

## Driving Transportation Infrastructure Improvement with NI LabVIEW

"LabVIEW enabled us to deliver a complete solution that met all the needs of the [Minnesota Department of Transportation's MnROAD Test Facility](#) without compromising the limited project timeline or budget."

—Mark Ridgley, [Radius Teknologies, LLC](#)

### Industry:

Transportation Infrastructure

### Application:

Pavement design, construction and maintenance

### The Challenge:

Porting an existing software application to run on the CompactDAQ hardware platform and implementing several new features to make the user interface more intuitive and easier to use.

### The Solution:

Developing the MnROAD Data Collection System application to support research, data collection and analysis in support of pavement design, construction and maintenance.

### Author(s):

Mark Ridgley, [Radius Teknologies, LLC](#)

### Understanding MnROAD and Pavement Research

Road Research is part of MnDOT's Office of Materials and Road Research. This research helps advance the state of the practice of pavement design, construction and maintenance by conducting and participating in pavement and materials research projects, implementation of research results, and supporting practitioners.

MnROAD is a pavement test track made up of various research materials and pavements owned and operated by the Minnesota Department of Transportation, working with its partners. Located near Albertville, Minnesota, MnROAD works in conjunction with MnDOT's Materials Lab. It finds ways to make roads last longer, perform better, cost less to build and maintain, be built faster and have minimal impact on the environment.



*Figure 1 - The MnROAD test track*

The MnROAD test track was initially constructed between 1991-1993 and is one of the most sophisticated, independently operated pavement test facilities of its type in the world.

MnROAD has over 50 unique test sections on the following two roadway segments:

- 3.5 mile (I-94) Mainline
- 3.5 mile (I-94) Original Westbound
- 2.5 mile Low Volume Road

MnROAD collects detailed pavement performance data using thousands of pavement sensors embedded in each test section.

## Company Background

Radius Teknologies, LLC is an NI Alliance Partner and independent LabVIEW consulting company founded in 2013. We are dedicated to helping companies be successful using NI hardware and software to design, develop, and implement creative, versatile, and sustainable solutions to complex technical challenges in measurement, automation, and control. We have experience designing, developing, and implementing test systems based on NI hardware and software for the academic, consumer, medical, automotive, industrial, and mil/aero markets.

## MnROAD Data Collection System application

The MnROAD Data Collection System application is used to support research leading to advances in pavement design, construction and maintenance. The application connects to multiple sensors embedded in each test section



Figure 2 - Using the MnROAD Data Collection System application

of the test track. Load test measurements may include stress, strain, displacement, pore water pressure, and accelerometer data.

The test vehicle is a semi truck towing a flatbed trailer carrying an 80,000 pound load. As the test vehicle approaches a configurable distance from the test section, a transponder onboard the test vehicle triggers the system to begin monitoring sensors in the test section so data can be collected as the test vehicle passes. Acquired data consists of measurements obtained as each axle passes over the sensors embedded in the test section. The acquired data is subsequently analyzed to quantify the pavement structure response to environmental change and/or dynamic loading.

## A Flexible, Complete Solution with LabVIEW

Radius Teknologies, LLC has many years of experience developing applications based on LabVIEW. As an NI Alliance Partner, we are strong advocates of the LabVIEW software development environment.

Using the LabVIEW software development environment, we worked with the customer in the lab and in the field to design, develop, implement and deliver a flexible, portable and complete system.

LabVIEW made it easier and faster to produce the intuitive and unobtrusive GUI that this customer required. We were able to quickly prototype and refine the GUIs to acquire the necessary data while “not getting in the way” of the system operator. We refactored the user interface by employing GUI design best practices and updated it to better support operation via a touch panel as required by the customer.



Figure 3 – Original User Interface

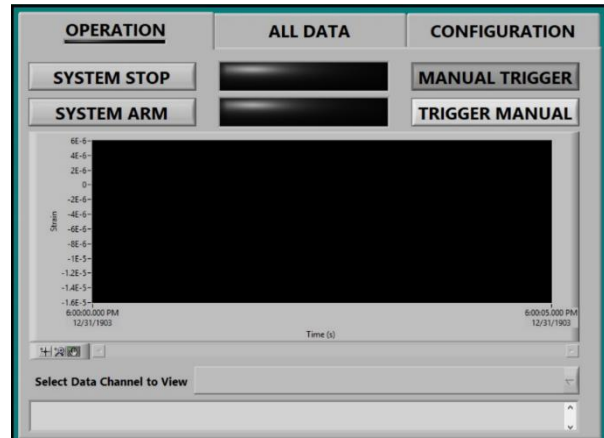


Figure 4 – Refactored User Interface

Finally, because LabVIEW supports a wide range of equipment and OSs, we were able to use the customer's existing equipment and computer systems to implement the MnROAD Data Collection System application. LabVIEW enabled us to deliver a complete solution that met all of the customer's needs without compromising the limited project timeline or budget.

### Conclusion

LabVIEW's flexibility and adaptability enabled Radius Teknologies, LLC to design, develop, and deploy a versatile, intuitive, and easy-to-use solution on time and within budget. Our customer is using the MnROAD Data Collection System application successfully, without experiencing any problems or unexpected behavior. LabVIEW was instrumental to this success.



*Figure 5 - Configuring the sensors*



*Figure 6 - Acquiring data*

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### Next Steps

[Contact Radius Teknologies, LLC](#) today to see how we can help with your next project!

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