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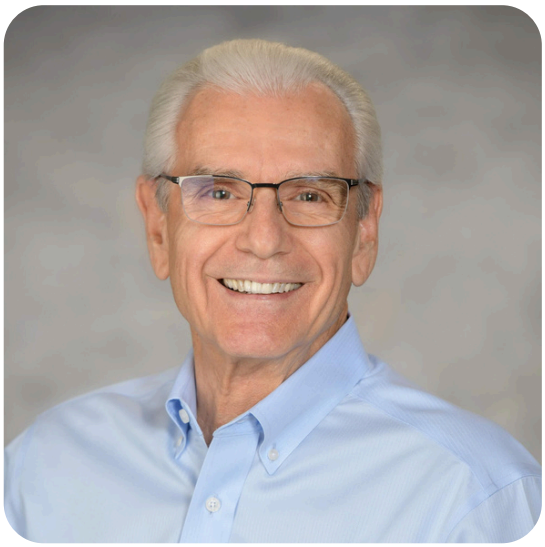
Alternative Fuel Vehicle Institute



CNG Fueling Station Maintenance Overview & Commonly Overlooked Items

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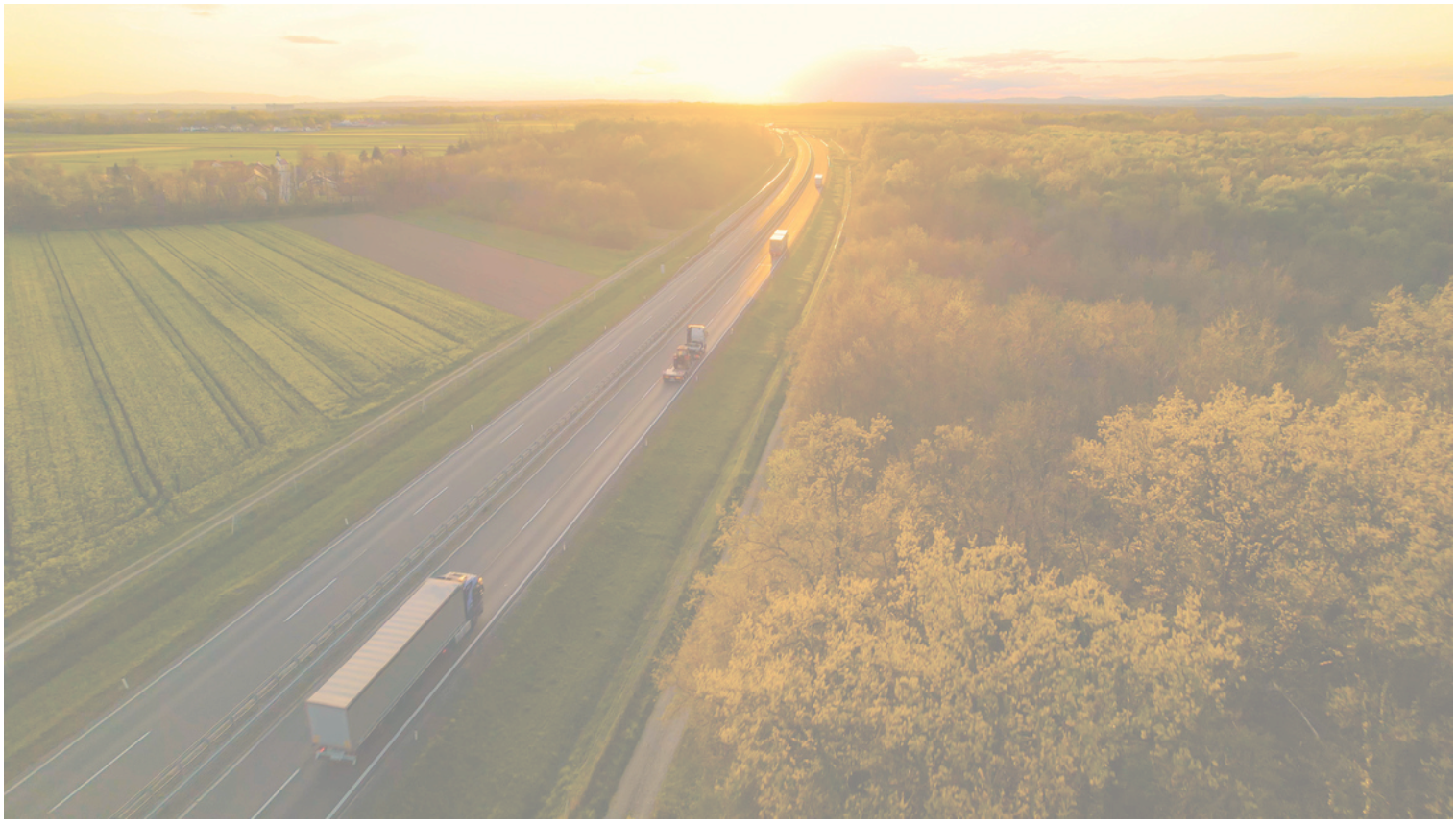

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Introduction

Leo Thomason, cofounder of AFVi, has over 40 years of direct experience with natural gas vehicles and fueling infrastructure development. He is known worldwide 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/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 that these 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. It is perhaps the most critical yet 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, AFVi outlines the why, what, who, when, and how of having a proactive CNG fueling station maintenance plan, as well as some of the most overlooked maintenance issues.

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

- Required by NFPA 52
- Ensure safety for the station's users, owner's 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 long-term capital investments
  - 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 operations
• 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's staff, an outside maintenance contractor, or a combination of both.

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 it is to be performed. For example:

- What: Recording and analyzing trends in 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 there is more than one fueling station) and a list of specific items to be checked, recorded, drained, or added at the time that the activity is performed.

Commonly Overlooked Items

In AFVi's experience, when inspecting and evaluating CNG fueling stations of various capacities, ages, and types across the country, here are the top six (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 has been running 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. **Failure to drain 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 compare 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. Carryover causes vehicle performance issues and therefore dissatisfied customers.

4. **Not recertifying 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 recertified 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 recertified 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. **A maintenance contractor's failure to respond or to perform**
    a. Consideration should be given to stipulating a penalty in the maintenance contract for failure of the maintenance contractor to respond to a callout or specific failure-to-perform operation, maintenance, or repair task that results 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.

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

CNG Fueling Station Audit
AFVi 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
AFVi can ensure that the vehicle maintenance facility you use 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, AFVi 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@afvi.com.

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