

Refineries Can Choose from Different Options for Distillation of Gasoline at Atmospheric Pressure

Many refineries use a combination of technologies to efficiently measure and optimize the distillation of crude oil into separate hydrocarbon components, so they can be processed into higher value products. A common solution to ensure product quality is to use more efficient analyzers that perform atmospheric distillation in compliance with ASTM D86.

In 2017, ASTM D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel, listed ASTM D7345 (Micro Distillation Method) as an approved alternative method for distillation of gasoline. This means that micro distillation analyzers are also an approved method for determining distillation characteristics for gasoline.

The approval of alternative methods of distillation measurement offers a tremendous opportunity to incorporate efficiencies into the distillation process for gasoline, diesel, and jet fuel applications. In a traditionally slow-to-change industry like refining, operators and stakeholders need proof and quantified data to be sure that new technologies like micro distillation analyzers offer true physical distillation that correlates with conventional distillation analyzers before they adopt the micro distillation method into their process.

PAC conducted a series of tests that showed how well micro distillation analyzers correlate with D86-compliant analyzers. PAC is a leading manufacturer of lab and process analyzers, which include Herzog and ISL brands.

COMPARING THREE UNIQUE DISTILLATION ANALYZERS

Working with a large group of refineries worldwide, PAC conducted a series of tests between its three unique distillation analyzers. During the testing period, five unique gasoline samples were run through each of the distillation analyzers, demonstrating high levels of correlation between the two micro distillation analyzers, MicroDist and PMD 110 the predecessor of the newer OptiPMD, using the ASTM D7345 method, and the laboratory distillation analyzer, OptiDist, which uses the ASTM D86 method.

A second study was performed based on documentary research of multiple Proficiency Testing Programs (PTP) from ASTM comparing the entire boiling point range from labs reporting D86 or D7345 for samples of #2 Diesel and Jet Fuel. PTPs for #2 Diesel (DF2) comprised 28 reports published between June 2010 and February 2019. PTPs for Jet Fuel (JF) comprised 25 reports published between November 2010 and November 2018.¹

OptiDist - An automated atmospheric distillation analyzer, OptiDist offers a 35-minute cycle time, with full compliance with all atmospheric distillation methods, including ASTM D86. It is designed to accommodate multi-methods and non-standard capabilities and can be adapted for multiple applications. As a highly user-friendly instrument, it is possible to install the flask in seconds using just one hand. Testing initiation occurs at the push of a button. OptiDist is field proven to deliver up to two times better precision for all common distillation samples.



¹ DF2 and JF data courtesy of ASTM Proficiency Testing Program



OptiPMD - A micro distillation analyzer with a 10-minute cycle time, OptiPMD fully complies with ASTM D7345 and results can be reported as equivalent to ASTM D86, ASTM D1160, ISO 3405, and IP 123. Its compact, portable design makes it ideal for field use. With true physical distillation in 10 minutes, it can accurately determine the boiling range characteristics of any commercially available petroleum product from a 10 mL sample. OptiPMD requires no pre-testing or programming and delivers exceptionally fast results and validation using user-defined criteria and automatic pass/fail notification. Method D7345 is accepted as an alternative to D86 and D1160 tests in 10 ASTM specifications and in more than 10 fuel specifications globally.

MicroDist - An online micro distillation analyzer, MicroDist operates in compliance with ASTM D7345, with a 10-minute cycle time and the ability to automatically pull samples from the pipeline. It also fully correlates with ASTM D86, ISO 3405, IP 123, and Cetane Index in accordance to ASTM D4737 and ASTM D976 (procedures A & B). MicroDist delivers test results with less variability, which allows tighter control and maximum upgrade from low- to high-value products. With full automation of initial heat, distillation rate, and final heat regulation, MicroDist offers robust and reliable process control.



RESULTS

The test results involving five unique gasoline samples demonstrated excellent correlation between ASTM D86 and ASTM D7345, as shown in the charts below.

