

Newark company creates novel device to cut tailpipe emissions and eliminate testing lines

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4.0 Analytics, a research and development company in NJIT's Enterprise Development Center (EDC), has developed a wireless emissions compliance and reporting technology for cars and trucks that alerts automobile owners in real time—on their own smart phone devices or computers—to engine and emission-system malfunctions that can lead to excessive tailpipe releases and poor performance.

By catching these problems early on, drivers should be able to substantially reduce emissions of pollutants, including [greenhouse gases](#) such as carbon dioxide (CO₂), while spending less on repairs, getting better mileage and prolonging the lives of their cars.

Bringing Transparency to the Heart of the Vehicle

The technology has been greeted enthusiastically by a host of partners in Newark, including NJIT, Rutgers University-Newark, Essex County College, Seton Hall Law School and New Community Corporation, among other non-profit institutions and corporations. A number of collaborators will begin testing it this month in public safety and maintenance vehicles, among others in their fleets.

They are taking part in the pilot demonstration by installing 4.0 Analytics technology, a small interface device that fits under the dashboard of their cars and trucks. The device captures [raw data](#) from the vehicle's engine and emission systems and transmits it in real-time to

cloud servers via secure cellular networks, where it is processed into actionable information with a proprietary software algorithm. Fleet managers and other users will then review results from their own accounts on 4.0's web-based platforms.

"It's almost impossible to manage something if you can't measure it," explains Mark Scotland, the company's CEO. "Bringing transparency to the heart of the vehicle—its engine and emissions system - and understanding its behavior is the key to preserving the life of a very expensive asset. We do this by extracting raw data and processing results for end-users. We make it easier for fleet operators and motorists to establish baseline behavior, set goals for improvement and measure results against goals."

Rutgers-Newark Backs 4.0 with Research Funds

Rutgers University-Newark is backing the pilot with \$70,000 from its Chancellor's Seed Grant Program.

"This is an opportunity to reduce emissions and greenhouse gases. While many people feel that's up to environmentalists and regulators, this technology allows individuals to play a part. We're beginning with what we can do locally—with Rutgers, NJIT and other Newark institutions," said Kevin Lyons, the principal investigator of the seed grant and program it funds, the Rutgers-Newark Green Zone 2020 EmCARS Initiative.

Lyons, an associate professor in Rutgers' Department of Supply Chain Management, will assist the company in identifying new markets and support the "Rutgers Green Zone" launch and expansion. "This is a rare chance to be involved at the R & D level—and to practice what we preach about sustainability," he added.

Two NJIT graduate students, Sandeep Raveeshbabu, who earned a master's degree in electrical engineering in 2015, and Krutarth Patel, who is currently pursuing a master's degree in computer science, helped develop the technology.

"We are thrilled that 4.0 Analytics, a rising star in our high technology and life sciences business center, was selected to receive this grant to demonstrate and refine its innovative technology," said Judith Sheft, associate vice president for technology development at NJIT. "Mark and his team are exemplary citizens of 21st century Newark, a city on the move with a growing population of future-focused entrepreneurs seeking to leverage the resources of New Jersey's largest city, with its rich set of academic partners and vibrant tech sector."

Sheft added, "This pilot program also aligns with our goal to make Newark a test-bed smart city. We look forward to working with 4.0 Analytics and the other partners on this project and others."

Taking Diagnostics out of the Test Bay and onto the Road

Robert Gjini, assistant vice president of facility systems for NJIT, has agreed to enroll several university vehicles in the pilot program while also supporting efforts such as reducing idle time (when a vehicle's engine is left on while in park), which wastes fuel, adds carbon emissions to the environment and shortens the life of some engine components. NJIT will help facilitate seminars and workshops on campus to apprise the university community and NJIT vendors about the dangers of vehicle emissions in urban communities.

Rutgers, which is interested in energy savings on its vehicles, will enroll pick-up trucks and vans in the pilot test, according to Patrick Harrity, the

director of grounds and fleet operations at Rutgers.

Gloria Cowart, the company's co-founder and operations director, said the demonstration "should show it is possible to reduce carbon emissions by 200,000 pounds for every 100 vehicles annually, while the timelier maintenance should also save drivers more than 10,000 gallons of gas."

The company contends its technology would measure performance more accurately by providing car owners with information not available from garage-based analytics.

"The complexities of the vehicle's on-board diagnostic system make it difficult to assess problems while it is in the repair bay and not on the road. Having access to historical data while the vehicle is operating on the road can more precisely determine problems for a technician," Scotland noted, adding, "These systems are also armed with anti-tamper mechanisms to prevent practices designed to subvert emissions-testing protocols. We designed our system so it cannot alter the federally mandated on-board computer system. We are able to see, evaluate and cross-reference data, and by doing so, we see anomalies that don't make sense."

The state conducts emissions tests to help reduce four pollutants related to vehicle combustion—hydrocarbons, nitrogen oxides, carbon monoxide and carbon dioxide. "A growing number of studies," Scotland noted, "conclusively show a correlation between urban areas with a high concentrations of vehicles and higher rates of upper respiratory conditions, heart diseases and cancer."

Proposing an Alternative to Manual Emissions Testing

New Jersey policymakers are now seeking ways to trim the cost of the program. The state's Motor Vehicle Commission (NJMVC), which runs it, and the state Department of Environmental Protection (NJDEP), which sets some policy parameters, have recently implemented measures such as eliminating pre-1996 vehicles from inspections and requiring cars that fail inspection to re-inspect them at private facilities, Scotland noted.

Through the Rutgers Green Zone project, 4.0 Analytics will present the state with a new, far-reaching option: phasing out manual emission testing entirely. The plan is designed to save the state millions annually in contractor fees to run the program and add additional revenue by converting to electronic testing. Motorists would be able to submit their emission compliance report each year from their mobile device, skipping a trip to the inspection facility.

"Our plan reduces costs for the state, is more convenient and less expensive for motorists, and would significantly reduce the carbon footprint. The technology exists today to begin this process," Scotland said. "According to state figures, we now spend about \$41 million a year to test the 88 percent of vehicles that pass inspection. We have shown how the technology can reduce the cost of the state's program by 70 to 90 percent. How is this possible? Begin by comparing the \$20.29 it now costs per test to that of an electronic transmission."

Federal guidelines are currently in place to allow state governments to transmit emission data remotely. Collaborators at Seton Hall Law School, one of the Green Zone partners, are researching New Jersey regulations to determine how to incorporate 4.0 Analytics' plan into the state program. "We're pleased to work on policies that may help the city of Newark and the State of New Jersey embrace cleaner energy technologies," said David Opderbeck, director of the Gibbons Institute of Law, Science & Technology at Seton Hall Law School.

Rodney Brutton, director of workforce development at the Newark-based New Community Corporation, said the new technology would give students in the non-profit's automotive training classes the chance to acquire valuable diagnostic and analytical skills.

"For us, this shows the diversity of jobs in the auto repair industry. The ability to focus on front-end analytics gives our students yet another career path," Brutton said. "So participating was a natural fit for us."

Provided by New Jersey Institute of Technology

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