EPCA Report No. 30 (March 2007)
CNG safety: Progress and action taken report
In the matter of W.P. (C) No.13029 of 1985; M.C. Mehta v/s UOI & others

1. **In 2002, Delhi introduced the use of CNG for its public transport buses. Since then, at the direction of the Hon'ble Supreme Court, EPCA has been monitoring issues connected to safety of vehicles using gas. The key reason is that CNG is being used, perhaps for the first time in the world, at such a massive scale in public transport buses. It is therefore, imperative, that this technology switch-over is carefully mandated and implemented to ensure that safety is not compromised.**

2. **During this period, efforts have been made to upgrade the safety inspection system for CNG buses and accordingly directives have been issued from time to time to the concerned agencies to undertake remedial measures. Though there has been considerable improvement in the safety regime and number of safety related incidents have been minimised, EPCA is concerned that sporadic incidents are still taking place. These incidents point to the need for constant scrutiny and improvements in the system.**

3. **EPCA has once again, reviewed the state of affairs and issued directives for further improvement in the system of monitoring and enforcement.**

4. **This report is to inform the Hon'ble Court regarding the status and action taken.**

1. Background

EPCA has been monitoring the implementation of the CNG programme in Delhi since its inception. During this period, it has made special efforts to upgrade the safety inspection system for CNG buses and has accordingly issued directives from time to time to the concerned agencies to undertake remedial measures. Though there has been considerable improvement in the safety regime and number of safety related incidents have been minimised, EPCA is concerned that sporadic incidents are still taking place. These incidents point to the need for constant scrutiny and improvements in the system. This report is to inform the Hon'ble Court regarding progress and action taken.

It is clear that there cannot be any compromise on safety related issues. It is important to identify the deep rooted maladies – both technical and institutional – to remedy them and ensure zero level of tolerance for any lapse in the implementation process. Series of steps have been taken over the last one year.

In August 2006, EPCA submitted its Report No. 26 (*Investigations relating to fire hazards and safety in CNG Buses*) and a supplementary report on converted CNG buses to the Hon'ble Supreme Court. This report reported the work done by EPCA to investigate the fire incident in mid-2006.

On May 2, 2006 EPCA had constituted an expert committee to investigate the fire incidents in the CNG buses. The committee analysed the root causes of bus fire incidents, identified the manufacturing deficiencies and defects pertaining to the engine and sub-system design/electric installations and electric wiring/gas piping and joints etc; assessed the conversion deficiencies, issues relating to spare parts, role of maintenance and recommended remedial measures for in-use CNG bus fleet and also examined the proficiency of DTC testing centers after having deliberations with the concerned agencies. The committee also took note of the problems with regard to the converted CNG buses in Delhi. Serious lapses in conversion practices were noted by the committee that had grossly undermined the safety and emission features of the buses. It was suggested that immediate remedial measures are needed if these buses are to be allowed on roads.

EPCA took very serious note of the findings of the expert committee on the bus fire incidents and expressed its displeasure over the fact that actions by various stakeholders on this front had remained unsatisfactory and the problem of safety had continued to persist. EPCA observed that there could be no compromise on the safety features of the CNG buses and issued the following directives.

Direction for bus manufacturers: EPCA took on board all the technical recommendations as detailed out in the report of the expert committee including the specific engineering and the technical changes that the bus manufacturers had been asked to carry out by August 31, 2006. The manufacturers were told that non-implementation of these measures would invite strong action.
Direction to DTC and transport department: To set-up mobile vehicle inspection and maintenance (I/M) facility.
Direction to transport department, NCT of Delhi: To ensure that CNG buses including the converted buses undergo three comprehensive and improved I/M

check ups one in each quarter of the year at the authorised and designated workshops: The quarterly inspection should include leakage checking, inspection of wiring harness checking for high tension leads for possible current leakage, checking conditions of hoses, tightness of CNG cylinders mountings, conditions of gas pipes and joints, functioning of all gauges in the instrument panel, inspection of battery cut off switch, current limiting devices, dust cap/plug etc.

Direction to transport department, NCT of Delhi: To constitute a Steering Committee to oversee the implementation of the entire I/M programme for CNG buses and report to EPCA.

Specific directions for conversion agencies

EPCA took very serious note of the fact that the conversion agencies had failed to provide after sale service and support for maintenance and repair to the converted CNG buses and their operators. This seriously compromised the safety features of these buses. Taking note of the problems in the converted CNG buses, EPCA issued the following directives.

Inspection of on-road converted buses: These buses must undergo periodic inspection once in every quarter of the year at the authorised converters workshops as per approved periodic inspection checklist.

The converter agencies: To submit to EPCA latest by August 31, 2006 the rate list of key spare parts and components of various subsystems such as the fuel system, electrical ignition system etc as also the names and addresses of the authorised suppliers of these spare parts and components.