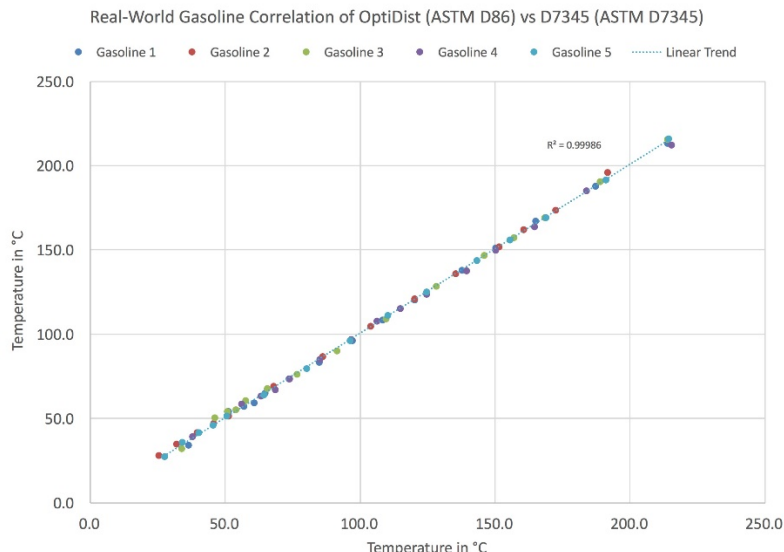


Illustration 1: PAC measured five different gasoline samples at temperatures ranging from 25 °C to 220 °C. At every stage of the testing process, the results demonstrated excellent correlation between the online micro distillation analyzer, MicroDist, to the laboratory distillation analyzer, OptiDist. (R squared of 0.9999).

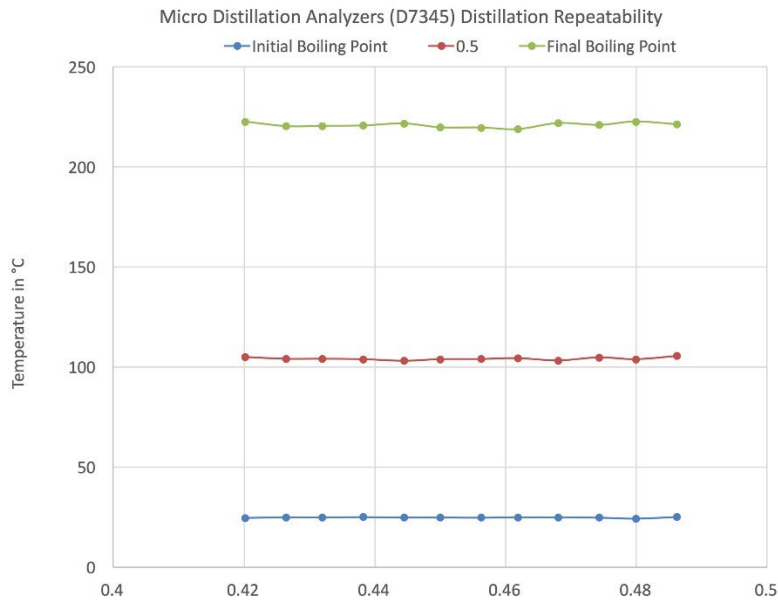


Illustration 2: The tests also showed a very high repeatability of micro distillation analyzers for a typical gasoline sample.

The documentary research based on #2 Diesel and Jet Fuel PTPs confirms there is an excellent correlation between the boiling temperatures reported by both D86 and D7345.¹

