Incident Summary #II-1232047-2021 (#23052) (FINAL)

SUPPORTING INFORMATION	Incident Date		August 4, 2021
	Location		Williams Lake B.C.
	Regulated industry sector		Gas - Propane system
	Impact – Injury	Qty injuries	1
		Injury description	Propane explosion, first degree burns to forklift operator.
		Injury rating	Moderate
	Impact – Damage	Damage description	Propane dispensing system taken out of service
		Damage rating	Insignificant
	Incident rating		Moderate
	Incident overview		A forklift operator at an industrial site was filling a liquid propane cylinder on the forklift and also heard a hissing sound. The operator then started the forklift and a flash fire explosion occurred at the forklift and propane dispensing system.
INVESTIGATION CONCLUSIONS	Site, system and components		The facility is an industrial wood processing plant with a propane dispensing system. Propane fuelled forklifts are used at this facility for movement of product. When necessary, the employees operate the propane dispenser to fill empty propane cylinders located on the Forklifts to continue in service operation. Cylinder — a container designed and manufactured in accordance with a cylinder specification authorized for the containment and transportation of propane under the *Transportation of Dangerous Goods (TDG) Regulations* of Transport Canada. Propane Dispensing system — A system, consisting of tank, pump and motor, propane dispenser, and associated piping and supports, for the storage, metering, and dispensing of liquid propane into containers. Relief device — a device designed to open to prevent a rise of propane pressure in excess of a specified value due to an emergency or abnormal conditions. When a propane relief device discharges and the internal pressure is reduced, a spring will reseat the sealing surface of the relief device and stop the discharge. Any defects or debris on the sealing surface may allow propane to leak to atmosphere after the relief valve has reseated. **V**alve — a device by which the flow of a fluid can be started, stopped, or regulated by a movable part that opens or obstructs passage. Hydrostatic relief valve — a pressure relief valve installed in a liquid propane line. It is a requirement for a hydrostatic relief valve to have a discharge pressure of no less than 375 psi and no more than 500 psi. Forklift - vehicle categorized as a powered industrial truck. They are used to lift and move various materials over short distances. A typical forklift is defined by a small truck frame with a front-facing mast assembly that is responsible for raising and

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	lowering the carried load. Forklifts are typically fueled by gasoline, diesel, electricity or propane. **Training** It is a requirement for a person transferring propane from one container to another to hold a current training certificate from a recognised training course. The training includes knowledge of the properties of propane, identification of sources of ignition and safe practices for transferring propane.
Failure scenario(s)	An incorrect hydrostatic relief valve was installed in the liquid piping of the propane dispensing system. The relief valve had a set discharge pressure of 250 psi which was below the minimum requirement of 375 psi. The forklift operator had not received training and did not hold a required training certification required to transfer propane from one. While the forklift operator was filling the forklift propane cylinder, propane was leaking from the system and accumulating around the forklift. The operator started the forklift creating an ignition source which ignited the propane vapor creating a flash fire.
Facts and evidence	Site observation A hydrostatic relief valve installed in the liquid piping of the propane dispensing system was found to have an identified discharge setting of 250 psi marked on the valve. This did not meet the minimum required discharge pressure of 375 psi. Witness statements The forklift operator had not received training on how to properly fill a cylinder and did not hold a required training certificate. The operator did not know the location of the emergency shutdown for the propane dispensing system.
Causes and contributing factors	The cause of the incident was likely due to an incorrect hydrostatic relief valve with too low of a pressure setting on the liquid pump at the propane dispenser. The lack of training and qualifications of the operator filling the cylinder likely contributed to the incident by them creating a source of ignition by starting the forklift while it was surrounded by the propane gas that had leaked out.

