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CNG Fueling Station Maintenance Overview & Commonly Overlooked Items

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A Natural Gas Vehicle Institute Technical Paper

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Introduction

Leo Thomason, co-founder of NGVi, has over 30 years of direct natural gas vehicle and fueling infrastructure development experience. He is known world-wide as an expert in natural gas fueling and vehicle technology. A professional trainer and experienced technical consultant, Leo helps fleet managers, technicians and drivers understand the nuances of using natural gas as a transportation fuel. He has worked for dozens of clients to assist them in solving technical and design problems that could not/would not be solved by others. In addition, he has assisted customers in designing and specifying fueling stations and working with them through the proposal selection and construction processes to make sure the stations meet their needs.

CNG Fueling Station Maintenance Overview & Commonly Overlooked Items

Effective CNG station maintenance can determine the success or failure of both a CNG station and the overall NGV program. Yet maintenance is perhaps the most critical but often overlooked issue affecting most CNG fueling stations. In many areas, there is a severe lack of experienced and qualified maintenance and repair technicians.

In this technical paper, NGVi outlines the why, what, who, when and how of having a proactive CNG fueling station maintenance plan and some of the often overlooked maintenance issues.

Why?

First, there are several reasons for having a CNG fueling station maintenance plan:

- Ensure Safety for the station users, owner personnel and the general public
    - Ensure that the high-pressure fuel system equipment is safe to operate and use to fuel vehicles
- Improved reliability and customer service
    - Ensure that the fueling equipment is operational when needed to fuel vehicles
- Compliance with environmental and regulatory agency requirements
    - Ensure that the station meets all federal, state, and local codes and ordinances
- Cost control
    - Ensure that the cost to operate and maintain the fueling equipment is minimized
- Protect the Capital investment for the long-term
    - Ensure that the expensive equipment installed in the station is taken care of and not wasted

What?

The primary goals of the maintenance plan include:

- Manage maintenance activities
- Monitor system operation
- Provide emergency fueling support
- Enhance equipment reliability
- Deliver clean fuel to vehicles

Who?

A routine scheduled maintenance program can be handled by the CNG fueling station owner staff, an outside maintenance contractor, or a combination of both. . In our experience, the most successful NGV programs are where the fueling station owner takes control of fueling station maintenance and uses an outside maintenance contractor to perform critical equipment rebuilds, i.e., dryer, compressor, dispenser, and PLC controller.

When?

There are three levels of maintenance needed for CNG station equipment.

- Proactive
- Scheduled
- Reactive (Emergency)

Most maintenance programs involve some measure of each but the most successful program will require that the majority of maintenance be planned and orderly rather than waiting for a breakdown to occur. If maintenance is primarily reactive, customer satisfaction will dramatically decrease and maintenance costs will significantly increase in the long run.

How?

The most critical aspect of maintenance, at least for proactive and scheduled maintenance, is that each task clearly defines **what** is to be done, **who** will do it, and **when** is it to be performed. For example:

- What: Recording and trending compressor suction, inter-stage, and discharge temperatures and pressures
- Who: The fueling station owner technician
- When: Daily at 2:00 p.m. and after no less than 30 minutes of continuous compressor operation

All maintenance activities that are performed on a CNG fueling station must be documented on an operation and maintenance form. The form should contain the date, time, weather conditions, ambient temperature, location (if more than one fueling station location) and a list of specific items to be checked, recorded, drained, or added at the time the activity is performed.

Commonly Overlooked Items

In NGVi's experience when inspecting and evaluating CNG fueling stations of various capacities, ages and types across the country, here are the top 6 commonly missed maintenance items:

1. Removal of hazardous materials (e.g., dryer desiccant, liquid from dryer regeneration, high-pressure desiccant filter cartridges, compressor lubrication oil, oily rags)
    a. Whether this is performed by the station owner or maintenance contractor, it is required as part of environmental and regulatory agency compliance, particularly OSHA, and failure to do so could result in costly fines. This should be a clearly defined what, who and when task item.
2. Improper recording of compressor suction, inter-stage and discharge temperatures and pressures
    a. These need to be recorded while the compressor is running and has been for at least 30 minutes. Recording these temperatures and pressures when the compressor is off provides no useful information on how the compressor is performing and/or if a catastrophic event is about to take place.

3. Not draining coalescing filters and ASME pressure vessels
    a. Coalescing filters are used to remove liquid and aerosol oil or water from the high-pressure natural gas. It is very important to keep track of all oil added to the compressor and cylinder lubrication systems and comparing it with all oil drained from the coalescing filters and the ASME pressure vessels. The difference in the two (oil in and oil drained out) is an indication of possible oil carryover into the vehicles being fueled from the fueling station. This causes vehicle performance issues and therefore dissatisfied customers. For more information on oil carryover, see our technical paper, *The Achilles Heel of Natural Gas Vehicles: The Symptoms, Diagnosis and Prevention of Oil Carryover*.
4. Not re-certifying safety relief valves
    a. Safety relief valves are located on the dryer, compressor, high-pressure storage vessels, and dispenser. Per National Fire Protection Association (NFPA) Code 52 for Vehicular Gaseous Fuel Systems, safety relief valves are to be re-certified every three years from the date of last certification. In addition, California OSHA requires that all safety relief valves installed on any pressure vessel (used to store high-pressure gas) must be re-certified every year. Failure to comply with these requirements could result in equipment safety concerns and noncompliance penalties from environmental and regulatory agencies.
5. Not testing the methane detector installed inside the compressor enclosure
    a. The methane detector detects the presence of methane at a 20% concentration in air and the detector should be checked annually to ensure its proper performance.
6. Maintenance contractor failure to respond or to perform
    a. Consideration should be given to stipulating in the maintenance contract a penalty for failure of the maintenance contractor to respond to a call-out or failure to perform specified operation, maintenance or repair tasks that result in an inoperable fueling system. The amount of the penalty should be proportional to the cost and inconvenience of not having the fueling station operational when needed to fuel vehicles.

NGVi Options

NGVi offers training and consulting services on natural gas as a transportation fuel.

- **CNG Fueling Station Audit**

NGVi can help maximize the efficiency and performance of your existing CNG station, beginning with a thorough fueling station audit to determine performance deficiencies, equipment malfunctions, maintenance requirements, safety practices and more. We can help you solve the most difficult challenges in the most cost-effective way.

- **Fueling Station Training-CNG Fueling Station Operation and Maintenance Training**

NGVi can ensure your vehicle maintenance facility that is used to maintain natural gas vehicles meets or exceeds National Fire Protection Association (NFPA) safety codes and industry standards through a maintenance facility site visit. Following the visit, NGVi will provide a written report detailing the modifications needed to safely accommodate vehicles with compressed natural gas fuel on-board.

For more information about these and other services, contact Leo Thomason at 702-254-4180 or via email at info@ngvi.com.

Helpful Links

National Fire Protection Association (NFPA)
http://www.nfpa.org/index.asp

NGVi's Oil Carryover Technical Paper:
The Achilles Heel of Natural Gas Vehicles: The Symptoms, Diagnosis and Prevention of Oil Carryover