

The Niton Apollo: Thermo Fisher Scientific's portable LIBS handheld analyzer

Thermo Fisher Scientific has provided innovative solutions for industrial applications for many decades. Their industry leading technology is designed to maximize their customers' protection and productivity by helping them achieve lab quality results in even the toughest environments.

Stainless Steel World Americas had the opportunity to speak with Brian Dalton, LIBS Product Manager for Thermo Fisher Scientific, about the new Niton Apollo LIBS handheld analyzer and how it increases efficiency, productivity, and safety for all users in any industry.

By Brittani Schroeder



Thermo Fisher Scientific Inc. (NYSE: TMO) is the world leader in serving science, with annual revenue exceeding USD \$30 billion. The company's mission is to enable their customers to make the world healthier, cleaner and safer. Whether their customers are accelerating life sciences research, solving complex analytical challenges, improving patient diagnostics and therapies, or increasing productivity in their laboratories, Thermo Fisher Scientific is there to support them.

The company's global team of more than 80,000 colleagues delivers an unrivaled combination of innovative technologies, purchasing convenience and pharmaceutical services through their industry-leading brands, including Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific, Unity Lab Services and Patheon.

Thermo Scientific is dedicated to increasing confidence within their users through superior technology like X-ray Fluorescence Spectroscopy (XRF), Laser Induced Breakdown Spectroscopy (LIBS), and radiation detection. Thermo Scientific analyzers make it effortless to conquer the toughest analytical challenges, allowing users to become leaders in their industries.

Ensuring positive material identification with the LIBS handheld analyzer

One of Thermo Fisher's newest product releases is the Niton Apollo, which is a handheld, laser-induced breakdown spectroscopy (LIBS) metals analyzer. "In a

range of industries across the globe, especially in the oil and gas industry, being able to identify a material type is mission critical, and this is the key factor that drove the building and evolution of the LIBS product," explains Dalton.

There is a single element that can have a drastic impact on the overall characteristics of a material, and that element is carbon. Dalton continues, "The existence of carbon in a metal can affect its weldability, or its wear properties. When you put a piece of metal in a refinery and you have the expectation that it will last for a certain number of months or years, you must be sure the chemical composition of that material is precise and accurate."

To successfully perform necessary repairs and to replace damaged materials, refineries and other industrial plants have scheduled shutdowns, which are determined by a very specific timetable. To replace those materials, customers must bring in materials of the exact same type and chemical composition. "If the material type is matched incorrectly, the product could weld incorrectly, which creates a failure point, or it could wear out sooner than they expected, which will also lead to failure. If a failure is imminent, while there are many

situations that can arise, the most important factor to consider would be the potential loss of life. This is why companies need to have a robust positive material identification (PMI) program in place."

The Niton Apollo LIBS handheld analyzer is used specifically to identify a material type before it goes into a process, whether it is during the manufacturing

process or in the actual downstream process of oil and gas. "Our customers need to be able to verify exactly what the material type is. This is usually a difficult task because there are over 50,000 different types of metals in the world, and when you are looking at these very similar types of metals, separating them can be quite complex. Using a very high-tech system, like the Niton Apollo that breaks down the chemistry, can determine the exact material, which is ideal."

The Niton Apollo LIBS handheld analyzer complements a technology Thermo Fisher Scientific has been selling for over 15 years, called X-ray Fluorescence (XRF). This addition has allowed Niton Apollo to round out their product portfolio for their customers.

Making LIBS technology portable

The technology behind the LIBS analyzer has been used before, but in a benchtop configuration. "A counterpart technology to LIBS, called the optical emissions

" You cannot sacrifice the people-aspect of the process. We needed to put the people first – productivity and results second."**"**

spectroscopy (OES), is offered as a system, but weighs over 80 pounds, which could be considered 'luggable', not 'portable,'" says Dalton. In the past, when a particular location was only rope accessible, there would be a person dangling in a harness on a rope attempting a material reading, and the 80-pound system would need to be elevated somehow. If there was no scaffolding



present to help elevate the system, such as in an off-shore setting, it would be lifted and left hovering in the air by a helicopter above the person taking a reading.

Dalton continues, "The evolution from an 80-pound luggable device to a 6-pound handheld analyzer is akin to the evolution of the cell phone. We started out with these huge phones that were almost the size of a human head, and now we have smartphones that fit in the palm of our hands. The LIBS analyzer went through less iterations to get to where we are now, but it is the same idea."

