Compressed Natural Gas (CNG) Fueled Vehicles

Representatives from MGE/Laclede Gas, the Federal Transit Administration and Clean Energy help illustrate the savings that CNG will provide.
Project Background - The CNG Basics

- The primary ingredient of natural gas is methane (CH4) which is nontoxic, odorless, colorless and tasteless.

- Natural gas is lighter-than-air and will rise under normal conditions; it's in a gaseous form at atmospheric conditions.

- Pipeline natural gas is odorized as a safety measure to allow human detection. Odorized natural gas can typically be detected by smell at approximately 1% natural gas in air.
Project Background - The CNG Basics

- Between 5% and 15% natural gas is required to support combustion in the air.

- The ignition temperature of natural gas is approximately 1100°F.

- CNG is stored on the vehicle in a gaseous form which has been compressed up to 3,600 PSI nominal pressure (at 70°F). At this pressure the volume of the natural gas is 3.5 times the volume of diesel containing the equivalent energy.
Fleet Conversion - What is Required?

KC ATA Facility Conversion (Buildings built in 1977)

- Vehicle Storage, Vehicle Maintenance
- Evaluate Ventilation Requirements
- Evaluate the potential of “Gas Pockets”
- Evaluate Electrical Requirements
- Elimination of High Temperature Surfaces
- Location of Fueling Stations
- Cost of Conversion
- Cost of Operation
National Codes Covering Vehicle Maintenance Facilities

- International Code Council's International Fire Code (IFC 2012)
  - International Mechanical Code (IMC 2012)
    - International Building Code (IBC 2012)

  Code for Motor Fuel Dispensing Facilities and Repair Garages
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Guidelines that cover vehicle maintenance facilities
Guideline for Determining the Modifications Required for Adding Compressed Natural Gas and Liquified Natural Gas Vehicles To Existing Maintenance Facilities

Prepared by
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Clean Vehicle Education Foundation
www.cleanvehicle.org

August 21, 2012
Facility Modifications to Accommodate Work on CNG Vehicles

Ventilation Rate = 1 cfm/ft²

Yes

Garage Type

No

Minor Repairs Only

No Modification Required by the Codes

Major Repair Garage

Fuel Type to Add to Garage

CNG Only

Type of Ventilation

Natural

Approval by AHJ required

Mechanical

Ventilation Rate = 5 ACH (continuous) or Methane Detector Triggered

Methane detection system not required unless <5 ACH

Ventilation Rate within 18” of Ceiling

Less than 4 ACH

Source of Ignition

Open flames and +750° F Surfaces

Remove the Sources of Ignition in Areas Subject to Ignitable Materials

Electrical Classification

4 ACH or more

Space is not considered a Classified Location

Space is a Class 1 Division 2 Classified Location
Ventilation Rate = 1 cfm/ft²

Yes → No

Bring Ventilation Rates up to Code
Yes
Garage Type

Minor Repairs Only

Major Repair Garage

No Modification Required by the Codes
Major Repair Garage

Fuel Type to Add to Garage

CNG Only

Type of Ventilation

Natural

Approval by AHJ required

Mechanical

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VESDA® VLI by Xtralis™

The VESDA VLI by Xtralis is an industry first early warning aspirating smoke detection (ASD) system, designed to protect industrial applications and harsh environments of up to 2000m² (21,527 sq ft).

**Long life, intelligent, fail-safe technology**

The VLI detector combines a fail-safe Intelligent Filter (patent pending) with an advanced clean-air barrier for optics protection allowing the use of absolute detection and a long detection chamber life without the need for recalibration.

The Intelligent Filter:

- Effectively reduces the level of pollution in the air sample before it enters the detection chamber, which dramatically extends the operational life of the detector in harsh and polluted environments.
- Is fully monitored, therefore providing consistent sensitivity over the entire operational life of the detector.

**Installation, Commissioning and Operation**

The VLI detector features a robust IP54-rated enclosure which provides protection against dust ingress and water splashes. In the majority of applications this eliminates the need to use expensive external IP enclosures, thus simplifying and reducing the cost of installation.

The VLI detector is equipped with a powerful aspirator that provides a total pipe length of 380m (1200 ft). It is fully supported by the Xtralis AGP/RE2, VSG and VSM software applications which facilitate ease of pipe network design, system commissioning and maintenance together with compatibility with existing VESDA installations.

The AutoLearn™ commissioning assistant reduces setup time and ensures optimum alarm and flow thresholds in a range of environments.

The VLI detector features a standardised industry BACnet over Ethernet communication protocol for remote monitoring and programming and connection to building management systems (BMS) and automation devices. This translates to direct cost savings on integration and monitoring.

The VLI detector is inherently less prone to nuisance alarms due to the intelligent filter, lint trap, sub-sampling probe and secondary filter. Coupled with its modular design, VLI offers a lower total cost of ownership over the life of the product.