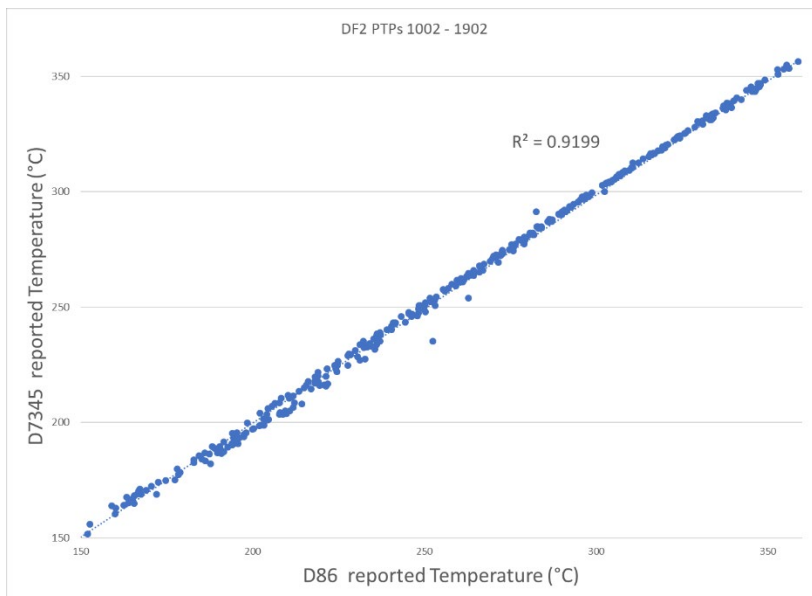


Illustration 3: Tests under reproducibility conditions, such as those found in PTPs, encompassing multiple samples over a 9-year period and a wide range of temperatures also demonstrate an excellent correlation between methods.

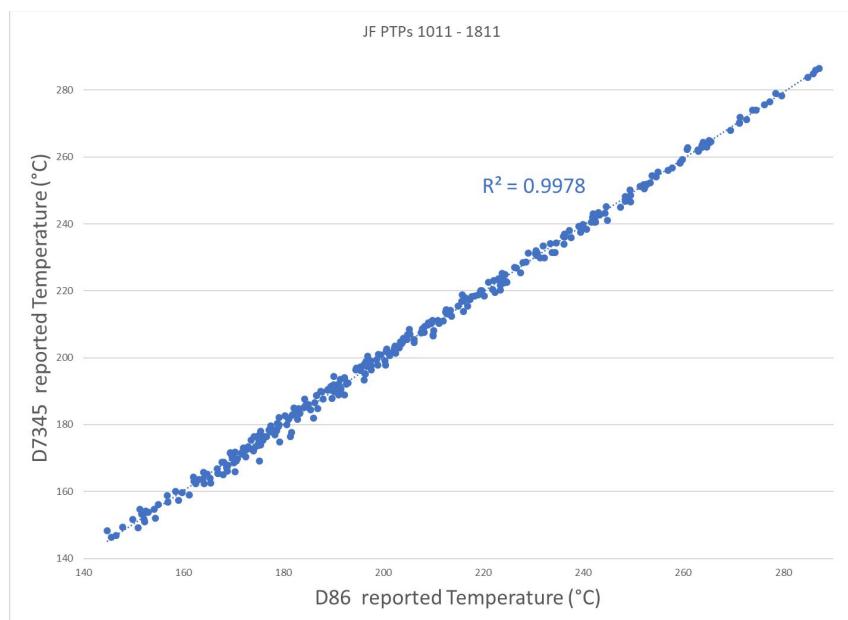


Illustration 4: The excellent correlation already proven for gasoline and diesel samples also applies to other fuels such as Jet Fuel, demonstrating why D7345 is accepted globally as an alternative to D86.

CONCLUSION

Analyzers using both the ASTM D86 and ASTM D7345 methods have been shown to deliver reliable, highly correlated results. The best choice of analyzer largely depends on the requirements of the refinery.

Laboratory distillation analyzers using the D86 method, like OptiDist, are ideal for laboratory analysis when full compliance with all atmospheric distillation methods is required. The versatility of OptiDist makes it easy to adapt the instrument to many different applications. Micro distillation analyzers like OptiPMD and MicroDist are ideal for field analysis, especially for gasoline, diesel, and jet fuel applications. Now that multiple fuel specifications published, not only by ASTM, but also in multiple countries, allow analysis by the alternate method D7345, the OptiPMD and MicroDist can be used to release products to specifications without the need for additional laboratory testing.