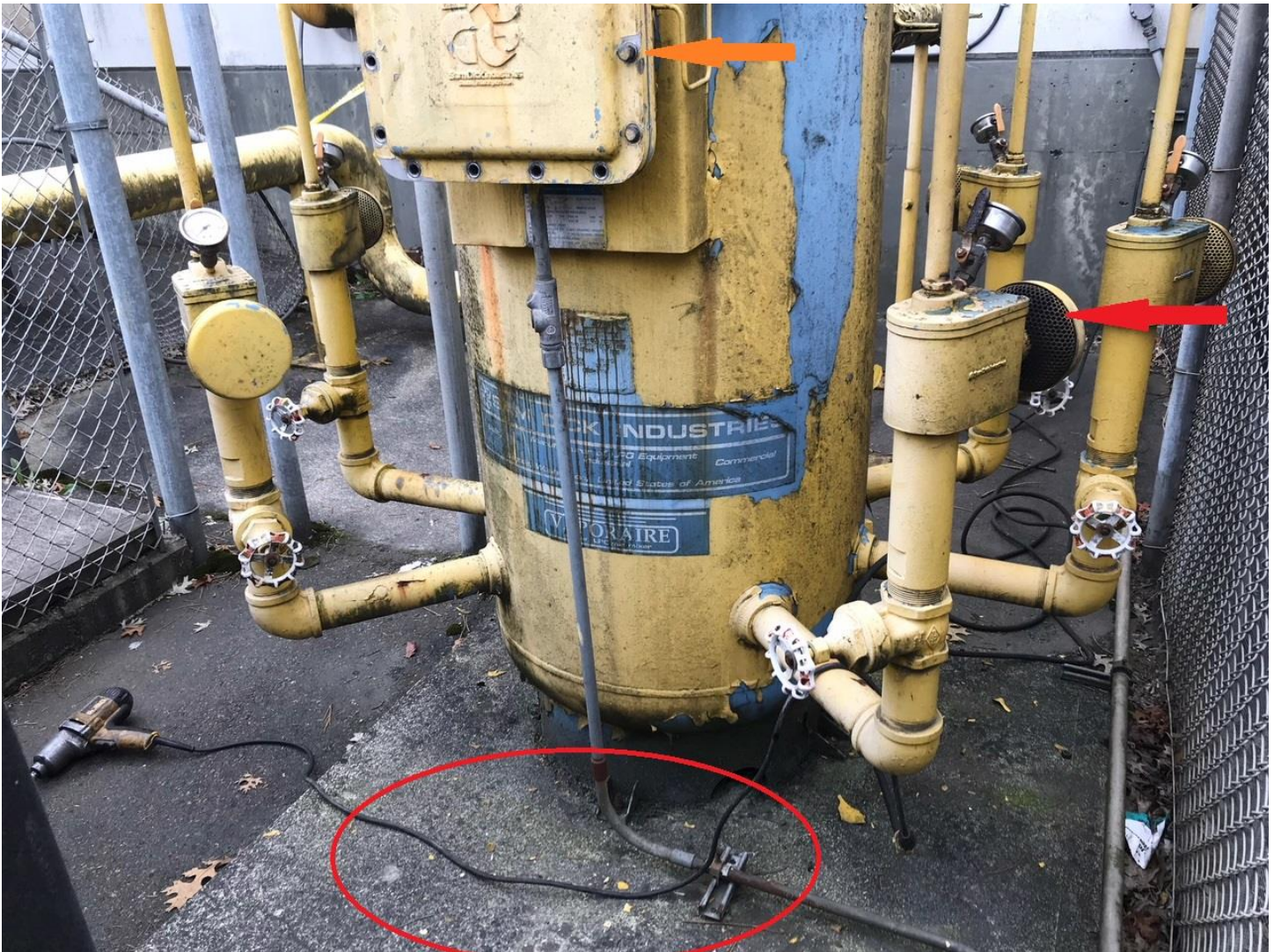


Figure 2. Scene on the day of the incident. The red circle indicates where the gas fitter was standing. The orange arrow indicates the bolt that the gas fitter was undoing. And the red arrow indicates the leaking mixing gun (Note blackened handle and screen)



Figure 3. Close-up of leaking mixer, again note the burned handle and blackened receiver screen.