

Technical Consultant Services for El Monte Union High School and Mountain View School Districts

Contractor

FuelMaker Corporation

Cosponsors

AQMD

Southern California Gas Company.

Project Officer

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Background

Air quality and health impacts of diesel exhaust have led the AQMD and others to focus attention on reducing diesel exhaust emissions from medium- and heavy-duty vehicles. Rule 1195 identifies the use of low emission, alternative fueled, school buses as a viable alternative to diesel.

On June 15, 2001 the AQMD Board approved grants to purchase lower-emitting diesel and alternative fuel school buses and infrastructure under the Lower-Emission School Bus Replacement and Retrofit Program for FY 2000-01. The CNG fueling stations for the Mountain View and El Monte Union High School Districts were partially funded by these grants.

Project Objective

The CNG fueling systems installed at Mountain View (MVSD) and El Monte Union High (EMU) School Districts were designed to meet normal conditions and water content. Due to some very unusual local conditions, the natural gas supplied to these two projects contain an extremely high water content (MVSD has about 95 pounds of water per million cubic feet of gas and EMU has about 25 pounds of water per million cubic feet of gas). Normally, natural gas contains from one-half to six pounds of water per million cubic feet of gas. The existing gas dryers are inadequate to remove the water from the supplied natural gas and must be replaced with larger units.

As a further step to save expense, regenerative-type dryers are being recommended to allow for the recycling of the molecular sieve desiccant. This will extend the life of the desiccant by six to ten times. The Southern California Gas Company will be providing technical and financial assistance with this project.

Some of the deficiencies experienced at these stations are:

- Existing gas dryers unable to remove sufficient water from the natural gas stream to prevent carryover into the fueling system
- In-line filters near the fueling posts must be manually discharged every few minutes during fueling operations, preventing overnight fueling
- Water carryover into the bus fueling and storage systems has damaged particulate filters, required daily maintenance and removal of entrained water and resulted in fuel line freeze ups.
- Current dryer design does not include the capability to regenerate the desiccant. Regeneration would allow the minimization of generated waste desiccant for disposal
- Modifications made to the fuel tanks of the buses (removal of part of the solenoid valve) to prevent freeze up in the valve create safety and operational concerns
- Entrained water can have serious impacts on the operational life of the fueling equipment and buses and the cost of associated maintenance *and repairs*

Technology Description

The proposed replacement dryers will correct these deficiencies so that the station is reliable, efficient and user friendly. The replacement units are Xebec, regenerative dryers using molecular sieve as the desiccant. Water entrained in the natural gas supply is trapped by the molecular sieve material allowing the dry natural gas to pass through to the compressor. When the water content in the molecular sieve has reached its

saturation point, flow through the dryer is switched to vent, the molecular sieve is heated and the entrained water is carried out through the vent. After the water has been vented, the dryer is switched back on line to resume operation.

Status

The dryer upgrades were completed before the October 2002 due date as established by the contract. In order to install the unit at Mountain View School District, an additional electrical service was required and the cost for this was covered by the School District. The equipment has been operating properly without problems and the buses fueled by these systems are no longer exhibiting adverse effects from the fuel.

Results

FuelMaker Corporation has provided the CNG refueling equipment for many of the smaller CNG fueling stations and they have demonstrated their ability to enhance the water removal systems if necessary. The upgraded dryers for these two projects have proven to be more than adequate to remove the excess water in the natural gas supply for these sites. The regenerative systems will minimize the need to replace the desiccant in the system and the increased size of the units will also minimize operator maintenance.

In addition to resolving the immediate problems, FuelMaker staff have also implemented procedures for their field contractors to follow to ensure that inadequate system will not be installed on future projects. These include: the requirement to have a SoCal Gas moisture analysis conducted on the gas supply prior to installation of any CNG fueling system; work with dryer manufacturers to utilize the best available dryer options; work with SoCal Gas representative to attain better knowledge of possible variations in the water content of the natural gas supplied to CNG sites.

Benefits

The Clean Fuels Program has been active in funding the development and demonstration of low emission, alternative fuel technologies. While not providing any direct emission reductions, the proposed station enhancements will resolve a problem that exists in the natural gas supplied to the sites. This natural gas contains extremely high levels of water and, as such, could seriously damage the fueling compressor, fuel

delivery system or the storage and fueling systems in the buses. In addition, water that is carried with the fuel into the buses presents a safety hazard for the students and drivers since the water could freeze and plug the fuel line thereby resulting in a stalled bus on a freeway or highway. The enhancements will include larger, regenerative-type dryers capable of removing the high levels of water found at these sites from the gas stream. The proper operation of existing stations must be ensured, and those designing future stations must have access to information that will facilitate their design, construction and operation. The primary benefit of this project will be to help resolve these refueling station challenges.

Project Costs

The costs for the two dryers (including the costs for replacement charges of the molecular sieve desiccant) are summarized below:

Location	Equip	Install.	Overhead	Total Cost
MVSD	\$32,500	\$7,500	\$3,040	\$44,040
EMU	\$27,700	\$7,000	\$3,655	\$38,355
			Total cost	\$82,395

Overhead includes freight and additional desiccant

AQMD and Southern California Gas Company will share the costs equally (\$41,197.50 each).

Commercialization and Applications

These dryers are commercial products and are normally used in small-scale CNG fueling stations.