

The Statewide Committee for Research honors Alaska's

# Northern Innovators



## Brian Shumaker

*Northern Innovators Hall of Fame Member*

Scientists define permafrost as any material that has remained frozen through the heat of at least two summers. In northern Alaska, ground that meets that definition can be thousands of feet thick. Every summer, though, the ground thaws near the surface, and often quite deep, creating a challenge for engineers designing oil-pumping stations, living quarters and many other structures in the far north.

If permafrost was really permanent, engineers would build upon it as if they were working with bedrock. With the Arctic now warming faster than any region on Earth, enduring northern construction is more challenging than ever.

The best tool for building foundations on permafrost landscapes is detailed knowledge of changing ground temperatures. Brian Shumaker invented a system that gives engineers and scientists detailed temperature readings of arctic installations from anywhere in the world.

In developing his company BeadedStream LLC, Shumaker saw a more dependable and durable way to measure a series of ground temperatures. He received a patent for his Multipoint Digital Temperature Acquisition System in 2010.

His device is a cable with a string of temperature sensors spaced at intervals selected by the client. Examples are buried

beneath many large buildings on permafrost. New examples are the Deadhorse Aviation Center near Prudhoe Bay, the Arctic Slope Regional Corporation North Slope Facility and the North Slope Borough's SA-10 Water and Wastewater Treatment Facility in Barrow. When coupled with a BeadedStream remote data logger, people with an internet connection can monitor the solidity of the ground upon which foundations are standing.

While working as a permafrost engineer, Shumaker for years worked with temperature-sensor strings that relied on thermistors that each required its own dedicated cable. Those cable bundles were heavy and inflexible and often cracked at cold temperatures. Their dependability was spotty, often forcing engineers to interpolate using just a few working data points.

Shumaker's development has allowed reliable, web-enabled continuous access to ground temperature data beneath structures. Using the older system, technicians needed to visit a site and download data into a laptop — not an appealing job in the cold and blowing snow. Shumaker automated the relay of data and uploads to the web, and his colleagues appreciate it.

“While we had instrumentation suitable for ground temperature measurements at that time, Brian's vision for obtaining temperature and climatic data with increased reliability

at lower cost was always on the forefront of our needs list as cold regions engineers,” said Richard Mitchells of Anchorage.

“During the analog collection days, we were lucky to receive a single data set for any particular site. This made our engineering effort for foundation design on permafrost and seasonally frozen soils difficult,” said Mike Hendee of Alyeska Pipeline Service Co. “Now, with digital technology, reliable data loggers and internet uploading capabilities, engineers around the world can see ground temperature data in real time. We can now monitor the performance of our designs and instill engineering modifications prior to malfunctions.”

“At a conference in Quebec last year, I was able to show a fellow engineer real time and stored freezeback data from below a building on the North Slope on my smartphone,” said Ed Yarmak, president of Arctic Foundations, Inc.

Environmental monitors for the state of Alaska are also using the system to monitor temperatures of the tundra landscape. It allows earlier vehicle access to the tundra by precise measurements of when the delicate surface has frozen up. In springtime, the system acts as an early warning system for tundra thawing. Shumaker's system has maximized industry access to remote sites via tundra travel while at the same time preserving the tundra.