



OPUS INSPECTION

How can we ensure that the VW cheating scandal never happens again anywhere in the world?

To quote a headline in the New York Times: By measuring emissions where cars pollute – on the road.

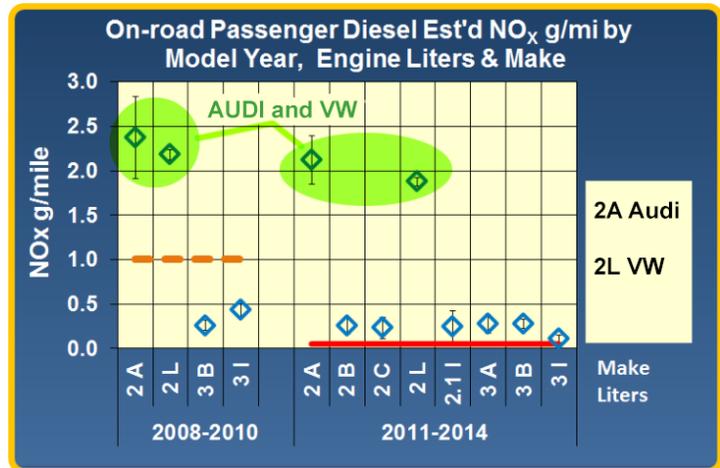
And how can that be accomplished? By expanding the implementation of technology that is already in use every day in many States in the U.S., and in countries worldwide: Remote Sensing. Remote Sensing technology measures emission levels of vehicles as they are passing by on the road. This technology allowed scientists in March of this year to warn of elevated NOx emission levels for Volkswagen and Audi 2-liter diesel vehicles that are driving on U.S. roads since 2009, confirming the work of their European counterparts.

The attached material explains in more detail how Remote Sensing Technology can once and for all identify emission cheaters and keep our roads clean.

THE VALUE OF REMOTE SENSING TECHNOLOGY

A vital component of Emissions Certification

Despite heavy duty engine manufacturers perpetrating similar fraud in the 1990s resulting in an historic \$1 billion fine, Volkswagen was able to install defeat devices to detect and cheat the standardized lab-based vehicle emissions certification tests and emit much higher levels of NO_x on-road as compared to official test limits. The elevated diesel passenger car NO_x emissions have been evident for years in European Remote Sensing data, and the abnormally high VW and Audi NO_x emission rates were exposed in U.S. Remote Sensing Data.



What Is Remote-Sensing Technology?

Unlike lab- or station-based tests, emissions measurements made with remote sensing devices (RSD) are unscripted and collected on the road during every day driving without any detectable intervention. Mobile RSDs unobtrusively measure “real-world” emissions of vehicles where they actually pollute – while in the act of doing so. A single RSD can capture thousands of vehicle emissions measurements a day, quickly amassing a large amount of information that can be mined by make, model, and year of manufacture to expose emissions-related abnormalities, whether fraudulent or inadvertent. RSD technology is proven and recognized by authorities around the world, used for over 20 years in 20 countries in monitoring and enforcement applications designed to improve periodic vehicle emissions inspection programs, and should be included as a truly independent element of the new vehicle emissions certification process.



A Call To Action:

1. Future vehicle/engine emissions certification and in-use compliance monitoring regulations should include four components:
 - a. Vehicle emissions certification testing under laboratory conditions
 - b. Large scale Remote Sensing to report on-road emissions levels for all light vehicle models from initial sale through useful life
 - c. Confirmatory testing in loaded-mode testing centers of suspect high emitting models
 - d. On-road emission monitoring of specific vehicles using PEMS
2. Why are all four steps required?
 - a. Certification under laboratory conditions continues to be the baseline of the vehicle's emission behavior. It continues to set the standard and should not be replaced by alternative methods.
 - b. Large scale Remote Sensing serves to verify the results achieved under laboratory-based certification and identify models with unexpected emissions that may result from design faults, deterioration, component failures or unusual operating conditions and fuels.
 - c. Confirmatory testing in loaded mode testing centers allows for confirmation of High Emitters identified by Remote Sensing.
 - d. On-road emission monitoring using PEMS allows for detailed determination of emission values for vehicle types identified for abnormal behavior

