

Case Study on Major Incidents

Case Study No.: PNGRB/Tech/2025/RO/ 10

Type of Installation: (CGD/RO)

No. of Fatality: 00

No. of Injury: 00

Incident Title: Bursting of On-board CNG cylinder of customer vehicle at a CNG station

Brief Description:

During the CNG refuelling in the on-board CNG cylinder of a customer vehicle (Vehicle Fuel Type - Petrol/CNG fuel), a rectangular piece (size 7.5" x 5.5") from the third-party on-board cylinder was blown off after bursting with release of high-pressure gas. The cylinder bursting resulted into severe damage to the customer vehicle being refilled. However, no other damage is reported to CNG assets at station forecourt area. No injury to any person reported. It is suspected that the detached portion of onboard CNG cylinder was intentionally cut and welded/fabricated on the cylinder and was positioned in such a way that it was not visible from outside. The incident was categorized as Major incident.

Photos:



Observations/Lapses:

1. The vehicle involved in the incident was purchased in 2013 and was subsequently retrofitted with Type-1 CNG cylinder on xx.xx.xxxx. The customer who brought the vehicle for CNG filling at the station is Prospective Owner (3rd owner) of this vehicle. As per interview with 2nd owner and Prospective Owner (3rd owner) of the vehicle, the vehicle was given on lease twice by the 2nd owner. It is suspected that the cylinder was modified during the time the vehicle was on lease on second time.
2. The vehicle is registered under the name of a relative of 2nd owner and was to be transferred on the name of current owner as agreed between them. Prospective Owner had collected the vehicle from 2nd owner and was informed by him regarding the problem that the vehicle was not running on CNG.
3. Prospective Owner (3rd owner) along with his friend went to a retrofitter for checking of CNG kit. The retrofitter checked the CNG fitment and tubing, no visual anomalies were observed. The retrofitter could not identify the fabricated portion of on-board cylinder as it was not visible (behind rear seat). He informed the owner that kit would work only after refilling of CNG.
4. As per interview with the vehicle Owner, Prospective Owner along with his friend had come to the CNG station for CNG refilling at Dispenser-2B point at around 18:00 hours. CNG filler staff checked the vehicle metal plate, found it adequate and started CNG filling. He noticed gas leak sound in cylinder valve. Immediately the filler stopped the CNG refilling and informed the owner to get the leakage rectified prior to refilling.
5. The Prospective Owner (3rd owner) again visited the retrofitter and got the leak rectified after tightening of nut ferrule of cylinder valve. 9. Both Prospective Owner (3rd owner) and his friend came back to CNG station for refilling at around 18:55 hours on 4B dispenser point. Another CNG filler staff checked the metal plate, found it adequate and started refilling. When CNG refilling up to around ₹150 was done, suddenly the on board CNG cylinder got burst. The welded piece blew-up at around 8-10 ft in the air, however there was no damage to any asset and no injury to any person.
6. Immediately after onboard cylinder burst, the filler closed the emergency isolation valves of dispenser at tubing trench near compressor fencing. Security person immediately rushed to electrical panel room and cut-off electrical power supply to all dispensers. The compressor operators had isolated compressor cascade and electrical panel.
7. AS per CNG filler's statement, CNG worth INR 150 (approx. 2kg) was filled in the vehicle before the bursting. The final dispenser reading showed 6.07 kg CNG was dispensed, it is assumed that after the incident, around 4 kg of gas was released till the time of isolation.
8. The on board CNG cylinder was cut (rectangle shape of 7.5" x5.5" size) and a plate of same size was welded on the cylinder. The rectangle slot surface in cylinder had brown coloured mild rusting and the cut piece has shiny grey surface. This suggests that the plate was welded onto the cylinder in recent past.
9. No passengers were inside the vehicle at the time of on-board cylinder burst. CNG filler, Vehicle driver and prospective owner were standing near the vehicle (CNG filling point). The operation at the CNG station was stopped immediately after the incident.
10. Both the CNG fillers, who were filling the vehicle, were trained for safe CNG filling and have around 10 years of experience for the same operation.
11. Station operator informed the entity operating the station about the incident as per incident reporting process.
12. The details of the on board CNG cylinder were found as below
 - a. Cylinder serial number – XXXXXX
 - b. Make-EKCG
 - c. Date of Manufacture – 12/2012
 - d. Date of Hydro test-11/03/2021
 - e. Hydrotest Validity-10/03/2024
 - f. Water capacity – 60 L
 - g. Working Pressure – 204 bar(G)
 - h. Test pressure – 340 bar(G)
 - i. Cylinder specification – IS 15490
 - j. Service life - 20 Years
 - k. Tare weight – 64.7 kg

Observations/Lapses:

13. Post incident, CNG pressure was observed Zero “0” bar on dispenser PG no. 4-B, where the vehicle was being refilled.

CNG pressure observed on all other dispensers- 200 bar(G).

CNG pressure observed on stationary cascade- 210 bar(G).

Cut-off pressure set on the dispenser- 200 bar(G).

14. SRV set points of CNG compressor were as mentioned below (as per the calibration report)

Compressor-1: D-R (1200 SCMH)

- a. First stage discharge pressure – 70.2 kg/cm² (G)
- b. Second stage discharge pressure – 141 kg/cm² (G)
- c. Third stage discharge pressure – 283.1 kg/cm² (G)

Compressor-2: KPCL (650 SCMH)

- a. First stage discharge pressure – 58 kg/cm² (G)
- b. Second stage discharge pressure – 128 kg/cm² (G)
- c. Third stage discharge pressure – 285 kg/cm² (G)

Alarm & Trip setting of CNG compressors were found as below (as per calibration report of pressure transmitter by DR/ KPCL in Jul-2022)

Compressor-1: D-R (1200 SCMH)

- a. First stage discharge pressure High alarm at 68 kg/cm² & Trip at 70 kg/cm² (G)
- b. Second stage discharge pressure High alarm at 132 kg/cm² & Trip at 136 kg/cm² (G)
- c. Third stage discharge pressure High alarm at 250 kg/cm² & Trip at 255 kg/cm² (G)

Compressor-2: KPCL (650 SCMH)

- a. First stage discharge pressure High alarm trip at 60 kg/cm² (G)
- b. Second stage discharge pressure High alarm trip at 130 kg/cm² (G)
- c. Third stage discharge pressure High alarm trip at 245 kg/cm² (G)

15. Based on the readings of dispenser’s pressure gauges and cut out pressure set for dispensers, the maximum pressure of dispensing CNG was observed not more than 200 bar(G).

Root Cause:

- 1. During CNG refuelling, the onboard cylinder got burst since a rectangular piece of cylinder was cut and welded / fabricated by local fabricator.
- 2. Un-authorized modification of the cylinder

Recommendations:

1. Lessons learnt from the incident to be shared amongst CNG station staff & relevant stakeholder.
 - a. Continue safe practice of 'No Passenger inside the vehicle' during CNG refilling in on-board CNG cylinder
 - b. Driver of vehicle must stay away from vehicle during refilling
 - c. Be watchful for any gas smell or sound during CNG filling. In case of any indication of gas leakage or any unusual sound, immediately stop CNG filling
 - d. Safe distance to be maintained between refilling vehicle and other vehicles waiting in a queue
 - e. Filler should apply emergency isolation switch and valve on dispenser for quick isolation
2. Raise awareness amongst CNG customers to avoid installation of modified / welded on-board CNG cylinder Customer Awareness campaign to include check list for self- verification including cylinder condition, especially at the time of change in CNG kit / ownership of vehicle.
3. Identify and carry out awareness of CNG retrofitters in nearby locations.

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