

## Status paper on use of CNG in DEMUs

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Use of CNG Engines is established in transport sector world wide and its popularity is growing because of its availability in abundance, cost effectiveness and clean fuel properties. As on date, more than one million vehicles are running with CNG in the world. Even in our country, realizing the adverse impact of increased environmental pollution and the increase in import bill of petroleum crude oil, CNG has been adopted in public transport in a big way.

In Indian Railways, the use of CNG has never been thought of before April 2004, when Northern Railway took the initiative to develop the concept of retro fitment of CNG kit in the present engine of DEMU without any major changes in the existing system. The details of the proposed system based on CNG were worked out in association with M/s CUMMINS in April 2004. The feasibility study through simulation trials was carried out and a decision was taken to develop proto type CNG retro fitment kit. It was also decided to carry out structural modifications in one of the existing DPCs at Diesel Shed, Shakurbasti to accommodate CNG gas cylinders and other associated parts of the CNG kit. After conducting simulation trails, a project report along with complete technical details was submitted to RDSO and clearance from RDSO was received in November 2004. Simultaneously, clearance from CCOE/Nagpur for use of CNG in DEMUs was also obtained.

The work of structural modifications in DPC No.19002 and retro fitment of CNG kit was started in Nov.2004 in Diesel Shed, Shakurbasti.

M/s IGL was also associated in this project to supply CCOE approved cascade fitted with CNG high pressure cylinders, high pressure gas pipe lines and associated fittings. IGL also supplied CNG for pilot project free of cost.

The structural modifications in the DPC, fitment of CNG kit, CNG cylinders & cascade and other accessories were completed in March, 2005 and successful stationery trials were conducted. Subsequently, one successful trip with CNG in dual fuel mode was conducted on 23.4.05. During on line trial, some teething troubles were noticed which are being addressed by fine tuning in the PLC.

**Successful trial of CNG in Railways is a landmark achievement which shall not only result in substantial savings in operating cost of DEMUs but shall also reduce the harmful exhaust gas emissions and provide clean environment. Dependence of our country on import of crude oil shall also be reduced on account of reduction in consumption of high speed diesel.**

## **Main benefits of use of CNG in DEMUs**

- Cost of CNG is 60% less as compared to Diesel for generating same amount of power. However, in dual fuel engine, since CNG shall replace approx. 50% of Diesel, therefore, operating expenses shall be reduced by approximately 30%. Considering average running of DEMUs as 400 engine hours per month, the **average saving per DEMU per annum shall be approx. 24 lacs. and the cost of conversion kit shall be recovered in 18 months only, giving annual rate of return of 66%.**
- Introduction of CNG has a definite impact on **environment improvement**. Reduction in CO and SO<sub>x</sub> shall result in reducing green house effect and thereby improving global warming scenario. Reduction in particulate matter to almost nil in pure CNG engine and by approximately 50 % in dual fuel engine shall result in reduced smog effect and thereby minimizing the health hazards.
- CNG burns cleaner than diesel and produces less deposit in the oil, therefore, the lube oil in a CNG vehicle does not need to be changed very frequently . In addition, cleaner burning characteristics of natural Gas and the absence of particulates shall reduce engine wear and tear. CNG engine **runs more efficiently** than a Diesel powered vehicle, **thereby extending the life of the vehicle.**
- CNG is abundantly available in India & Asian countries. Its extensive use in Railways shall result in reduction in consumption of HSD oil, thereby the **precious foreign exchange shall be saved.**
- **Special safety features**
  - a) Flame arrester which prevents any backward travel of flame in case of malfunctioning of valves in combustion chamber of engine.
  - b) Leak detector and auto shut off of gas supply during gas leakage, if any.
  - c) Pressure Relief devices PRDs are provided to protect against the possible explosion of a CNG cylinder if it were involved in fire.
  - d) Separate chamber for storage of CNG cylinders is completely isolated from engine room, thus making the system free from fire hazard even in case of any leakage.

### **Future plans**

After successful trial of CNG on DEMU, all existing DEMUs can be converted into dual fuel engine. Subsequently all new DEMUs can be manufactured with pure CNG engines which shall further reduce operating costs. This concept can then be tried on WDM2 locos, metros, power cars & DG sets & bring enormous economic benefits to Railways.

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