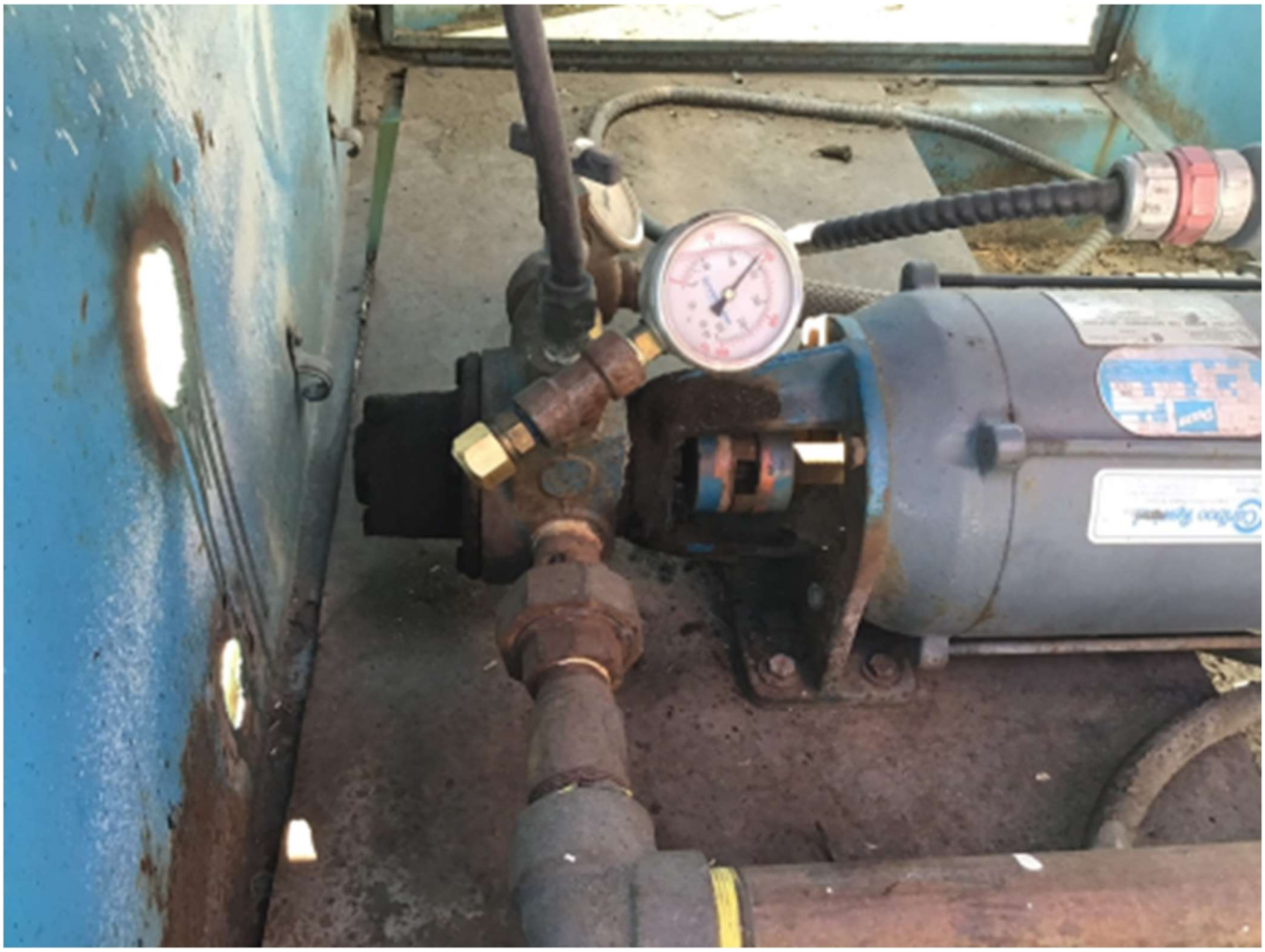

Image 1 - Discharge gauge on liquid pump, and hydrostatic relief removed

Image 2 - Pump overview and bypass

Image 3 - Internal safety control and emergency shutdown

Image 4 – Propane cylinder mounted on the forklift