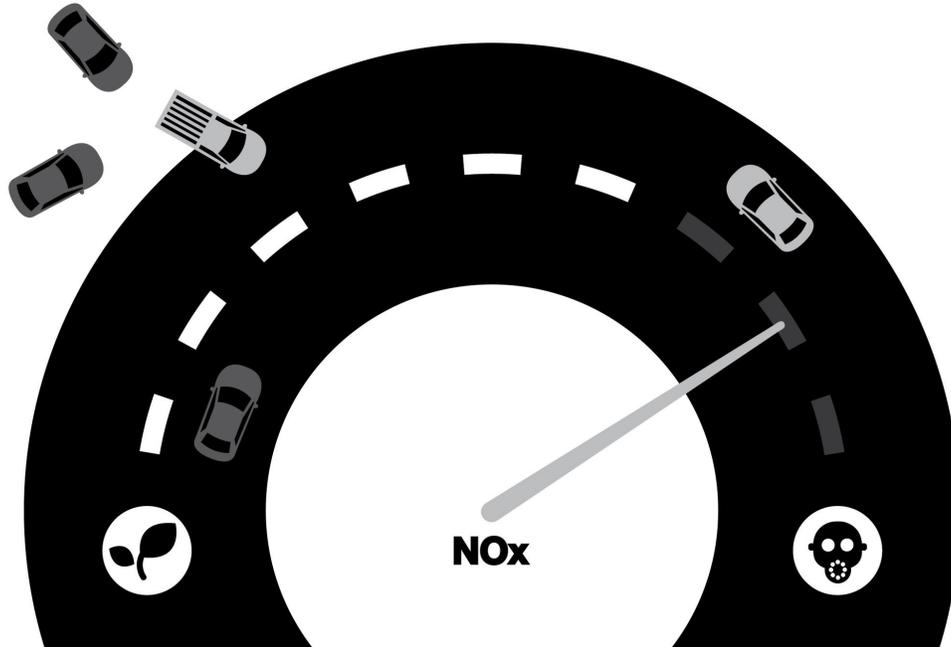
3. The reason to include remote sensing:
 - a. Remote sensing can measure millions of in-use vehicles, thereby allowing identification of emission levels for individual vehicle types, sorted by model year, vehicle make, model and engine type, under all kinds of driving conditions:
 - i. Fast and slow
 - ii. Acceleration and steady state
 - iii. Low and high altitude
 - iv. Warm and cold seasons
 - b. Remote Sensing data can identify high emitting vehicles, as currently performed in some U.S. States (High Emitter Identification).
 - c. Remote Sensing data can identify emission data for individual vehicle groups under each driving condition, both compared to government standards as well as compared to each peer group.
 - d. Any vehicle type showing abnormal behavior under certain driving or ambient conditions can be directed by governing authorities to undergo additional on road emission monitoring, using PEMS or similar technologies.
 - e. Any vehicle type showing abnormal behavior under certain driving or ambient conditions can be requested by governing authorities to undergo additional on road emission monitoring, using PEMS or similar technologies.
 - f. Remote sensing is quite inexpensive as compared to any other form of emissions testing (\$1 - \$2 per valid test record).
 - g. Due to its on-road, drive-by nature, remote sensing is convenient for motorists

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The New York Times



By PETER M. MCCLINTOCK SEPT.30, 2015

Los Angeles — VOLKSWAGEN has shown how easy and tempting it can be for car manufacturers to rig the pollution controls on vehicles to cheat the system. We shouldn't have been surprised. Manufacturers of heavy-duty diesel engines were caught doing the same thing in the 1990s.

How do we guard against this happening again?

It would be a mistake to invest millions of dollars only in improved emissions tests and vehicle computer systems. If computers could be rigged once, they can be rigged again.

What's really needed is a truly independent emissions-testing system that measures pollution where it occurs, on the open road, and not just in a laboratory or emissions-testing station.

In fact, this technology already exists. Remote sensing devices on the roadside can measure emissions as a vehicle passes by, without impeding traffic flow, often without the driver or vehicle knowing they have been tested, and without the vehicle owner waiting in line at an inspection station.

Most important, this technology measures vehicle emissions where vehicles actually pollute, on the road. These are real-world emissions, as opposed to what is measured in vehicle-certification laboratories or at testing stations, where it has become clear that those scheduled and scripted tests can be thwarted.

A single roadside remote sensing device can capture thousands of vehicle emissions measurements a day in free-flowing traffic. These machines use infrared scanning technology to measure emissions, speed and acceleration. A camera records the license plate number, which can be matched to state vehicle registries.

This technology has been around for years. About a half-dozen states now use it routinely to supplement their inspection programs, and at least 10 others perform periodic surveys and studies, mostly in urban areas with air-quality problems, to monitor overall compliance to clean air rules. In

Colorado, for instance, cars that are found in compliance by a remote sensing device are exempted from vehicle emissions tests.

What makes this technology particularly useful is its ability to aggregate emissions data on makes and models of cars and measure how various models, vehicle technology classes and emissions-control components are performing on the road.

