

## Methane Detector with Wireless Communication for Residential Applications

**Description:** A robust and reliable methane detector with wireless capabilities developed for residential applications.

**Status:** Laboratory testing successfully completed. UL and FCC Certification testing ongoing.

### BENEFITS

Methane detectors have a wide variety of applications in the natural gas industry. New regulations will require the installation of such detectors either as individual, isolated units or as a part of a network of sensors. NYSEARCH is developing a version of a UL-certified methane detector that has wireless communication capabilities so that it can be used in the range of applications.

NYSEARCH developed and tested a sensor technology that is accurate, low cost and most importantly, it operates differently from traditional methane detectors that are established as a consumer application. This Micro-Resonator technology is not susceptible to contamination or false alarm in the presence of household chemicals and other interferents. The successful completion of this project provides customers with a UL-certified and FCC certified methane detector with wireless capabilities. Thus, it provides a market solution for applications where such detectors are desired by customers and regulators.

### BACKGROUND

A few instruments are available in the market that measure concentration of methane and/or combustibles. They vary in accuracy, range, price, and calibration needs. Typically, low cost sensors

suffer from reliability and robustness issues, resulting in many false positive alarms. Sensory technologies have advanced in the last decade. Through the Oracle project, NYSEARCH identified the micro-resonator technology as a technology able to provide all the features needed. In addition, certain jurisdictions like New York City are developing plans to require the use of natural gas detectors in multi-family homes. Remote communications and speedy information on presence of methane gas in such facilities generate the need for detectors with wireless capabilities.

### TECHNICAL APPROACH

NYSEARCH worked with Applied Nanotech, Inc. of Austin, TX, to determine whether a miniature hydrogen sensor could be developed to detect methane. Successful testing led to product development and test program of this micro-resonator technology, that a detection limit of 0.25%, with a range of zero to 100% methane in air or nitrogen, and a resolution of 0.1%.

A micro-resonator is a sensor able to measure the viscosity of a gas mixture. Changes in gas composition give rise to changes in the oscillation frequency of a tuning fork or micro resonator (MR) that oscillates within the gas. This methane sensor uses a pair of quartz tuning forks (see Fig. 1) oscillating at a very high frequency.

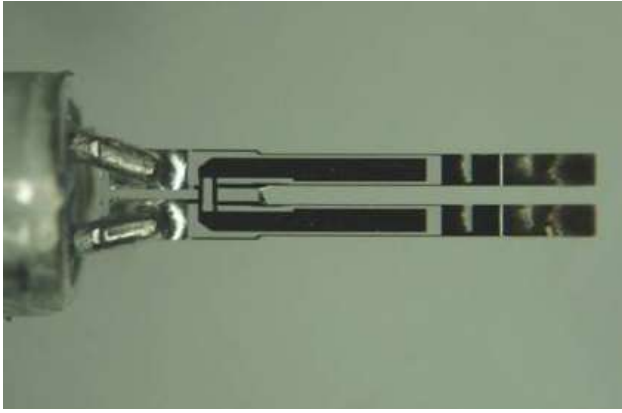


Figure 1: Tuning Fork Used in the MR Methane Sensor

The frequency difference between a measuring micro resonator and a reference micro resonator enclosed in a vacuum package will be proportional to the methane concentration in a mixture of natural gas and air. Since the resonance frequency of a micro resonator depends on the ambient temperature and pressure, the MR sensor provides proper compensation against variations of ambient conditions. The residential detector is a simple design that includes an alarm buzzer and back-up battery for power outages.

The wireless methane detector is using the methane sensor portion of the original residential detector design to the maximum extent possible. The wireless communication is being designed in such a way that when one detector unit goes into the alarm state, it communicates to other methane detectors, within proximity, that the methane concentration is above threshold limit; hence these other methane detectors also go into alarm state. All alarms will continue to sound until the initial detector no longer detects methane above the concentration threshold.

The detector can be modified to work with different communication protocols. Z-Wave has been adopted as protocol of choice for this wireless detector version. The final wireless methane detector will be tested for radiated emissions per FCC requirements.

## PROGRAM STATUS

The development of the wireless detector is complete and engineering prototypes (see Fig. 2) have been tested in the lab to demonstrate that all the

specifications have been met. This was preceded by optimization for low power consumption, manufacturability and low cost.

The original residential methane detector is completing pilot testing in a range of residential environments. The wireless detector units are being built to submit to UL for certification. In parallel, the unit will also go through 3<sup>rd</sup> party testing for Z-Wave/ FCC certification for wireless communications. Commercialization discussions are on-going.



Figure 2: Wireless Methane detector for UL Testing

### Highlights METHANE SENSOR SPECIFICATIONS

- Concentrations range: 0 – 100%
- Response Time ( $T_{90}$ ): 1 sec
- Alarm limit: 1%
- Accuracy: 0.25% of full scale
- Resolution: 0.1% of full scale
- Communication Protocol: Z-Wave

For more information contact:  
[admin@NYSEARCH.org](mailto:admin@NYSEARCH.org)