Incident Summary #II-797439-2019 (#10506) (FINAL)

SUPPORTING INFORMATION	Incident Date		January 7, 2019
	Location		Coldstream, BC
	Regulated industry sector		Boilers, PV & refrigeration - Refrigeration system
	Impact – Injury	Qty injuries	0
		Injury description	No Injuries
		Injury rating	None
	Impact – Damage	Damage description	Part of a gasket was blown out from a flange on the plate heat exchanger releasing (NH3) ammonia into the machinery room.
		Damage rating	Moderate
	Incident rating		Moderate
	Incident overview		On the plate heat exchanger a machined nut had backed off on the flange bolt that holds the gasket in place causing part of the gasket to be blown out resulting in (NH3) ammonia to leak out.
INVESTIGATION CONCLUSIONS	Site, system and components		The plate heat exchanger has many grooved plates with gaskets that allows heat from fluid, liquid or gas to pass to a second fluid, liquid or gas without the two fluids having to mix together. The fluid passes through pressure piping that is connected to the plate heat exchanger by a four bolt flange. The essential principle is that it transfers the heat without transferring the fluid that carries the heat. It usually is working to reclaim lost energy to heat or cool a building.
	Failure scenario(s)		The plate heat exchanger has (NH3) ammonia flowing through an orange painted pipe that has a flange bolted on the outside of the plate heat exchanger. The bolted flange holds the orange (NH3) ammonia pipe in place by 4 bolts, washers and machined nuts. The nuts loosened from the flange bolts and that created a gap between the gasket and the flange. That then created an area for (NH3) ammonia to escape. The pressure from the (NH3) ammonia gas blew out part of the gasket.
	Facts and evidence		The (NH3) ammonia was released into the machinery room and the alarm was activated. • Upon inspection the nuts on the bolts where very loose and only a flat washer was in place with no locking washer on the bolt. • The manufactured nuts did not fit on to the bolts tightly and lock washers where missing on the bolts. The nuts may have been manufactured with a different pitch than the bolts. • Part of the gasket from the flange that holds the orange (NH3) ammonia pipe was on the floor from being blown out. • The nuts on the bolts showed a gap that indicated they had loosened off from the time of installation and were no longer at the manufactures torqued specifications of 277ft-lbs. • All the nuts where then taken off the bolts and replaced with new nuts and locking washers.

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Causes and contributing factors	It is highly likely that the missing lock washers did not create a tightening back pressure on the nut after installation which would not maintain the torque specified by the manufacture. The lock washer prevents nuts and bolts from turning, slipping and coming loose because of vibration. The loose nuts on the flange caused the gasket to blow out and created a (NH3) ammonia leak.

Image 1 NH3 Leak – no lock washer on bolts

Image 2 Plate Heat Exchanger & NH3 Orange Pipe

Image 3 New nuts and lock washers

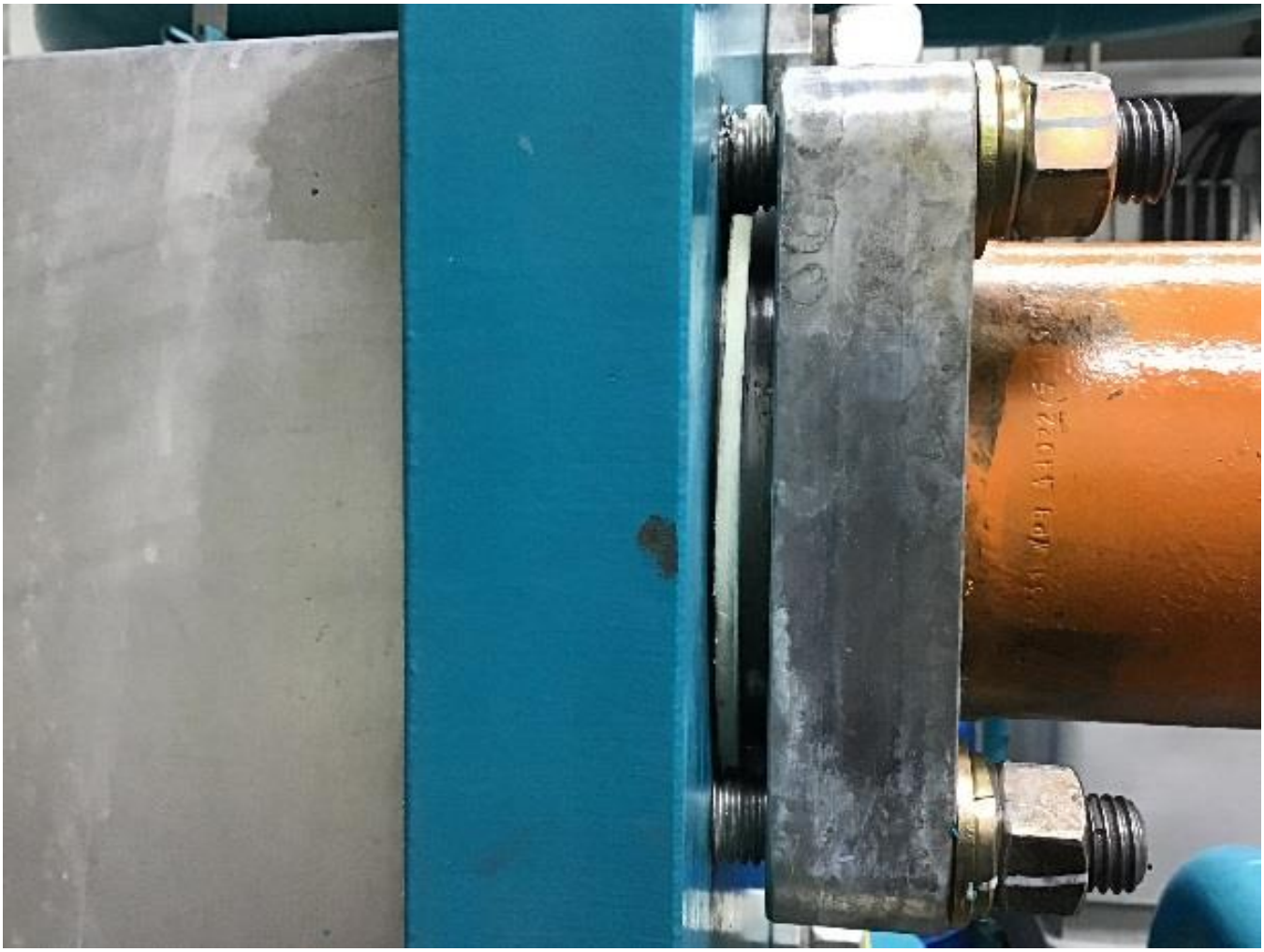

Image 4 NH3 Pipe - new flange gasket

Image 5 Plate Heat Exchanger – NH3 & glycol