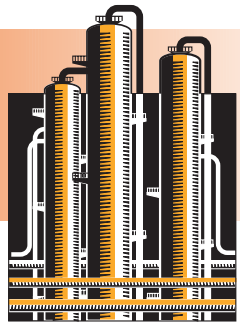
PETROLEUM

Project Fact Sheet



Pulsed Laser Imager for Detecting Emissions of Hydrocarbons and Volatile Organic Compounds

Benefits

- Potential to discover the source of leaks to avoid the loss of 15 trillion Btu of methane and petroleum gas resources, which are currently lost through compressor station and refinery gas leaks
- Offers safe remote monitoring from 100 meters (328 feet) up to 2.5 kilometers (1.5 miles)
- Portable detection device weighs only 35 pounds and includes a shoulder strap and tripod
- Uses well-known principles of infrared spectroscopy for accurate laser imaging
- Configurable measurement capabilities within the three micron electromagnetic band

Applications

The technology's primary applications are in chemical plants, refineries, and railroads and truck transport, which must carefully monitor and comply with leak-detection and correction standards for the gases they produce, sell, or transport. The technology may also be applied to nonaccidental hazardous material management at landfills or depositories, as well as for emergency response teams.

Advanced, laser-based technology safely and effectively detects leaks and emissions without requiring an air sample

A new hydrocarbon-detection device, a Pulsed Laser Imager developed by LaSen Inc., uses the principles of infrared spectroscopy to locate and measure the extent of hydrocarbon leaks and emissions of volatile organic compounds. Current gas-detection devices typically require an air sample to monitor potentially dangerous hydrocarbons at the source of emission. The Pulsed Laser Imager's main advantage over its competitors is its remote sensing feature that does not require an air sample. The Pulsed Laser Imager detects hydrocarbon leaks from a safe distance by analyzing the electro-magnetic spectra of the compounds. Both the short- and long-range versions of the Pulsed Laser Imager are flexible, sensitive, accurate, and intrinsically safe, providing a cost-effective solution for companies and consultants who require hydrocarbon detection equipment.

Pulsed Laser Imager

The Pulsed Laser Imager provides accurate data about volatile organic compound emissions from locations up to 1.5 miles (2.5 kilometers) away.

Project Description

Goal: Modify an existing portable Lidar sensor and test it at two natural gas compressor stations in conjunction with an industry partner.

The Pulsed Laser Imager is a NiCad rechargeable battery-operated, hydrocarbon remote-detection device weighing about 35 pounds and having a detection range between 100 meters (328 feet) and 2.5 kilometers (1.5 miles). Two versions of the device are available, the Lidar and the NICE, each having unique specifications. The Pulsed Laser Imager operates by firing an invisible, pulsed laser into the region where the suspected compound is located. Radiation is "back-scattered" to a telescope, and the Lidar sensor measures the concentration level. This involves carefully calibrating each pixel element and then comparing two separate laser lines. The NICE imager converts the back-scattered radiation to a false color image using video-processing technology.

The Pulsed Laser Imager has been designed to eliminate many of the problems found in current hydrocarbon-detection devices, which typically require a sample of air near the suspected leak site in order to detect the concentration level. Because the Pulsed Laser Imager requires no air sample, it can be operated accurately from a safe distance to determine the type and extent of a leak before personnel are sent in. This remote capability provides better information for response teams to more effectively plan containment and cleanup activities.

LaSen, Inc., is developing this new technology with the help of a grant funded by the Inventions and Innovation Program in the Office of Industrial Technologies.

Progress and Milestones

- LaSen, Inc., holds several patents on technologies relating to the Pulsed Laser Imager.
- The company plans to apply for additional patents for the technology components, including the transmitter's Optical Parametric Oscillator (OPO) and the receiver's Optical Parametric Amplifier (OPA) and Frequency Sum Mixer.
- LaSen, Inc., is also developing an airborne version of the Pulsed Laser Imager and expects to have a working prototype during 2001. The prototype will be integrated with a Global Positioning System, and the advanced system will have the ability to look around and under objects, such as trees, by measuring reflectivity.

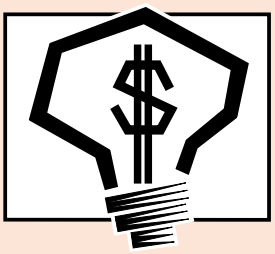
Economics and Commercial Potential

In addition to natural gas compressor stations, chemical plants, refineries, and railroad and trucking companies have the most to gain from the specific benefits the Pulsed Laser Imager can provide. These industries have unique requirements for the features and capabilities of both short- and long-range versions. The Pulsed Laser Imager already has industry officials excited because of its potential applications. In a recent market survey, experts from these industries reported that the Pulsed Laser Imager has the potential to save time and money in detection, containment, and cleanup activities. Current detection devices are typically short-range, handheld models that range in price from $1,500 to $25,000. Longer-range devices can cost up to $100,000 or more, and are usually custom-built based on the purchaser's requirements. Experts report that a refinery or chemical plant may pay from $5,000 to $100,000 to purchase one to four Pulsed Laser Imagers per plant, while a railroad company may pay $15,000 to several million dollars to purchase 10 to 100 units. The cost is comparable to current technology.

Industry of the Future—Petroleum

Petroleum is one of nine energy- and waste-intensive industries that is participating with the U.S. Department of Energy's (DOE) Office of Industrial Technologies' Industries of the Future initiative. Using an industry-defined Vision of the petroleum industry in the year 2020, the industry and DOE are using this strategy to build collaborations to develop and deploy technologies crucial to the industry's future.

OIT Petroleum Industry Team Leader: Jim Quinn (202) 586-5725.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

Project Partners

Inventions and Innovation Program
Washington, DC

LaSen, Inc.
Las Cruces, NM

For project information, contact:

Allen R. Geiger, Technical Director
LaSen, Inc.
300 Telshor, Suite 600
Dona Ana County
Las Cruces, NM 88011
Phone: (505) 522-5110
Fax: (505) 522-6355
lasen@zianet.com

For program information, contact:

Lisa Barnett
Program Manager
Inventions & Innovation Program
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585-0121
Phone: (202) 586-2212
Fax: (202) 586-7114
lisa.barnett@ee.doe.gov

For project updates,
visit our home page at
www.oit.doe.gov/inventions

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, DC 20585-0121

DOE/GO-102001-1029
Order# I-PT-768
January 2001