**Features**

- Suitable for Class 1 Division 2 applications
- Groups A, B, C & D
- Up to 2000m² (21,527 sq ft) coverage
- Up to 4 inlet pipes
- Total pipe length up to 300m (1000 ft)
- Five (5) high intensity status LEDs for greater visibility
- Robust absolute smoke detection
- Intelligent Filter (patent pending)
- Lint trap to capture fibrous particulates
- Sub-sampling Probe (mental separator)
- Secondary filter
- Clean air barrier for optics protection
- Rapid commissioning
- AutoLearn™ Smoke and Flow
- Clean Air Zero™
- All-path monitoring
- Five (5) relay outputs (Fire, Fault and 3 configurable)
- Relays configurable as latching or non-latching
- Expandable GPI and relay outputs
- Ultrasound flow sensing
- Xtralis VSG, Xtras VSM and AGP/RE2 software support
- IP65 Enclosures
- Easy mounting through steel support bracket
- Modular field replaceable parts for ease of servicing
- BACnet over Ethernet
- Local USB configuration port
- Easy cable termination access
- Imperial and metric pipe ports
- Ruggedized finish for external housing

**Listings / Approvals**

- UL
- IEC
- FM
- ActiveFire
- LPCB
- CE - EMC and LVD
- BMN 91.40
  - G10 5.4 m/s 1.0m/s² 95% 0.90 m/s²
  - G10 32 m/s 0.31 m/s² 95% 0.90 m/s²
  - G10 10 m/s 0.25 m/s² 95% 0.90 m/s²

Classification of any configuration is determined using APMACS.

Readers assume risks of any component or system being VESDA smoke detection. Always consult our site for the latest product approvals.
VESDA ECO™ Detector

Gas Detection for Use with Aspirated Smoke Detection

Xtralis is the manufacturer of the market leading VESDA aspirating smoke detection (ASD) technology that has developed the industry’s first multi-hole aspirated gas detector.

When used with the VESDA range of ASD products, VESDA ECO provides the industry’s first combi aspirated smoke and gas detection system.

VESDA ECO provides early warning of toxic, oxygen and flammable gas hazards to protect personnel and property whilst ensuring business continuity.

Applications include:
- Battery charging rooms
- Boiler plant rooms
- Commercial kitchens
- Parking garages
- Utility / service tunnels
- Refrigerated stores and plant rooms
- Water treatment and sewage plants
- Power generation plants
- Metal processing plants
- and more...

How It Works

VESDA ECO uses an existing or new VESDA aspirating pipe network to actively monitor for gas escapes and build-ups.

Each ECO gas detector can house up to two gas sensors, and additional detectors can be added easily to the VESDA pipe network to monitor more gases if required. Pre-calibrated sensor cartridges are easily replaced in the field and readily converting to different gas sensors or replacing sensors is a simple task.

The VESDA ECO detector is configured using Xtralis VSG configuration software and can be remotely monitored using Xtralis VSM monitoring software. Both VSG and VGM can be used to download data from the onboard memory card for data analysis and trending of historical data.

Integration with other building systems, including fire alarm control panels, PLCs, HVAC and building management systems, provides real-time situational awareness for intelligent emergency response.

VESDA ECO by Xtralis provides significant installation and routine maintenance cost savings over conventional multi-point gas detection solutions, by reducing the number of detectors required to cover an area and by providing easy access for routine maintenance.

Hazardous area certified variants of VESDA ECO are available (Approval pending).

Gas Detection and Environmental Monitoring

Features
- Toxic, Oxygen or Flammable gas detection
- Single or dual gas versions
- Factory calibrated sensor cartridges
- Integral alarm status LEDs
- Integrated with PLCs/HVAC/BMS/FAOCP
- Configurable relays
- 4-20 mA analog outputs
- RS485 Modbus output
- On-board event logging
- On-board fault diagnostics
- Integral gas test port
- Remote reset

Approvals

CE
- Electrical safety: Conforms to EN50131-3:61010-1
- Certified to CAN/CSA Std C22.2 No. 61010-1
- EN 61010-1

EMC:
- FCC E&F Part 15 class B
- IEC 609
- EN 55022

Others:
- IEC 61519:2015
- ATEX 1000 certified
- VNL:15022:2017
- VNIIP:15022:2017
- Federal Aviation Administration (FAA: APL:15022:2017)
Space is a Class 1 Division 2 Classified Location

Less than 4 ACH

Ventilation Rate within 18” of Ceiling

Electrical Classification

Sources of Ignition

Open flames and +750°F Surfaces

4 ACH or more

Space is not considered a Classified Location

Remove the Sources of Ignition in Areas Subject to Ignitable Materials
Lessons Learned

- Explosion Proof versus Spark Resistant AHU’s
  - Use a belt driven plenum fan which is an aluminum fan wheel which won’t spark if a failure creates contact between the housing and fan wheel.
  - Use an enclosed fan cooled (TEFC) motor so that the brushes and windings aren’t exposed to the airstream versus an open drip proof (ODP).

- Air Sampling Filters
  - Require replacing more frequently while the diesel fleet is still in operation.
MID-AMERICA ALTERNATIVE FUEL CODES SUMMIT
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