

The real deal: Testing the authenticity of vaccines thanks to IoT



- **Business needs** - Faster, easier ways to test the purity and authenticity of vaccines and other fluids.
- **Networking solution** - Equipping hand-held, micro-nuclear magnetic resonance devices with AT&T Global SIM cards facilitates data collection and transmission in near-real time.
- **Business value** - Global connectivity supports better healthcare and helps prevent catastrophic equipment failure.
- **Industry focus** - Medical and industrial detection
- **Size** - Startup

About WaveGuide Corporation

WaveGuide is a privately held analytical instrument company focused on developing its portable micro-nuclear magnetic resonance (μ NMR) platform technology. The WaveGuide FormuLa™ combines proprietary time domain NMR methods and diagnostic techniques. This allows diagnosis and analysis, including in remote settings, to reduce costs and improve responsiveness to critical patient and customer needs. Its customers include biopharmaceutical manufacturers, hydrocarbon processing and refining plants, and biotechnology companies.

The situation

Substandard and falsified medicines can be a public health challenge, especially in developing countries. The onset of the COVID-19 pandemic created opportunities for the unscrupulous to sell counterfeit, improperly stored, or out-of-date vaccines. WaveGuide wanted to enable medical professionals to test the purity, authenticity and viability of vaccines and medicines and share their test results quickly to help contain COVID and other infectious diseases. It also wanted to help heavy equipment manufacturers and users test industrial lubricants to keep equipment working well.

Solution

AT&T Global SIM cards and the AT&T Control Center enable WaveGuide's innovative NMR devices. With AT&T wireless connectivity, WaveGuide's device can deliver quick analyses of vaccines and other fluids, even in remote parts of the world. The AT&T Control Center enables WaveGuide to deploy and manage its devices and send reports in near-real time, helping to recognize, report, and stop the use of counterfeit or adulterated vaccines. The devices can also be used to test industrial lubricants and fuels to prevent potentially catastrophic equipment failure.

Technology delivers low cost, rapid analysis

WaveGuide Corporation uses nuclear magnetic resonance (NMR) technology to enable industry and healthcare professionals to quantify the purity, viability, and authenticity of materials—everything from medications to airplane lubricants and even cooking oil.

NMR technology has long been used to analyze and identify materials and to enable physicians to distinguish between normal and cancerous tissue. NMR spectrometers are large, expensive machines, ranging in price from hundreds of thousands to millions of dollars. Due to cost, the machines have been available only at first-world hospitals, universities, and large corporations.

For years, researchers have imagined what could be accomplished if the spectrometers could be made portable and less expensive. WaveGuide Corporation is

commercializing a portable, affordable handheld NMR device, based on technology developed by Ph.D. researchers at Harvard University. The portable WaveGuide Formula has been a game changer for healthcare and industry. The small device is about the size of a tablet computer, making it handheld and fully portable, battery operated and easy to use anywhere especially by non-scientists.

Verifying vaccine authenticity

Healthcare practitioners have long been concerned about substandard and falsified medicines, which can be a problem in developing countries where accessing authentic medicines can be difficult. Nelson K. Stacks, WaveGuide's President and CEO, says the global focus on developing an effective COVID vaccine highlighted the need for better quality-control tools for the pharmaceutical industry.

WaveGuide set out to make it easier for medical professionals to verify the purity, authenticity, and viability of vaccines and other medications. "Let's say a patient who is being infused with a cancer drug is not getting better," Stacks said. "We need to know if that means the cancer is growing, or if it's because the patient is not receiving the real cancer medicine. Substandard and falsified drugs have been and continue to be a major problem in many parts of the world."

The WaveGuide Formula device lets healthcare workers, even those in remote locations, ensure that the medicines they're using are authentic. It also lets them know that the medicine has not lost its potency because it is past its use-by date or has been improperly stored.

Before shipping a device to a client, WaveGuide tests significant quantities of a client's product under various conditions to test for temperature, humidity, and other environmental variables to determine the product's specific signature. "We need to know what the signature looks like across a wide range of conditions," Stacks said. Then when clients test their product, the WaveGuide device matches the sample with the library of fingerprints it has developed to determine if it's acceptable for use.

Addressing small problems to prevent catastrophic failure

The value of WaveGuide technology isn't limited to pharmaceutical use cases. Major manufacturers and airlines have called on WaveGuide to help them ensure that the lubricants, fuel, and other fluids they use are what they are supposed to be.

"Airlines see the benefits of WaveGuide to learn whether a lubricant is past its life expectancy or has picked up contaminants, and is authentic to begin with," Stacks said. WaveGuide technology can also detect minuscule amounts of metals in the fluids of planes or trucks to learn if vehicle parts are shearing.

"We can tell them that a cam shaft or bearings are wearing out, and they can replace it before they experience a catastrophic failure," Stacks noted. "If they take care of a problem early, it can be a very small repair instead of replacing a whole engine."

