CINRG

The Innovator
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Don't just Automate. innovate.

Are your Particle Counts Suddenly Higher?

Richard Beercheck – Lubes'n'Greases

In 2015, the United States National Institute of Standards and Technology (NIST) released the latest batch of calibration fluid for optical particle counters. The fluid, identified as SRM2806b, has certified values that are considerably higher than those of the previous batches of calibration fluid.

According to Bill Quesnel of CINRG Systems Inc., Burlington, Ontario, Canada, "When optical particle counters are calibrated with fluids with traceable to SRM2806b, they show alarming shifts in threshold settings for the various particle sizes. When samples are subsequently tested, count data and cleanliness codes are significantly higher compared to historical data."

In a presentation at OilDoc in Rosenheim, Germany, in January, Quesnel reported on an investigation by CINRG that examined the data from two calibration fluids to estimate the certification error between the two standards and to determine comparative particle counts. As a result of similar tests, he said, the committee responsible for ISO 11171 proposed a revision to the standard to manage the problem.

The ISO 11171 calibration standard for optical particle counters was issued in 1999 to account for the introduction of ISO Medium Test Dust to replace Air Cleaner Fine Test Dust used previously. "There was much confusion surrounding the changes introduced in 1999 and a degree of resistance from oil labs to adopt the new standards," Quesnel related. "But there is no doubt the changes eventually had a beneficial effect on the quality and reproducibility of count data produced by oil labs."

Since 1999, the industry has enjoyed a little more than 15 years of consistency with the calibration fluids based on the new standard. "This consistency was interrupted in mid-2014 when NIST release the third batch of calibration fluid, SRM2806b, which had certified counts that were considerably higher than those of the previous two batches," Quesnel said.

The higher counts were due to improvements in metrology that produced a more accurate particle counts. Although test dust content increased in SRM2806b, the new nominal content was not published by NIST. This missing information made it difficult to assess whether the relative contributions were as the result of higher dust concentration and/or a more accurate procedure.

To quantify the relative contributions of these two variables, CINRG used the previous SRM2806a and newer SRM2806b standards to calibrate an optical particle counting system and analyzed the data to compare the two fluids. The company concluded that it is reasonable to assume particle counts will increase by at least 40 percent or more after an optical particle counter is calibrated with NIST SRM2806b.

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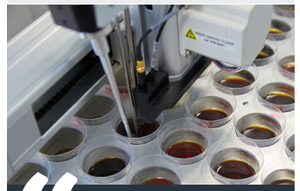
CINRG Systems Inc offers a range of flexible laboratory solutions including our patented Automated Auto-diluting Particle Counter, and the new Houillon Viscometer Automation system.

Caveats when using SRM2806b

Instrument manufacturers use NIST SRM2806b for calibration. Laboratories may use NIST SRM2806b or RM2806b secondary standards with the following caveats;

- Confirm that your current particle counting instrument is calibrated to the current ISO 11171:2016 standard using NIST traceable SRM2806b.
- Confirm that the calibration kit your are using for re-calibration meets the new ISO 11171:2016 specification and is NIST traceable to SRM2806b.
- Laboratories need to understand the difference between a (b) vs. (c) calibration and make an informed decision of whether or not to implement the change from (c) to (b).



> *This innovative particle counter has already proven itself to be highly effective*

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Quesnel explained that this increase is a major concern because the higher counts will have an impact on hydraulic, lubricant and fuel applications globally. "Samples will appear to be dirtier and filters will appear to be less efficient, while it will be impossible to compare new ... data with historical data," he said. "This will have far-reaching consequences because a vast number of technical specifications will need to be revised to accommodate the changing numbers."

The committee responsible for ISO11171 investigated the performance of the new and old calibration fluids, and drafted a revision to ISO11171 that will minimize the impact of the new calibration fluid. Quesnel reported that the final draft has passed the ballot and has already been published as ISO11171:2016.

The revision allows recalculation of particle sizes measured with the new calibration fluid to an equivalent value for the old calibration fluid. This will yield results that are consistent with a calibration that would historically be traceable to SRM2806a.