The converter agencies: To display in their workshops a price list for various components and fittings as also of various replacement costs.

The converter agencies To give an undertaking that they would provide in their respective workshops after-sales service facilities to the converted buses for as long as the buses are on road.

The transport department, NCT of Delhi: To constitute steering committee to monitor the periodic inspection and maintenance programme as also the functioning of the converters workshops and the manufactures authorised workshops.

2. Status of implementation of measures on CNG safety

On January 6, 2007, EPCA convened a meeting to take stock of the progress made with regard to the implementation of the measures suggested by the expert committee for the safety of CNG buses in the city. EPCA emphasised the need to carry out proper checks of safety of CNG buses as envisaged in the EPCA report submitted in August 2006. EPCA took stock of the pending actions to be taken by the transport department and OEMs in this regard. Deliberations were held on various measures which included logbooks for in-use vehicles, periodic testing of CNG buses, creation of mobile test facility for on-road tests, inspection and auditing of converters workshops and measures to be undertaken to overcome malpractice of the use of ‘floating components’ at the time of annual fitness test/third party inspection. The status with regard to implementation of these measures is as follows:

a. Logbook: It was made mandatory by EPCA that the bus manufacturers and the converters should provide printed logbooks on all their on-road buses. The logbook should include vehicle particulars, cylinder details, gas system details and ignition system details, maintenance schedules and table for recording inspection and repair details and also photo I-card, PAN card of the owner and

the vehicle registration certificate (xerox copy). It was informed that the manufacturers and the converters had implemented the directive regarding printing and making available logbooks for use on all their on-road buses. Periodic inspections, maintenance and repairs carried out on the vehicle have to be recorded and duly authenticated by the approved workshops authorised staff. Each OEM/converters/DTC workshop had also provided to CMVI Burari the specimen signatures of the technical persons authorised by each of their workshops to sign the entries in the logbooks after every periodic inspection/repair carried out there. The transport department has to take the necessary action to ensure that the on-road buses carry these printed logbooks.

b. Periodic testing (quarterly fitness) centers: As per EPCA's earlier decision, OEMs and converter workshops had also been authorised to carry out the mandated periodic testing of CNG buses which was earlier being done at a few DTC workshops only. In addition to the DTC workshops, 10 Tata Motors authorised workshops, 5 Leyland authorised workshops, authorised workshops of Swaraj Mazda and Eicher along with converter agencies workshops had been permitted to carry out the quarterly fitness tests. The names, addresses, contact numbers of all these test centers had been given at Burari fitness center by these workshops. Specimen signatures of the authorised staff at each of these test centers had also been handed over to the transport department staff manning the Burari fitness test center so that at the time of annual fitness test it could be checked that periodic testing as also repair and maintenance jobs had been carried out at the authorised workshops. A common periodic testing checklist to be followed at each of these centers had been finalised and given for use to the OEMs/converters authorised workshops. They had also been given a list of equipment/instruments they were required to have as also the requirements of the technical staff manning the test centers/workshops. However, the transport department has yet to notify the incorporation of the OEMs/converter workshops in the list of workshops authorised for periodic testing. As a result the bus owners/drivers who are getting periodic testing done at the OEMs/converter workshops are being asked to get them redone at the DTC workshops. It was decided that the transport department should issue the necessary notification so that periodic testing is carried out at OEMs/converters workshops and can be linked with the annual fitness tests. The transport department agreed that the required notification relating to permit condition with regard to periodic testing done by OEMs/converter workshops will be issued shortly. There is an urgent need to tell the manufacturers that they should adhere to the prescribed checklist during periodic testing, and the periodic testing fee of Rs. 300 should only be charged for periodic fitness test. They should also display in their workshops pricelists of various replaceable components.

c. Mobile test facility: EPCA had directed the transport department to set up a mobile safety checking facility to carry out surprise on-road checks. The equipment to be used in the mobile test facility had been finalised by the expert committee, transport department and the TPTI/ASRTU. In addition, a checklist for carrying out on-road tests by the mobile testing facility staff had also been finalised by the transport department, TPTI/ASRTU, DTC and it has been circulated and agreed upon by all concerned. There has been an unduly delay in setting up this much needed facility. The transport has now informed that the mobile test facility will be in place by mid February 2007.

d. Inspection and auditing of converters workshops: EPCA has directed that converter workshops should be inspected with regard to the equipment, staff etc

and other facilities available there. The transport department was to notify a four men committee having representation from ARAI, transport department, DTC, EPCA expert nominee, to inspect and audit these workshops.

