



APPLICATION HIGHLIGHT:

## OptiFlash LVC: Flash Point Testing of Waste Plastic Pyrolysis Oil (WPPO)



## Introduction:

PAC Powered by Herzog is the benchmark in flash point analysis that comes with 50 years of experience in automated flash point measurement. OptiFlash LVC is designed to perfectly meet today's expectations on user convenience, quality, and safety. The OptiFlash LVC accurately detects flashpoint for petroleum products, lube oils, gear oils, food & beverages, chemicals, and bitumen.

LVC Small Scale High Temperature Flash Point Analyzer comes with various features and combinations, enabling the users to perform flash point analysis at both the low and high-end of the temperature spectrum:

- LVC Small Sale High Temperature Flash Point Analyzer expanding from 30°C up to 300°C
- LVC Small Scale Built-In Peltier Cooler Flash Point as low as 0°C up to 135°C
- LVC Small Scale Low Temperature Built-In Peltier Cooler, Built-In Cooling Coil, Flash Point as low as -30°C



### Highly Efficient Peltier Cooling System:

OptiFlash LVC is an instrument having significantly faster pre-cooling capability. In this design, no external cooler is required for flash point measurements above 0°C. This reduces initial costs associated with buying a system also decreases ongoing maintenance costs. OptiFlash LVC also has an expanded flash point range with optional built-in cooling coil and small external cooler for flash points down to -30°C.

Depending on the sample type and method, OptiFlash LVC can run on very low sample volumes down 2mL where the sample injection can be done with syringe as can be seen in Figure 1. OptiFlash LVC can be used for various methods such as ASTM D7236, D3828 A+B and ISO 3679 A+B. D7236 does not require mixing in ramp method with only one sample injection, and D3828 A+B can be run either at 50°C in 3 minutes or 100°C in 4 minutes.



Figure 1: Sample injection of OptiFlash LVC.

### Plastic Circularity and Increased Use of WPPO:

Due to increased world population, higher standards of living, longer lifetime, increasing amounts of plastic packaging especially from food industry, growing concerns on environment, and new legal regulations, the rates of

collections and recycling of waste plastics are soaring globally. In addition to mechanical recycling, advanced recycling methods such as chemical recycling of waste plastics by pyrolysis are integral & complementary methods for achieving the sustainability targets worldwide.

However, the nature of the WPPO is very different than the traditional hydrocarbons necessitating to develop new applications and equipments to reveal its chemical & physical properties. OptiFlash LVC is a strong analytical instrument to determine the flash point of WPPO samples. Flash point measurement of WPPO increases the safety of the operations using these emerging feedstocks in circular economy applications either for fuels or chemicals.

### Instrument Preparation and the Test Results Comparison:

OptiFlash LVC is user friendly. It does not need the user to handle thermometer, igniter and shutter drive. Due to the small amount of volume and high speed of analysis, it creates high throughput. As can be seen in Figure 2, the method does not require stirring. Similarly, the use of block thermometer eliminates the necessity of sample thermometer. Thereby, there is no tedious cleaning procedures required for neither stirrer nor for thermometer. All these features result in a much easier method for the user.

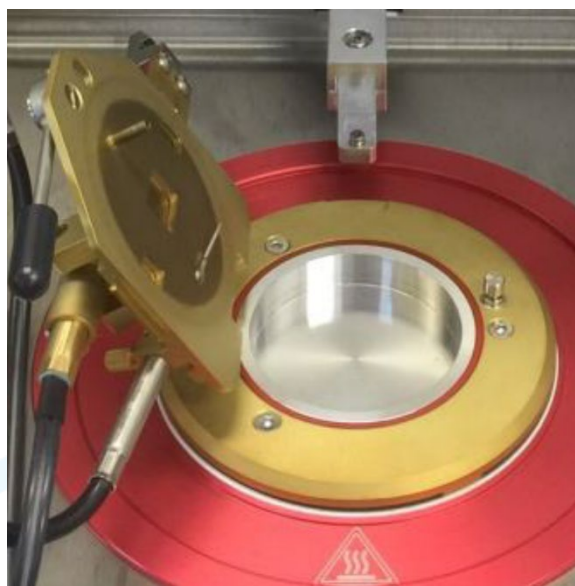


Figure 2: Sample test block of OptiFlash LVC.



### Complex Nature of WPPO Samples for Flash Point Analysis with Close Pour Points:

The other alternative flash point measurement methods (D93, D7094, and D6450) do not work for some WPPO samples having low flash point with problematic pour points. D93 requires the user to cool down the sample 23°C below the expected flash point. However, the nature of WPPO samples are not like crude oil. For instance, some WPPO samples with low flash point also have a pour point close to flash point therefore when the user cools down the sample 23°C below the expected value, the samples already get partially solidify thereby making the mixing during the testing not possible.

However, the D93, D7094, and D6450 methods ask for mixing. The method of ASTM D7236 on the other hand does not require the mixing and based on the data obtained in this application note, D7236 works well for WPPO samples.

The test results of the WPPO sample according to the ramp method ASTM D7236 are shown in the Table 1 below. The units of all temperature values given in the table are °C. Very stable and precise results are obtained ranging from 21.5°C to 26.5°C making the OptiFlash LVC a suitable analyzer for complex WPPO samples having paraffinic nature with long hydrocarbon tails entrained in light fractions with homogenously suspended mixtures.

**Table 1: Flash point results of various WPPO samples, according to ASTM D7236.**

Test	Sample	Test Method	Igniter Type	Flash P.	Description
1	WPPO #1	ASTM D7236	Electric	26.5	Test instrument OptiFlash LVC Low Built-In Cooler
2	WPPO #2	ASTM D7236	Electric	25.5	
3	WPPO #3	ASTM D7236	Electric	21.5	Test instrument OptiFlash LVC Low Built-In Cooler
4	WPPO #4	ASTMD7236	Electric	21.5	

## Conclusion:

OptiFlash LVC is in full compliance with ASTM D7236, ASTM D3828 A+B and ISO 3679 A+B methods. It is a very ideal analytical testing for various samples including paste and waxy ones without stirring & only a few mL of sample needed. Its highly efficient peltier cooling system significantly fastens the pre-cooling of the instrument resulting in a wide temperature range from -30°C to 135°C. Its unique features make it an ideal solution for circular economy applications such as the analysis of WPPO.

Part number: AN-2024PP-006. Rev 2024.1 – 06.08.2024. © Copyright PAC L.P. All rights reserved.





[pacip.com](http://pacip.com)