"Laboratories can purchase a calibration fluid traceable to SRM2806b and then have two options with regard to how they calibrate their particle counters," explained Quesnel. "And the laboratory can continue to report particle counts as it has done in the past with relatively little change in count data or ISO cleanliness codes due to the use of the new calibration fluid." ■

New Particle Counter offers Distinct Advantages

Alistair Geach of CINRG and Dr. Thomas Fischer of OELCHECK discussing the CS-APC-2 system during installation.

OELCHECK GmbH purchased a new CINRG automated particle counting instrument. This new generation particle counter works like existing devices with a laser sensor, but the new instrument homogenizes and better prepares the samples for testing. The entire particle counting process has been simplified and optimized. In the conventional particle counting process, air bubbles and water droplets can influence the results. The new instrument can produce accurate particle counts despite these issues in the majority of cases.

In the OELCHECK laboratory, particle counting is one of the first stages of analysis an oil sample undergoes. Previous instruments performed analysis of the sample directly from the original container. As the test can take up to 5 minutes to complete, this would lead to delays during the testing process, because samples were getting backed up as they waited to for particle counting. With the new instrument laboratory assistants are only required to pour approximately 20 ml of sample into a plastic cup, which is placed into the tray of the new instrument. As a result, the sample is immediately available to move to the next test stage, which reduces processing time. Instead of only 20 samples, the new device can be loaded with over 100 samples.

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> "With the CINRG Particle Counter we have counted more than 80,000 samples (approx. 5,000 samples/month). We and also our customers have found very reliable results. The dilution works perfect. The counts have an excellent repeatability."
>
> **Peter Weismann, OelCheck GmbH**

> "[With the CS-APC-2] we have been able to reduce the analysis and report times, in many cases to half with this improved production capacity. This is why we have decided to accredit this test under ISO 17025"
>
> **Jose Ignciacio, Tekniker Spain**

> "CINRG has a state of the art particle counter that far exceeds expectations. Approximately seven hours of preparation time is saved due to its automation. A definite asset to any oil analysis laboratory."
>
> **Frank Perri, WearCheck**

New Particle Counter offers Distinct Advantages

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Before the sample is counted, an innovative ultrasound sensor determines the volume of the sample so that an exact mixture of sample to solvent at a ratio of 2:1 (based on ASTM D7647-10) is produced from which the solvent counts are subtracted from the final count results.

Prior to testing, the sample is stirred and degassed. Air bubbles escape quickly from the diluted sample and therefore are not counted in the analysis. Isopropanol in the solvent mixture dissolves water droplets making them "invisible". In addition, toluene in the solvent dissolves any soft reaction products which may be present in the sample to ensure that only hard particles which are present in the oil are counted.

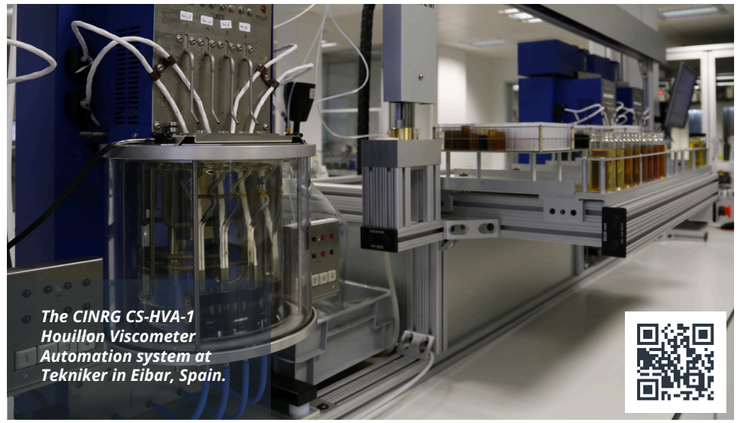
The entire diluted sample of 30 ml is then counted three times in succession, from which a mean average is extrapolated. If the individual values differ from each other greatly, the particle counter rejects the whole analysis and requests a new sample. It doesn't get much more precise than that!

CINRG Systems is behind our new particle counter. In the OELCHECK laboratory, this innovative particle counter has already proven itself to be highly effective. Each day it tests over 250 samples and is set to be joined by a second device of the same make soon. ■

Reprinted from OELCHECKER

[Editor's note: OELCHECK GmbH indeed purchased a second instrument shortly after this article was published].

