Incident Summary (Reference #5616609) (DRAFT)

SUPPORTING INFORMATION	Incident Date			May 24 2017
	Location			South Surrey
	Regulated industry sector			Refrigeration system
	Impact	Injury	Qty injuries	0
			Injury description	None
			Injury rating	None
		Damage	Damage description	Man hole gasket seal failed resulting in release of approximately 16lbs of ammonia (NH3) in the machine room
			Damage rating	Moderate
	Incident rating			Moderate
	Incident overview			Manhole gasket seal on an oil separator pressure vessel failed to hold ammonia in the vessel which resulted in the exhaust ventilation system to be activated.
INVESTIGATION CONCLUSIONS	Site, system and components			Frozen food storage facility has a mechanical room separate and self-contained from the warehouse. In an ammonia refrigeration system, ammonia in a gas state is compressed from the compressor to high pressure high temperature ammonia gas. The compressed gas heats as its pressurised. The hot gas enters an oil separator where the ammonia gas and compressor oil is separated so that oil is not carried over with the ammonia gas to the coils and other components. The hot ammonia gas is directed to the coils where the refrigerant gas dissipates its heat. The ammonia gas condenses into ammonia liquid at high temperature. The high pressure liquid flows through the expansion valve where the ammonia immediately boils and vaporizes which causes the refrigerate effect. The low temperature low pressure ammonia gas is directed back to the compressor to complete and repeat the cycle. The sensors are programmed to detect an ammonia release and activate an exhaust ventilation system. The exhaust system is capable of exhausting 18 room air changes per hour. The pressure vessel (oil separator) is fitted with a manhole hatch for maintenance and inspection. A gasket is needed to provide a tight seal between the manhole cover and base metal to prevent escaping gasses from the vessel. The manhole cover is elliptical in shape and is held to the seat with two yokes and bolts.
	Failure scenario(s)			New compressor addition to ammonia system installed in 2016, within 1 year of the installation a leak developed at the lower half of the manhole access from a factory installed gasket.
	Facts and evidence			

