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# PHMSA R & D Forum

## Leak Detection/Mitigation

### WG #2

NYSEARCH OVERVIEW OF ONGOING RESEARCH

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# NYSEARCH Active Work in Methane/Leak Detection



- ▶ Safety and Analytical Sensors for Residential Methane Detection
- ▶ Leak Survey/Leak Emissions RATE quantification – SOA Evaluation and Test Program and Emissions Validation Project
- ▶ Development of Optical Techniques for Methane Emissions Quantification (direct measurement of flow rate and leak plume visualization)
- ▶ Evaluation of Application of Aerial Leak Survey for Distribution
- ▶ Leak Pinpointing – new approach; leak pinpointing inside pipe
- ▶ Regulatory and Technology Assessment of sUAS (drones)
- ▶ Evaluation of Methane Detection using sUAS
- ▶ Mercaptan Sensor/Smart Nose

# Advantages of NYSEARCH/ANI's MR 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 Emissions Quantification Technology Evaluation & Validation

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- ▶ Overall Program Goal:
  - ▶ Identify, test and validate what technology or technologies can be applied to a mobile platform in an urban environment for quantitative measurement of methane emissions to prioritize non-hazardous leaks
- ▶ Phase II/III Goals
  - ▶ Solicit, interact and select technology service providers
  - ▶ Develop detailed test plans that are acceptable to funders & collaborators
  - ▶ Test the selected technologies in a controlled environment
  - ▶ From the most promising candidates in controlled tests, select practical solutions, conduct field tests
- ▶ Phase IV Goal
  - ▶ Identify, apply and test a set of methodologies that allow a gas distribution operator to **validate** the accuracy of measuring, locating and quantifying methane emissions flow rate

# Methane Emissions Quantification

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- Scenes from Controlled Testing at PSEG in April/May 2015



A - Cert Methane Gas



B - Mass Flow Control



C - 3D Anemometer



D - Windssock



# Methane Emissions Quantification

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- SoCal, Olympic Property, Los Angeles, February and March 2016

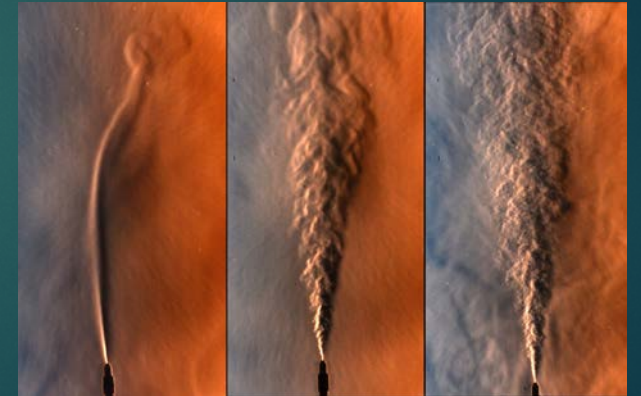


# Standoff Gas Flow Imaging for Emissions Quantification

- Research work currently contracted with FloViz
- Objective is to demonstrate feasibility of a portable, standoff Schlieren system that can detect and quantify natural gas leaks in the field
- Methane has a different refractive index from air which causes light rays to pass through these gases differently
- High resolution cameras allow for 3D reconstruction of the plume which can be fed into dynamic flow analysis for quantification.



Schlieren image of Helium flow (courtesy of Floviz)