> "After two months working with [the CS-HVA-1] we think it is, by far, the biggest advance in automation we have in our labs and we are fully satisfied with its performance and results."
>
> **Jose Ignciacio, Tekniker Spain**



The CINRG CS-HVA-1 Houillon Viscometer Automation system at Tekniker in Eibar, Spain.

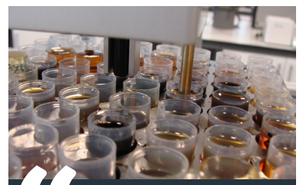
CINRG Develops Robotic Houillon Viscometer System

The CINRG CS-HVA-1 Houillon Viscometer Automation system is a fully automated system that meets the requirements of ASTM D7279-14. The CS-HVA-1 is designed to automate instruments that perform viscosity measurement using Houillon viscometers. The robotic system combines equipment from several leading equipment manufacturers with some innovative technology from CINRG and sophisticated software that was developed by WearCheck for use in their commercial oil analysis laboratories. The system has a high degree of flexibility and can be customized to use a variety of Houillon instruments and to suit laboratory processing requirements.

Solvent requirements are kept low at only 3.5 ml of solvent per sample (in addition to the solvent used to clean the capillary tubes). The system includes a liquid level measuring system to measure the oil sample level in the sample vials, sample bottles and the viscometer capillary tube to virtually eliminate carry-over and sampling errors. The system minimizes needle contamination by limiting the initial plunge depth into the oil sample being tested and further minimizes needle contamination by moving downwards at the same rate as the oil sample uptake during sampling.

After dispensing the oil sample into the viscometer capillary tube the needle returns to the wash station and both the internal and external needle surfaces are cleaned with solvent and the needle tip is dried before processing proceeds to the next sample. The system also maintains optimal solvent levels in all viscometer baths to eliminate variability of solvent pressure for cleaning cycles and to minimize labor requirements.

The system can be loaded with standard laboratory racks (lab rack geometry and positioning can be easily specified in the software setup) or 200 position sample trays. By using the sample trays up to 800 samples can be loaded at one time. A complete sample loading and testing cycle (including cleaning and drying of the syringe needle) takes only 40 seconds allowing the CS-HVA-1 system to process 90 viscosity measurements per hour. As such the system can perform close to 1,200 viscosity measurements in only an 8-hour laboratory shift. ■



> *By using the sample trays up to 800 samples can be loaded at one time.*

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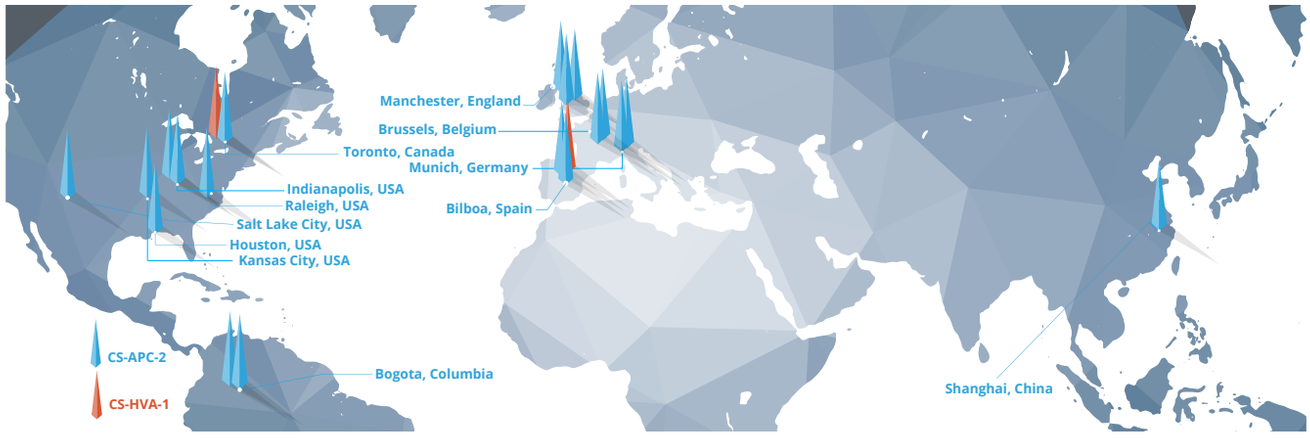

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