e. 'Floating components' on CNG buses: It was pointed out that often vehicles for annual fitness/third party inspection replace before going for the test the faulty components of the vehicle with hired/borrowed components that are returned after the inspection to the supplying agents/agency for re-use on another vehicle and the faulty components are refitted on the inspected vehicle. This defeats the very purpose of fitness/third party inspection. To overcome this malpractice of 'floating components' it was decided that the chassis number/registration number of the vehicle would be engraved on such vulnerable components. The system of this engraving was developed by CMVI, CIU, PCO Burari. A decision had been taken that OEMs should also do such engraving on the critical components in the new buses. Regarding engraving the chassis/engine number on the critical safety and emission components, the transport department had decided that the engraved numbers should be of the minimum 5 mm in size and this should be readable. For in-use buses this is to be done as per the registration number and for new buses the engraving on components to be done on the basis of engine/chassis number by the OEMs or registration number if available. The components needing this action had been identified in a meeting in the department with participation of TPTI.

2.1. On the basis of the above deliberations EPCA has directed the following:

- **The transport department:** The department in its meetings with OEMs/converter workshops should emphasise to them that the OEMs/converter workshops should not mix up repair and maintenance with periodic testing. Minor adjustment and repairs to prevent leakage of gas/electric current should be carried out free of cost. They should display the pricelist of replacement components. The OEM workshops can advise a bus owner on the imperative of replacing a component if it is causing leakage of gas/current or is badly damaged.
- **Inspection and auditing team:** A four men team having representation from department of transport, ARAI and with Prof. H. B. Mathur and with Mr. Malhotra (DCGM Peeragarhi depot, DTC) chairman and member respectively of the CNG safety committee of EPCA, is to be notified by the transport department to carry out the inspection of the workshops with respect to their facilities – technical, personnel, qualification and experience and such other things as deemed necessary by the committee. This committee should visit these workshops and submit its report by end of February 2007.
- **Mobile test facility:** This facility should be set up and begin on-road checking as per approved checklist by mid February 2007 latest.
- **Checks on the 'floating components'**: The 'floating components' which are critical in terms of safety and emissions to be engraved to show chassis number/engine number/registration number by the OEMs (in new buses) and registration numbers on in-use buses by CMVI/TPTI at Burari. The transport department and OEMs were asked to submit an action taken report in this regard.

3. Bus fire incident on January 27, 2007: findings and recommendations

EPCA was very disturbed by the bus fire incident that occurred on January 27, 2007. A contract carriage school bus (DL 1P 5993) caught fire at around 2:30 pm near Chirag Delhi while ferrying students of Lodhi Estate based Delhi Kannada school. The bus was badly burnt but all the occupants of the bus including the driver and the conductor escaped unhurt. EPCA observed that while a number of the safety related directives issued by the Authority had been implemented and considerable progress had been made in building the infrastructure for the safety inspection in the city, some serious implementation lapses still remain.

Following the incident, EPCA constituted a committee to investigate the incident. The committee carefully examined the burnt bus, its documents and the circumstances leading to the accident and submitted its findings to the Authority.

3.1. Findings of the committee

On examining the documents of the burnt bus, the committee found that it was an original Tata diesel bus registered in 1994 and converted to a spark ignition engine mode to run on CNG by the retrofitter Rare Fuel & Automobile Technologies Private Limited in 2002. On June 16, 2003, the bus underwent third party technical inspection mandatory for heavy commercial vehicles and the last third party inspection of the bus was carried out on June 3, 2006. The bus did not undergo any of the EPCA directed mandatory quarterly inspections at any of the approved DTC tests center and no such testing was either done in converters/manufacturers authorized workshops also.

The committee examined the burnt bus and the investigations revealed the following:

- The right hand portion of the interior of the bus was more badly burnt than the left hand portion (looking from the front end). The entire upholstery was completely gutted.
- The right hand portion of the engine was far more damaged than the left hand side (looking from the back end).
- The portion of the cylinder cover the spark plugs had partly melted exposing the spark plugs number 5 and 6.
- The hoses had burned out.
- The gearbox sheet had melted.
- The tappet cover had also melted at two locations.
- The distributor had burnt.
- The batteries had badly burnt.
- Available evidence showed that tappings from the battery had been taken for the musical system and the two speakers had partly burnt.
- The wire harness which was passing through the left hand side of the bonnet in close vicinity of the exhaust (typical of Tata buses) was burnt.
- The mandatory fire extinguishers were not in place.

The committee based on the available documents and the inspection of the bus drew the following conclusions.

- Manufacturing deficiencies and poor maintenance have contributed to bulk/continuous gas leakage and sparking due to short circuit/hot spot formation leading to initiation of the fire under the bonnet.
- The bus owner's/driver's avoiding the quarterly testing mandated by EPCA for CNG buses to ensure proper inspection and maintenance of on-road buses is a

serious lapse on the part of the concerned owner/operator/school authorities using the bus.