The new Niton Apollo is a 6-pound handheld device capable of giving customers a lot more flexibility and higher productivity. Dalton explains, "Typically, as a system grows it becomes more complicated, more expensive, and requires more maintenance. The same can be said for the OES, which is a bigger system altogether. They take longer to calibrate, up to 40 minutes just to reach the proper temperature and to stabilize, and take more training to be able to use. In contrast, the Niton Apollo can be taken out of the box and running in five minutes or less."

A user-friendly system built for productivity

Another form of PMI testing comes from a laboratory or outside testing company. "If using a lab to test your material, you would need to send a sample off to the lab and have to wait around a week to get the results, which slows down the process. For a lot of companies, time is critical, so this is not always the best option. The alternative is to hire an outside company to come in and use equipment like this, but the costs would become prohibitive at a certain point," relays Dalton.

By owning the Niton Apollo, customers can bring the PMI testing in-house and are able to get quick results on the spot. "We gave the LIBS handheld analyzer a fixed-shot analysis time, which means all of their results are displayed in an 11-second analysis window. This is quite a bit faster than the alternative methods that were available before," says Dalton. "In contrast, with the OES system, when the gun is aimed at the material, the screen that shows the results is on the main piece of the unit, which could be 50 feet away. If you are doing the work via rope access, you could not get back up to see the results fast enough. This is why it was so important to have a very clean, easy-to-use interface directly on the handheld device."

Lab-quality results

The Niton Apollo LIBS handheld analyzer was in the research and development stages for five years. "Compared to some of our other products that have been released to the market, that is a very long research and development period, but we needed the time to get it right. This technology is extremely difficult to harness, and the proof is that Thermo Fisher Scientific is one of only two companies in the world that can do it," says Dalton. "The levels we have to measure down to is 150 parts per million (0.015%), which is an extremely small quantity. For example, to separate it from another material that has 300 parts per million, there is a critical difference that is extremely difficult to repeatedly do correctly. Repeatability is important for a product like this, and that is why we spent so long developing the analyzer."

'Getting it right' also meant that the Niton Apollo needed to be able to provide lab-quality results. "If we brought out this new handheld analyzer, it weighed 2 pounds and it took one second to analyze, it could be



considered the best product in the world, but if the results do not match up to what a lab would give you, it is worthless to a customer," says Dalton. "During our product demonstrations, we take certified reference material pieces of metal that we had lab-vetted, and we then analyze the same sample with the Niton Apollo and show how closely it matches the lab results. In this way, we prove that we can provide lab-quality results, without having to send it out to a lab and wait a week for the results."

Safety first

The Niton Apollo was created with the purpose of function, but then Thermo Fisher also engineered it around a strict safety layer.

The LIBS handheld analyzer features a class 3B laser. "We made sure to have robust redundant safety interlocks on the analyzer; without those safety interlocks, if you were within the nominal ocular hazardous distance, serious eye or skin damage could occur," explains Dalton. "Thermo Fisher Scientific is dedicated to making the world a safer, cleaner place, and that is where our safety interlocks come in."

One of these interlocks make sure that no one can engage the laser unless it is fully sealed onto a metal. The area is purged with argon gas during the analysis, and that means it is also measuring the pressure – if the pressure breaks, the Niton Apollo shuts off the laser. This would happen if the device was rotated while flush to the sample, therefore breaking the pressure. In addition, if light floods into the chamber the laser will be shut off. Dalton contin-

ues, "We also do a spectral, which basically means if you are analyzing something, within the first half a millisecond the device would tell you if the material was a metal base – if it is not a metal base, the laser will turn off immediately."

Battery life made easy

When developing the Niton Apollo LIBS handheld analyzer, Thermo Fisher Scientific partnered with Milwaukee for batteries to power the device. "We decided early on that we would not create a proprietary battery for the device to run on. This decision goes back to our people-first vision. If we used our own battery for the device and a customer's battery died, they would have to wait for our company to ship out another battery before they continued their work. By using a Milwaukee battery, users can go out to their local hardware store, get a battery, and keep on running," explains Dalton.

In the case of a battery running out while performing an analysis, a large capacitor inside the device holds onto the power long enough that a new battery can be swapped in. He continues, "We call this 'hot-swappable', and it means the customer does not have to power down, swap the battery, and start the process all over again. This brings up the user's productivity, significantly."

Looking at 2021 and beyond

Everything Thermo Fisher Scientific does is guided by their mission: to enable their customers to make the world healthier, cleaner and safer. "The nature of our business is to enable growth and innovation within the global scientific community and to help researchers, organizations, and companies solve some of the world's most pressing issues. We are excited to continue bringing the best product offerings to our customers to better suit their urgent needs," concludes Dalton.

