LA-UR-16-27338
Approved for public release; distribution is unlimited.

Title:	September 2016 Advisory Council Update
Author(s):	Larkin, Ariana Kayla
Intended for:	NMSBA Advisory Council Newsletter
Issued:	2016-09-26

NMSBA
Los Alamos National Laboratory
Sandia National Laboratories
Solving New Mexico's Small Business Challenges

The Electrochemical Based Gas Analyzer for Automotive Diagnostic

The Electrochemical Based Gas Analyzer for Automotive Diagnostic NMSBA leveraged project is made up of Albuquerque companies, Automotive Test Solutions, Inc. (ATS), ATS Mobile Diagnostics and Thoma Technologies and Los Alamos small business, VI Control Systems, to develop a new sensor system for the automotive industry.

The companies were paired with Los Alamos National Laboratory (Los Alamos) principal investigator (PI) Eric Brosha and his technical team of Cortney Kreller, Rangachary Mukundan, and student John Ryter to answer the technical challenge the companies are facing.

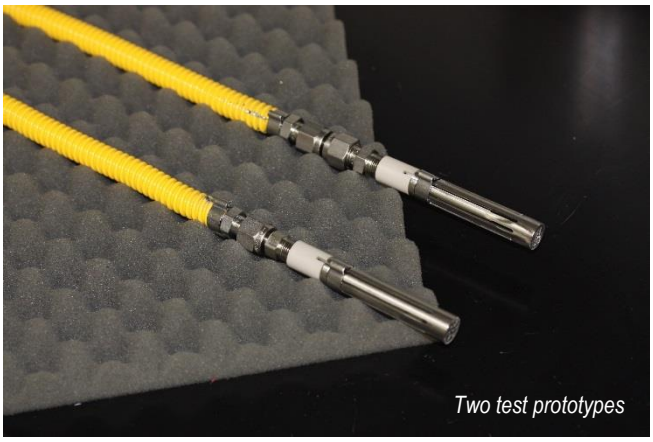
The Los Alamos staff is using sensor technology developed at the Laboratory to measure exhaust gases at the vehicle's tailpipe outlet with minimum time delay. This electrochemical based sensing element eliminates the need to pump gases from the vehicle's tailpipe into the sample cell for analysis and instead enables analysis of gases directly within the exhaust pipe.

The primary technical challenge the team has faced during the project is determining an advanced packaging method to deliver the sensor safely to the desired location within the exhaust pipe. The advanced packaging consists of developing a fixture to hold the sensor in place and protect the sensor from the environment conditions within the exhaust pipe. This will permit the necessary *in-situ* testing of the technology that will be required in order to move forward with development.

Los Alamos student John Ryter developed a test prototype for the sensor during his 2016 summer internship. Due to his contributions the team is using the two packaged sensors to measure exhaust output onsite.

Testing at ATS facility

An unforeseen benefit of the collaboration between Los Alamos and the companies was a new type of sensor control circuit board designed by ATS, which boasted additional functionality over other sensor control circuit boards currently being used within the Los Alamos team's lab. These ATS sensor control circuit boards with a new software interface allow for temperature control of the sensor. It became clear to the Los Alamos team that the improved sensor control system could support other Los Alamos projects. The team is interested in purchasing the sensor control systems once they are a commercial product.



Two test prototypes

Next steps planned for is to further prepare the sensor technology for release commercially. These include:

- Establishing and improving the sensor's response time for measurements
- Determining the recovery time of the sensor
- Moving the detection capabilities from qualitative to quantitative so measurements can be easily characterized
- Increasing the stability and durability of the sensor in order to survive everyday usage
- Integrating multiple sensors to make the system and measurements more robust for detection and analysis

The companies and Los Alamos team plan to continue working together and are planning to apply for the DOE Energy Efficiency and Renewable Energy Office's Small Business Voucher Pilot Program.

Sandia National Laboratories

Los Alamos NATIONAL LABORATORY EST.1943

NMSBA
Los Alamos National Laboratory
Sandia National Laboratories
Solving New Mexico's Small Business Challenges

Maximizing the Production of High Value and High Demand Guar Gum on Marginal Lands in New Mexico

The Guar Gum NMSBA Leveraged Project began in January 2016 with the goal to develop biotechnology to enable a genetic modification of prairie cordgrass, a renewable feedstock for bioenergy and bio-manufacturing. In the long term, the companies hope to use the technology to bio-manufacture high value products in the stem of the plant.

The five industrial partners on the project, Spartina Biotechnologies, LLC and Eldorado Biofuels, LLC, of Santa Fe County, Mountain Vector Energy, LLC, of Sandoval County, Pitchfork Ranch, LLC, of Lea County, and Yates Industries, LLC, of Eddy County asked Los Alamos principal investigator Shawn Starkenburg (Bioscience Division) to assist with profiling gene expression patterns in prairie cordgrass. This work involves analyzing large and complex data sets requiring specialized bioinformatics skills.

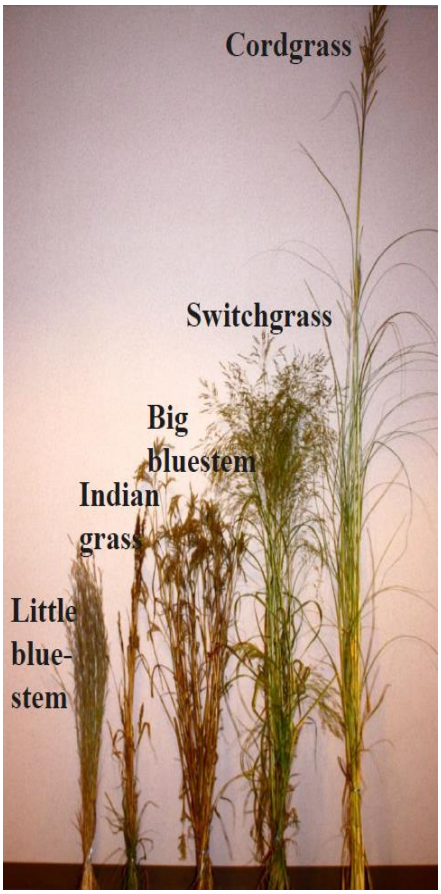
The primary technical challenge for the industrial partners is genetically modifying prairie cordgrass to produce guar gum, a food additive made naturally in the guar plant. This type of genetic modification requires a genome sequence and knowledge of key genetic elements required to express new products in specific parts of the plant. Unfortunately, the prairie cordgrass genome has never been sequenced, and the genetic elements required to express products in the stem have not been identified.

Prairie Grass

Los Alamos has worked on:

- Generating a draft genome sequence of prairie cordgrass using state of art sequencing technology
- Collecting and sequencing RNA from specific plant tissues (stem, roots, leaves)
- Mapping the RNA to the draft genome sequence to identify the genetic elements that are unique to each tissue type

There is one final step to go before the conclusion of the project which entails inserting the unique genetic elements in a genetic reporter system to test if a transgene can be expressed in the stem of prairie cordgrass. Starkenburg plans on testing and delivering the expression vectors designed to express transgenes in the prairie grass by the end of 2016.



Sandia National Laboratories

Los Alamos NATIONAL LABORATORY EST.1943