The results can be eye-opening. I was part of a team of scientists in Colorado that used this technology to identify emissions problems with Volkswagens and Audis that have two-liter diesel engines months before the recent scandal broke.

The first hint came from a colleague in Europe who, looking at remote sensing data collected in Switzerland, had noticed high diesel nitrogen oxide emissions coming from passenger cars. At his suggestion, we examined thousands of measurements collected by Colorado's vehicle emissions program.

Sure enough, late last year, we found nitrogen oxide emissions from Volkswagen and Audi two-liter diesel vehicles significantly above not only the regulations, but also above the emissions of similar vehicles. But we had no idea then that VW had rigged inspection tests, let alone of the scope of the company's subterfuge.

Cops walking their beats notice things, and in this sense, remote sensing is the "cop on the beat" of emissions control, spotting abnormalities, defective emissions devices, deteriorating emission-control systems or unexpected emissions in unusual conditions, such as high elevation and high temperature.

When measuring millions of vehicles, remote sensing technology is far less expensive to implement than laboratory testing or other on-road emission testing methods.

Virginia motorists, for instance, will spend about \$5 million a year on an expanded remote sensing device program in the northern part of the state starting soon that will test their vehicles on the road (motorists will be mailed an invoice to cover the cost of the inspection).

The state will allow up to 30 percent of the cleanest cars to bypass testing at an emission-inspection station. The program helps the state meet federal air pollution standards by also identifying vehicles emitting high levels of pollution so repairs can be made before the next inspection is due.

Still, overall, not enough is being invested at the state or federal levels to expand these real-world patrols.

The Environmental Protection Agency should establish a network of roadside devices that would monitor vehicles more methodically for abnormal emissions. This would help the agency better understand how cars and trucks are performing on the roads in all conditions.

In the worst cases, the data could provide the probable cause for focused investigations of particular models that are failing to meet emissions requirements. If necessary, any inquiry could be supplemented by the use of so-called portable emissions measurement systems (the vehicle-mounted "lab in a box" used by the investigators from West Virginia University who exposed the Volkswagen cheating).

Given the scope of the Volkswagen case, with more than 11 million cars involved, there are sure to be calls for laboratory emissions tests that can't be thwarted, and for improved vehicle computer systems.

But we shouldn't lose sight of what is really happening on the road — where vehicles actually pollute, and where they can be monitored without detecting that they are being tested. This is why we should significantly expand the use of remote sensing devices, a technology the cheaters can't cheat.

SPOKESPERSON BIOS

Lothar Geilen

CEO Opus Inspection

Education: Dipl.-Kfm. Ludwig Maximilians University, Munich, Germany (MBA equivalent)

Lothar Geilen is a business executive with extensive experience in managing technology companies in international markets. He has spent his entire career in the vehicle testing industry. In 1987 Lothar started his career as Managing Director for Sensors Europe in Düsseldorf, Germany. In 1997 he became President of Sensors, Inc. an automotive gas analysis manufacturer.

In 2000, he co-founded Systech International, a company specializing in managing vehicle inspection programs. In 2008, Systech was sold to Swedish Opus Group AB and later became Opus Inspection. As its CEO, Lothar has managed the company's growth from one to now over 1,000 employees, as well as its presence in many international markets.

In addition, Lothar is responsible for all vehicle inspection activities of Opus Group and is a major shareholder and board member of the publicly listed company.

Peter McClintock

Independent Consultant, Applied Analysis, Los Angeles, Calif.

Peter McClintock has been a consultant in the vehicle inspection and maintenance field since 1991 and has been actively involved with on-road remote sensing for more than 15 years. He was a contributor to the development of EPA remote sensing guidance documents, and has participated in federal advisory subcommittee workgroups on OBD and mobile source modeling.

He has authored or co-authored remote sensing studies and fleet surveys for many metropolitan areas in the United States, Canada and elsewhere around the world, and has presented at clean air and emissions workshops internationally. He is actively involved in monitoring the operation and performance of remote sensing and vehicle emissions in the Air Care Colorado and Air Check Virginia Programs.

McClintock earned a PhD in Engineering, from the Imperial College of Science and Technology, University of London.

About Opus Inspection

Opus Inspection is a multi-national company with over 1,300 employees dedicated exclusively to motor vehicle inspection.

Opus Inspection is a fully vertically integrated company with operations in 22 of the United States and several countries. Building on an unmatched record of success and customer satisfaction, Opus Inspection has become the industry leader in providing professionally managed solutions for centralized and decentralized I/M programs that apply leading edge technology to data management, safety and emissions testing equipment, on-road Remote Sensing, and wireless Remote OBD monitoring.