

# Northern Innovators



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 loggers and internet uploading capabilities,

engineers around the world can see ground temperature data in real time. We can now monitor the performance of the temperatures of the tundra landscape.

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