



CAT™ Dealer Improves Workflow Thanks to PerkinElmer's LPC 500 Liquid Particle Counter

The Nation's Oldest Caterpillar Dealers

Yancey™ Bros. Co. is the "nation's oldest Caterpillar dealer" and is proud to call Georgia home since 1914. The company sells and rents new and used Caterpillar equipment, engines, and power systems. Throughout generations, Yancey Brothers continues to expand its operations and venture into new growth opportunities by learning more about its customers and offering equipment and support to keep up with their changing needs. Lab Manager Robert Broaddus has been instrumental in helping the business acquire new technologies to help their customers succeed.

Robert Broaddus began his laboratory career in 1980 as a Data Analyst with Analysts, Inc., specializing in aviation. In the span of four decades, he has served in many different capacities as it relates to oil analysis within a vast array of industries and markets including industrial, manufacturing, chemical, petrochemical, and power generation. His extensive lubricant testing background includes wear particle analysis in fuel, oil, coolant, and grease.

During his tenure at Yancey CAT, he expanded his role by creating new programs such as their in-house coolant and fuel testing and management program, while implementing applications, and analyses to help support the Yancey business.

According to Broaddus, the three main objectives for lubricants testing are accuracy of test results, rapid turn-around time, and cost control. Automatic particle counting or (APC) technology, up until now, has not kept pace especially in terms of automation. Current APC's are standalone instruments where the process to perform an analysis on several hundred samples is very labor intensive. This article demonstrates PerkinElmer's integrated solution for particle count and elemental analysis of in-service lubricants in a single run. This solution is a game changer for this kind of laboratory.

An Impractical Method

Broaddus explains that all existing particle analysis techniques are labor intensive. Biggest problem with many particle counters is inconsistent or high counts, as much as +/- 3 ISO codes often due to sample viscosity and opaqueness. Manually diluting several hundred samples in a rapid production lab was simply put, impractical.

"I've worked with several types of particle counters, most of which showed extremely high particle count readings in the >20, >40, and even >70 micron ranges. Many analysts believe trending particles in these size ranges may be indicative of severe wear particles. I've performed gravimetric analysis on many occasions to confirm the presence of larger particles (morphology) using a 0.8-5.0 micron filter patch using up to 100 mL of fluid and then examined under a microscope. For most samples, I did not see any larger particles (hard or soft) or nothing near the counts from the APCs (automated particle counters)."

These methods showed promise for Broaddus's team, but were not a practical approach to be able to provide the throughput needed (several hundreds of samples per day) in a rapid high-productivity oil analysis lab.

Without sacrificing their reputation for high quality and dependable analyses, the company embraced innovation and adopted a more practical approach to particle testing.

PerkinElmer Provides a Solution

"I didn't have a lot of faith in particle counting instruments or the results". Until recently particle counting instruments all required a technician to prep sample, load, and watch it run on every single sample. "That right there is a full-time job for almost two technicians. I ended up having to resubmit those samples because the results were imprecise, and the reading was too high. I ran a gravimetric analysis to do a visual analysis and I didn't see any of the particles."

Broaddus first heard of PerkinElmer's particle counter through his long-standing relationship with his local sales representative and was able to learn more about it at the annual CAT Dealer conference. "When I came across them at the conference I thought: Here is a rapid means of running these samples. It dilutes them and runs them for you." In no time, Broaddus and our PerkinElmer sales rep were in the lab running samples and testing the instrument's automation capabilities. "I liked what I was seeing".

The LPC 500™ Liquid Particle Counter is a single particle optical sizing (SPOS) platform designed to count and size particles with high resolution. Two components, an optical sensor and a multi-channel pulse analyzer, comprise the system. As lubricants pass through the cell of the optical sensor, particles are detected. The detector in the optical sensor sends pulses to the multi-channel pulse analyzer, which converts the pulses into particle counts for selected particle size channels.

For both configurations, the Teledyne CETAC Oils 7400 Stirring Autosampler combined with the Teledyne CETAC Particle Xpress completely homogenizes and transport diluted samples first, through the optical sensor, and then into the PerkinElmer ICP-OES system.

Complete analysis for both the LPC 500 Liquid Particle Counter and the PerkinElmer ICP-OES occurs at a rate of 45 seconds per sample. Less than 1 mL of lubricant is required for each sample analysis.

According to Bob Broaddus, "Repeatability improved with +/- 1-ISO range. Samples with high suspended water levels did not saturate the sensor. Transparency and viscosity are negated by the dilution. Auto-dilution and auto-sampling frees up my technicians to perform other tasks, not to mention eliminating any human inconsistency in processing samples manually." The LPC 500 Liquid Particle Counter provides sample throughput of approximately 45 seconds per sample, with less than 1 mL of sample used for diluted sample preparation by OilPrep™ or OilExpress™.

Currently, Broaddus' lab has an Optima® 7300 ICP-OES hyphenated to his new LPC-500 system. He also has a PerkinElmer Clarus® GC for fuel dilution analysis. They most recently purchased the OilExpress4 with sample dilution capability. The system dilutes samples for ICP and Particle Count when it's not performing infrared analysis. His extensive array of PerkinElmer instruments has been key to keeping up with industry standards, regulations, and improved quality monitoring. "Bottom line, I wanted to stay with PerkinElmer. All their equipment is reliable, consistent, and requires minimal preventive maintenance. Throughout the last decade, PerkinElmer has continued to provide excellent customer service, innovative technologies, and solutions that accelerate growth."

Confidently Looking Forward

After kicking off the diesel fuel testing and surveillance inspection programs, there was an influx of service contracts for maintaining fuel, coolant, and engine equipment systems. Today, Yancey's monthly sample volume averages about 6,500 samples per month or 300-500 per day. All oil samples are tested on ICP, FT-IR, and Viscosity while particle counts average between 90-120 samples per day. As the need for new solutions increases, the lab will require a second ICP-OES and an FT-IR to increase production, accuracy, and reliability. As for Robert Broaddus, "After that, who knows – maybe retirement?"

References

1. Yancey Bros: "Welcome to Yancey Bros. Co., Georgia's Caterpillar Dealer since 1914" <https://www.yanceybros.com/company> Accessed November 14th, 2019.
2. Broaddus, Robert. Telephone Interview. 24 Jan. 2020