- Absence of mandatory fire extinguishers in the bus is again a very serious safety lapse.
- Re-routing of the electrical wiring harness by bringing out it of the engine compartment to the extent possible was mandated by EPCA but it seemed this has not been carried out in all the Tata make buses.
- EPCA had mandated that the converted buses should undergo three comprehensive I/M check ups one in each quarter of the year at the authorized designated workshops. The quarterly inspection would include leakage testing, inspection of wiring harness, checking of high tension leads for possible current leakage, checking conditions of hoses, tightness of CNG cylinders mountings, conditions of gas pipes and joints functioning at all gauges in the instrumental panel, battery cut off switch, current limiting devices, dust cap/plug etc. But it appears that this has not been implemented by the concerned authority.
- The mobile testing facility as mandated by EPCA to carry out surprise checks on the fitness of the on-road vehicles has not been implemented by the transport department.
- The Hon'ble Supreme Court's guidelines for 'Educational Institution Bus or any other Omnibus/Transport' used for the purposes of transportation of school children in NCT of Delhi have not been followed by the bus under investigation.
- This fire incidents which jeopardized the safety of the school children, could have been avoided if the transport department had implemented well in time the recommendations/directives made by EPCA. While other stakeholders such as the manufacturers filed the action taken report on the mandates issued to them by EPCA, the transport department never did so. No amount of directives issued and guidelines given by EPCA for improvement of the safety of these CNG buses can have any meaningful impact unless their implementation is ensured by the transport department. This firing incidents should be taken as a wake up call by the transport department and it should put in place the required enforcement measures failing which more damaging and fatal accidents will follow as the CNG bus fleet is ageing.

4. Remedial action taken and directives issued

EPCA took very serious note of the findings of the committee and convened a meeting on February 3, 2007 to deliberate on the issue. The Authority observed that this incident would have been fatal as lives of more than 30 school children was at stake but timely rescue action saved the lives of these children. EPCA observed that while a number of its directives had been implemented, and considerable progress has been made in setting up the infrastructure for safety checks and inspection in the city, some serious gaps and lapses still remained in the implementation of the EPCA directives. The Authority pointed out that safety regulations were not being fully enforced. The Authority emphasised that no such incident should occur in the future. EPCA issued a set of directives to be enforced with zero tolerances for lapses.

i. **Introduce mobile facility for safety inspection**: Department of Transport of the Delhi government should set up a mobile facility for safety inspection to check gas leakage and other safety related parameters for random on-road surprise inspection by February 7, 2007 as committed by the department earlier.

ii. **Rigorous enforcement of the mandated safety inspections**
    a. For this purpose 20 safety inspection centres have been identified in DTC depots and in the manufacturers workshops.
    b. The transport department must issue notices stating that clearance of quarterly inspections obtained from these centres will be mandatory for annual fitness certificates and permits.
    c. All bus operators must register for quarterly inspection with inspection centres within 15 days to enable tracking of the inspection status of the buses in the future. The transport department will maintain a complete list of the registrations. The transport department should take action against the bus operators, -- even impound their buses, if they do not come for quarterly inspection within the due date.
    d. Each bus will have to maintain a logbook with the details of periodic testing and repairs. Transport department must ensure compliance.

iii. **Improve safety inspection facilities and testing**:
    a. All buses must be inspected according to the officially approved check-list for safety tests. The transport department must inspect and ensure that the test facilities and test procedures in all authorized workshops are as per the specifications detailed out by the EPCA led expert committee on CNG safety.
    b. All authorised workshops of the DTC, the bus manufacturers as well as the transport department (for its mobile facility) must immediately obtain automatic gas leak detectors and digital Volt Ohm meters.
    c. The transport department should hold monthly meetings with manufacturers representatives to iron out any bottlenecks with regard to enforcement of the prevailing norms of testing and directives issued by EPCA.

iv. **Directives for the bus manufacturers**:
    a. Tata Motors must act on re-routing of wire harness in the remaining Tata buses – including converted buses – within one month to avoid safety related accidents. The transport department should ensure compliance in this regard.
    b. Tata Motors have already offered special package to rectify problems of gas leakage etc in their old pre 2005 buses, through replacement of joints and better components etc at reasonable costs. All buses must avail of this package. The transport department must ensure this is implemented.

v. **Prepare schedule for phasing out of old buses**: The transport department must submit to the EPCA a list of the buses that are due for phase-out.

vi. **Setting up committee to audit compliance**: EPCA is setting up a committee under the chairmanship of Prof. H. B. Mathur, vehicle technology expert, to oversee compliance and auditing and report to the Authority on its findings.

EPCA will continue to carefully monitor these issues and report to the Hon'ble Court.