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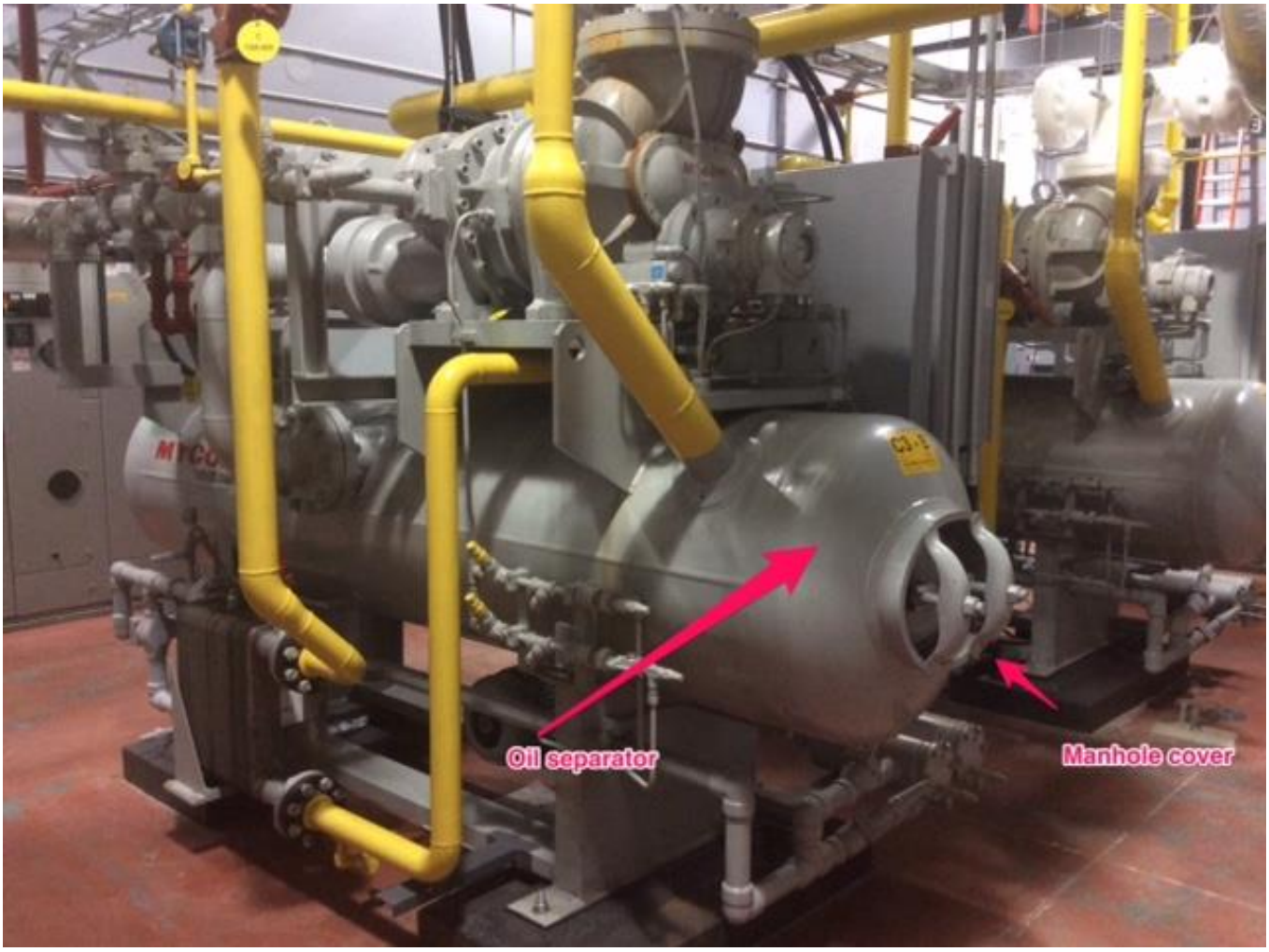
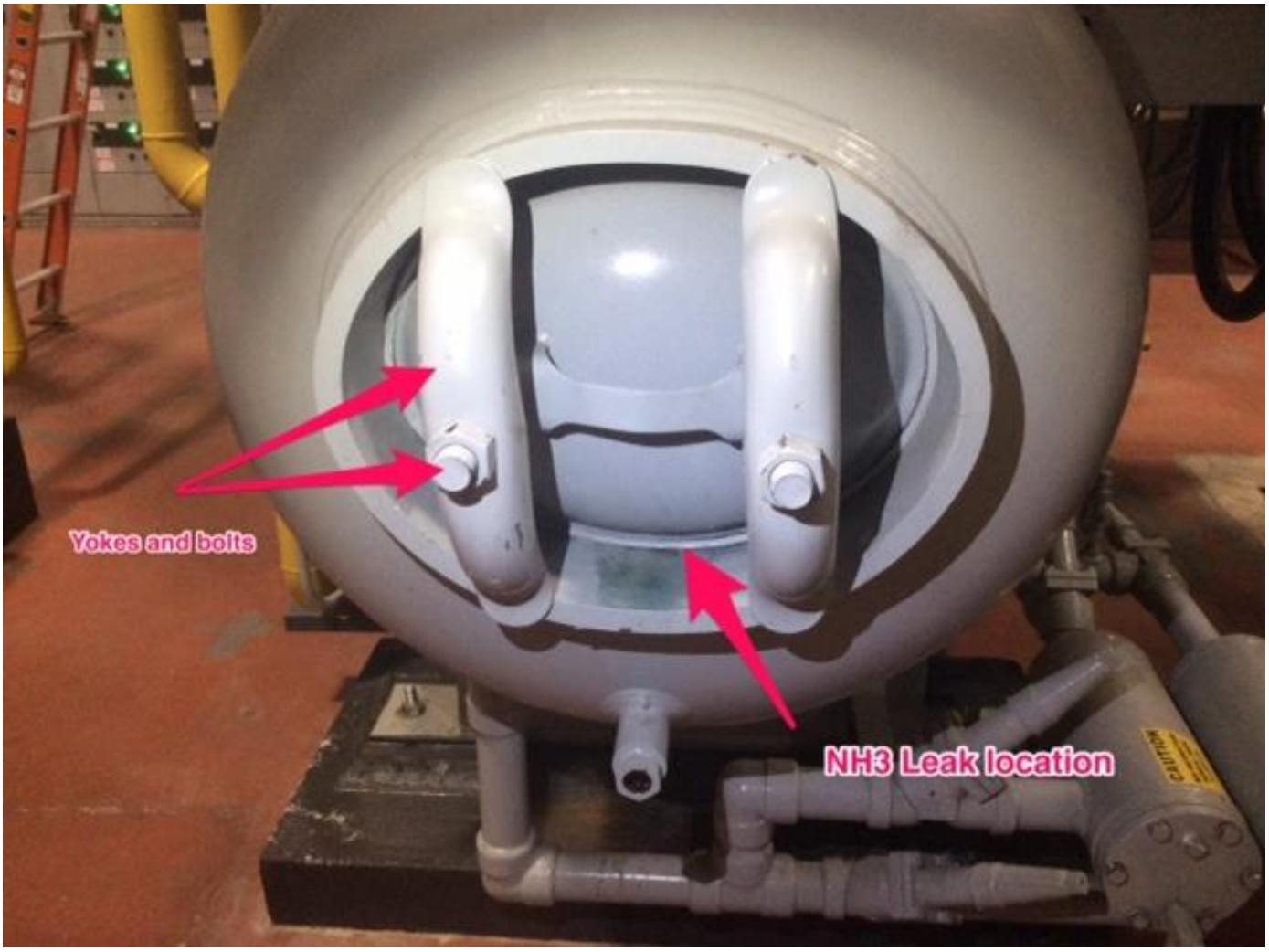
		Ammonia release report -witness received trouble alarm the plant exhaust system has been activated. -Chief engineer instructed shift operator to locate leak and isolate compressor at the inlet and outlet valves. -time of alarm 3:37am at 50 parts per million(ppm) in mechanical room -Shift engineer was instructed to switch fan speed to manual high ppm level were between 10ppm with fan on. -received incident report via safety authority. **Pictures** -Reviewed location of leak on oil separator found minor residue at area of escape.(see picture) -Examined seal ends of seal were painted from factory.(see picture) -installation permit indicates unit was installed March 2016 -pictures of damaged gasket. -Pictures of alarm trends -Picture of manhole cover -Pictures of new gasket **Gasket company data sheet**. -material is proprietary rubber -compatible with ammonia -gasket failed before recommended service life and replacement.
	Causes and contributing factors	It is likely that over torqueing on the manhole cover against the flanged connection damaged the gasket.

Photos or diagrams (if necessary)


Oil separator
Manhole cover


Yokes and bolts
NH3 Leak location


Leak residue through gasket


C38
Damaged gasket


Area of leak escape