Northeast GAS ASSOCIATION

NYSEARCH

Leak Detection & Methane Emissions

PHMSA Government/Industry Pipeline R&D Forum
Working Group #2
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NYSEARCH Strategies

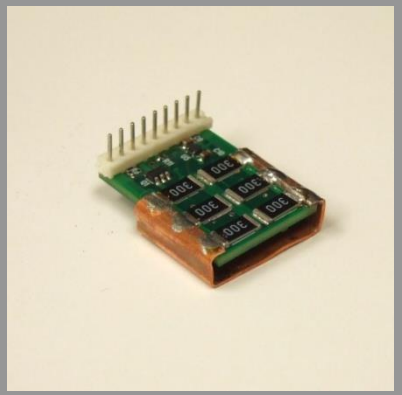
- Improve Safety through development of next generation, low-cost and more reliable methane and mercaptan sensors
- Evaluate SOA technologies that could serve to improve safety and leak detection in distribution sector
- Evaluate and develop technologies that can quantify methane emissions on individual leaks in distribution environments

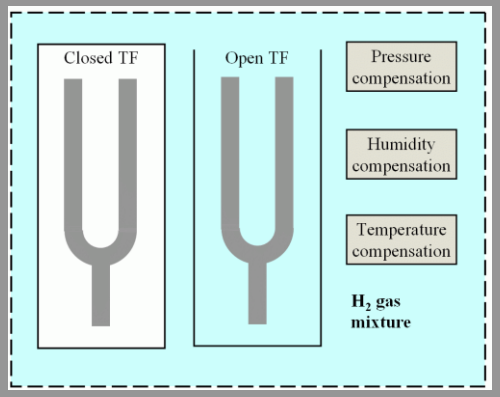
NYSEARCH/ANI Methane Sensor

- Develop a new methane sensor based on existing hydrogen sensor technology
- Specifications
  - NG concentration 0 – 100%
  - LDL in air 0.25%
  - Response time 1 sec
  - Accuracy ±0.1%
  - Resolution ±0.1%
  - Supply voltage 5 VDC
- Pre- commercial sensor development and commercialization effort cofunded by PHMSA

Operating Principle

- Two tuning forks; one exposed to the ambient, the other in vacuum
- Frequency depends on viscosity of gas to be measured
- Pressure compensation
- Temperature stabilized via heating element





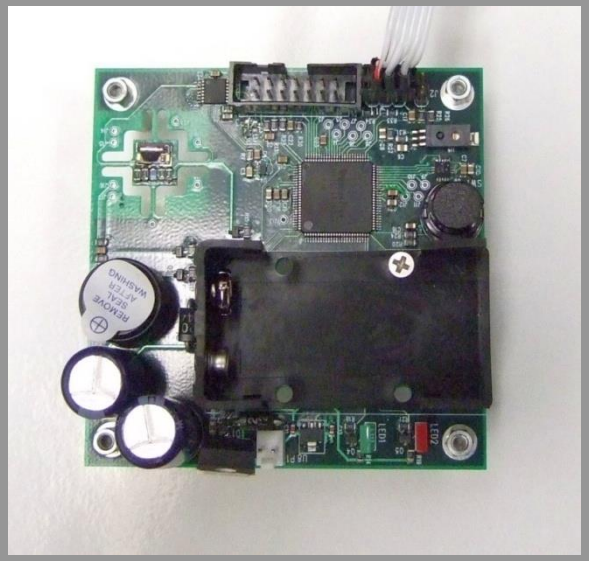
Advantages of Methane Sensor

- Low cost, even in small scale production
- Sensor and controller can be very small
- Physical sensor
  - Immune to degradation
  - Immune to poisoning
- No consumables required
- Almost instant response, less than 1 sec
- Does not respond to other hydrocarbons or household and industrial chemicals – no false positives
- Can operate as alarm sensor for methane leak detection, or as analytical instrument
- Meets UL 1484 and 2075/913 standards

Methane Sensor Engineering Prototype

- Engineering prototype produced and tested by NYSEARCH member companies in 2012/2013

Analytical tool engineering prototype: Sensor kit includes DC power supply, software, sensor with built-in sensor head, and RS-232 cable



Pre-commercial alarm sensor prototype: testing completed

Features of Sensor Designs "A" and "S"

Application specific requirements

	"S" Design	"A" Design
Application	Residential - Safety	Industrial - Instrument
Compliance	UL 1484	UL 2075/913
Usage	Wall/ceiling mount	Handheld/portable
Power	~120V + backup bat.	~120V + recharg. bat.
Indication	LED/Sound Alarm	LCD/Sound Alarm
Communication	(RS232)	RS232
Parameters	Fixed	User selectable
Other	RH sensor not needed	Micropump is optional

Sensor tested for interference effects from household and industrial chemicals; no false positives

Current R & D Activities on Methane Sensor

- Phase IIIb – cofunded by PHMSA in 11/13
  - Completed pre-commercial design optimization
  - Conducted discussions with several prospective commercializers
  - Recently completed reliability/interferent testing at contractor's lab
- Initiating pre-commercial testing with prospective commercializer under NDA
- Decision on needs for additional pilot testing pending
- Expected completion - 2015

ANI Mercaptan Instrument

- NYSEARCH has been seeking a smart nose mercaptan sensor for years
- Using ANI's technology combining Gas Chromatography and Differential Mobility Spectroscopy, starting in 2009, NYSEARCH developing & testing a product to measure mercaptans/odorants at the 1 ppb level in both natural gas and air
  - Portably sensing of mercaptans in outdoor environment (smart nose for leaks)
  - In-line detection of mercaptans (detector for odorant operations and trace constituents)

ANI Mercaptan Sensor
Project Status

- Field demonstrations in 2012 identified sensor stability issues
- Various components have been modified to address instability
- Changes to algorithms are being implemented to assure humidity compensation
- Additional field testing anticipated

Methane Emissions
NYSEARCH Goals

- At the request of members, focusing multiple efforts on evaluating, developing and/or testing technologies that can QUANTIFY Methane Emissions for distribution pipe segments
- Understand current technology offerings and how they are applied from other uses to gas distribution leak challenges
- Determine what improvements are necessary to apply SOA technologies

Ongoing Activities for Methane Emissions

- Performing technology assessment for Con Edison specific to evolving systems that can quantify emissions RATES from stationary or mobile platforms to prioritize Type 3 non-hazardous leaks

- Determining what test processes are necessary to fully characterize technologies' fit-for-purpose; designing a test program to follow for Con Ed /gas company assessment

Ongoing Activities for Methane Emissions (cont.)

- Identifying challenges of emissions rate estimation in dynamic plume environments and R & D contractors to address those challenges
- Addressing methane emissions technology deployments in a practical manner that allows gas safety to remain top priority

Methane Detection for small Unmanned Aerial Systems (sUAS)

- NYSEARCH evaluating sUAS application to incorporate small highly sensitive methane detector
- sUAS leak detection at "tree top" level survey, agile and semi-autonomous
- Methane to be identified and discriminated; intended to overlay onto gas map, GIS or street map

Questions?

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