Leak in an LPG depot

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Cournon d'Auvergne – [Puy de Dome] France

Release
LPG depot
Loading arm
VOC recovery system
Draining
Connection
Hose
Procedures

THE INSTALLATIONS IN QUESTION

The site:

The depot ensures the logistic activity of bulk distribution via the storage and transfer equipment. The fuel tankers are loaded using two automatic stations fitted with drain valves used to decompress the arm before disjunction. The gas collected in the cargo hose is sent to the storage site through the recovery network.

THE ACCIDENT, ITS BEHAVIOUR, EFFECTS AND CONSEQUENCES

The accident:

A propane leak occurred at the loading station. The depot manager, alerted by the noise, secured the site by pressing the emergency button, in accordance with the site's standard operating procedure. The emergency services were contacted as a preventive measure. The automatic devices associated with the emergency shut down operated correctly, including: automatic disconnection by closure of the valves, flooding by fixed sprayers (spray booms and monitors), disconnection of power supplies. The spraying systems are designed to dilute the cloud. The operator then went to the pump station and closed all the manual valves. No trucks were being filled at the time of the accident.

The consequences:

The gas leak was limited to the truck loading zone (liquid leaked via a ½" branch connection). Once disconnected, the leak stopped by itself once the piping was empty. The resulting cloud of gas did not catch fire. The incident resulted in no property damage.

European scale of industrial accidents:

By applying the rating rules of the 18 parameters of the scale made official in February 1994 by the Committee of Competent Authorities of the Member States which oversees the application of the 'SEVESO' directive, the accident can be characterised by the following 4 indices, based on the information available.

The parameters that comprise these indices and the corresponding rating method are available at the following address: http://www.aria.ecologie.gouv.fr.

The index relative to quantities of hazardous substances equals 1 since to characterize LPG leak for which no data is available about the quantity dispersed (parameter Q1).

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

The leak was located on a purge line used to drain the hose after loading operations are complete. The line runs between the tank's manual valve and that of the loading arm and to direct the residual liquefied gas to the storage tank. This operation is performed by a Venturi type device, which draws in the product, and by operating the manual valves positioned at the loading stations and actuated alternatively at the end of the loading process (configurations corresponding to product recovery then release to the atmosphere). This function was recently installed to allow for the recovery of volatile organic compounds (VOC). The piping consists of a rigid part and a flexible part connected by an "olive" type screw connector.

The leak was caused by the rupture of union (premature ageing) between the rigid and fixed parts. In addition, owing to the position of the valves, the piping was connected with the product intake circuit: the leak was thus supplied, the product circuit was not equipped with a device preventing the return to the purge (no shut-off device in this configuration).

The hose was no longer adapted to the new operating constraints: in the past, regular purge operations were performed using this device to vent the liquid phase section. In the new configuration, the use corresponds to product recovery cycles, with extended pressurisation.

Furthermore, the valve configuration allows it to be sent either to the recovery circuit, or to the atmosphere at the end of the residual gas operation. On the day of the incident, these valves were incorrectly positioned in relation to the procedures: the safety position required was "release to the atmosphere" while the circuit was configured for product intake.

ACTIONS TAKEN

The operator immediately implemented the following measures: the hose was replaced with an identical model, locking out of valves, temporary shut down of the recovery operation.

Modifications were then undertaken:

- ✓ installation of hoses adapted to the stresses associated with product recovery,
- ✓ automation of the control of purge system valves (configuration to the safety position when the alarm is sounded or at the end of a loading operation),
- ✓ installation of a check valve upstream from the recovery circuit to limit the quantity of product released in case of a hose rupture.

An investigations program was elaborated including: an expert evaluation of all hoses, replacement with rigid pipes when the flexible hoses are not indispensable, cataloguing of the installations having this device, identification of potential sources maintaining hoses under pressure.

LESSONS LEARNT

The notable points are as follows:

1 – The need for a preliminary risk analysis before making any modifications.

Furthermore, this event highlights the need for periodic revisions of the risk analyses which represent a method for backfitting modifications made prior to the implementation of the safety management system.

2- The need to verify that the material used is adequate in relation to new operating requirements induced by the modification (cyclic and prolonged operation under pressure): e.g. hose pressure resistance, shut off between the hose and return line to the tank.

3- The need to ensure that adequate procedures: consideration of the modifications made (alignment, proper configuration of valves, etc.).

Other accidents at LPG depots of the type having led to the same problem:

- Mâcon (Saône et Loire) 12/22/1975: see corresponding sheet (No. 28500) although without VOC.
- Le Blanc (Indre) 10/23/1989: see corresponding sheet (No. 948)