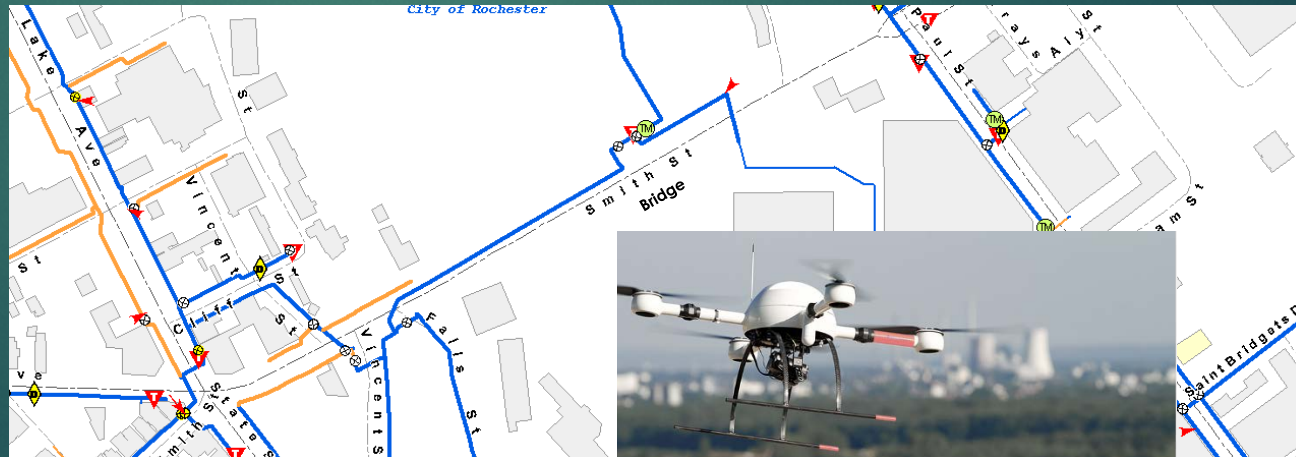


Images from NYSEARCH lab testing with methane

# Regulatory & Technical Assessment of sUAS

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- ▶ Objectives
  - ▶ Confirm FAA regulatory compliance of sUAS applications
  - ▶ Evaluate the capabilities and benefits of an sUAS in performing routine and emergency gas pipeline inspections and surveys
  - ▶ Pursue and develop a methane leak detection module capable of mounting onto an sUAS



# FAA-Approved Flights for NYSEARCH Project

## Example: Tic Canyon, California (SoCal Gas)

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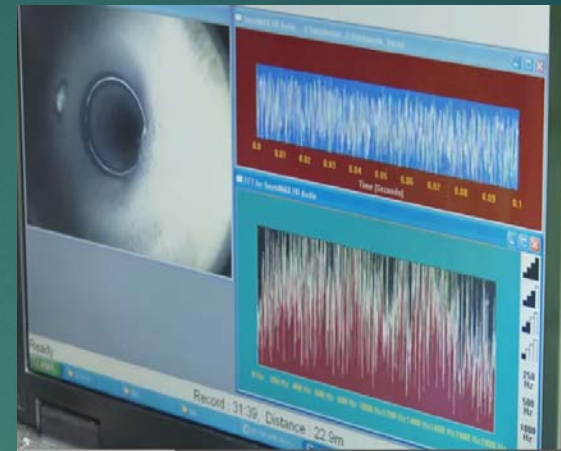


# Drivers/Needs for Leak Pinpointing Innovations

- ▶ Striving for innovative technologies/methods to pinpoint natural gas leaks; need for precise location
- ▶ Identifying required sensitivity for gas concentrations ranging from 0.5% gas (10% LEL) to 100% gas for pressures ranging from 0.25 psi to 99 psi
  - ▶ Providing a low range gas leak rate of 0.1 cu ft/hr and noting emphasis on lower pressure systems
  - ▶ Providing pipe diameter ranges of interest from 2" – 12" with 6" as nominal size for initial focus
- ▶ The developed technology must be rugged, safe user friendly, accurate and cost effective

# Leak Pinpointing Inside Pipe

- ▶ In 2014 – 2015, NYSEARCH investigated the development of a new type of leak pinpointing tool; one that detects and precisely locates leaks from inside the pipe
- ▶ Testing technology from the water industry, NYSEARCH had early success with an acoustic tool in Phase I pipe loop tests
- ▶ Tool was more sensitive and applicable than other commercial technologies used in transmission sector and other industries
- ▶ NYSEARCH is interested is pursuing more rigorous development and testing of the acoustic detection tool for use on a robotic platform inside the distribution pipe



# Summary

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- ▶ The distribution sector has unique needs in a wide range of areas that qualify as leak detection, mitigation and quantification
- ▶ The sectors within the industry and organizations serving the industry define leaks differently
- ▶ The LDC community as individual organizations and in consortia like NYSEARCH have been very active on safety issues for methane detection and mitigation and recently on environmental concerns related to NG emissions and quantification technology gaps
- ▶ Emissions monitoring and prioritization of non-hazardous leaks for LDC infrastructure and replacement decision-making is the focus in one of many areas of methane detection R & D