Airlines and other businesses that rely on heavy equipment can use WaveGuide technology to test the purity of fuel and other fluids. This isn't as much of a problem in the U.S., but many companies have to

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President and CEO,
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refuel their equipment when it's in Russia, China, and other places where the products may be substandard, and they have less control over suppliers. "The ability to test fuels gives them a lot more confidence that the airplane or truck is going to function the way it's supposed to," Stacks said.

Validation with our customers

WaveGuide's groundbreaking technology required a provider with worldwide reach to connect its Formula NMR devices. Stacks chose AT&T Business in WaveGuide's earliest days and has remained a dedicated customer. "We trust AT&T Business. We've had a relationship with AT&T from the beginning because we trust the network. The relationship is very important to us."

"AT&T is a brand that registers around the world, and it gave us validation with our customers and investors," Stacks said. "It lets people know that we have a significant technology that's going to improve the value of people's lives in a meaningful way."

Stacks said he also was attracted to AT&T Business because of its commitment to use the Internet of Things (IoT) to reduce its carbon footprint, eliminate food and water waste, and help make the world safer and healthier. “There are other connectivity vendors out there,” he said. “But what made AT&T Business stand out to us was certainly its global reach and mission to use IoT for good.”

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Like AT&T Business, WaveGuide wants to make a difference in the world. “None of us are nonprofits; we want to make money,” Stacks said. “But at WaveGuide we also want to do good in the world and help people. AT&T’s IoT for Good program and its work in healthcare were important to us. It was good to find someone that understands our business.”

Confidence in the data

The AT&T Global SIM card gives WaveGuide’s Formula devices the power to instantly transmit results to the company’s research facilities half a world away. In addition, the AT&T Control Center enables WaveGuide to activate, deploy, and manage its connected devices around the world in near-real time. That makes it easy for the company to monitor use and change rate plans when necessary.

“The AT&T network is critical for us. We use it to upload data via the cloud and do around-the-clock data analytics, looking for trends,” Stacks said. Network reliability is a critical component of the devices’ success. “We’ve never had a hiccup.”

Stacks finds the AT&T Control Center portal easy to use. “It’s great. We’re able to get information in real time and see what’s going on anywhere the devices are being used.” That reliability has enabled WaveGuide to send its devices to a large client with operations in the Middle East, Asia, and North and South America. “It’s all under one umbrella. AT&T Business covers everything,” he said.

Whenever tests are run, WaveGuide staff and approved customer users are able to go to the portal, log in, and see the results. “It’s the ability to get instant validation—the ability to give customers the confidence that everything is working as it should be.”

“The devices all use the AT&T SIM cards, so they can connect either by cellular or Wi-Fi,” he said. “No matter where our devices are being deployed, as long as it’s an AT&T network, we have confidence that the data coming back is good and secure.”

Rowing in the same direction

The AT&T account team working with WaveGuide was extremely helpful. “They bought into our vision,” Stacks said. “It felt like a partnership to work with someone that is rowing in the same direction as us. And our account lead helped us navigate AT&T Business. It’s a large organization, and he made it easy and a wonderful experience.”

The deployment was smooth, delivering connectivity even to remote parts of the world. “We crossed our fingers when WaveGuide Formula was being tested in Asia, but we got data back within seconds,” Stacks said. “AT&T Business gives us the confidence to deploy internationally in markets that would probably have been much more difficult for us to gain acceptance in without the AT&T network.”

Stacks said WaveGuide realizes significant benefits from the expertise of its AT&T account team and their colleagues. “Whenever I call with an issue or a question, our account rep immediately adds three people to the call to make sure we get the right answers. We have AT&T Business experts introducing us to additional experts to overwhelm us with data, which is great. It’s exactly where we want to be.”

“AT&T knows the business. When they bring in additional experts, we know we’re really in the right hands, so we feel great,” he added.

The future of healthcare

WaveGuide plans to expand the use of its devices to diagnose diseases such as tuberculosis and cancer. Even though TB is not a major concern in the United States, it is one of the deadliest infectious diseases in the world. “The disease is curable, and its spread can be prevented—if it is caught early enough and treatment is started,” Stacks said.

Stacks views medical advancements like WaveGuide’s handheld Formula device as the future of healthcare in the digital age. “We see it as better, faster, cheaper,” he said. “Delivering healthcare that’s less expensive is great for the patient, as is getting them a quicker diagnosis. If we can bring the test to the patient rather than having patients travel to a Tier 1 hospital, we’re really able to treat the disease earlier and have a much better chance of curing the patient and stop or significantly reduce the spread of deadly infections.”

As the company begins clinical trials to gain approval to use its μ NMR device for medical use in the United States and overseas, WaveGuide is working to be able to detect ovarian cancer. “The Stage 1 five-year survival rate is 85%, but, unfortunately, many women present in stage 3 or 4,” Stacks noted. “We hope to be able to detect cancer earlier and save lives.” There are also plans to detect other cancers, he said. “There are so many possibilities with this technology—there are a lot of diseases we hope to detect and prevent. We’re looking forward to a rosy future.”