White Paper

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OptiMVD™

Maximize margins, improve efficiency, and increase throughput with PAC's OptiMVD combination viscometer and density meter

In the crude oil value chain, margins are a big deal.

Because oil refining is a complex process, refinery laboratories run tests, collect data, and interpret the behavior of fluids under varying conditions to determine the most optimum and efficient manner of operations to maximize gross margins. Refinery labs are always looking for ways to improve their efficiency and throughput. One way to achieve this is to reduce the cycle time of their laboratory instruments.

Using Innovation to Drive Time Savings

Next-generation laboratory instruments set out to improve the customer experience—be it through higher precision, faster speeds, intuitive interfaces, improved productivity, lower cost of ownership, or another method. Likewise, PAC's OptiMVD viscometer/density meter is designed to push the limits of the latest electronics, deliver tight temperature control, and minimize sample and solvent requirements to deliver an instrument that increases analysis speed, while maintaining precision and accuracy. OptiMVD was designed with the Smart Sample Order capability, built-in intelligence that allows the instrument to determine the run order of samples in the fastest, most expedient way.

By design, OptiMVD provides an exceptionally accurate determination of viscosity and density in petroleum products between +15°C and +100°C through very tight temperature control. The OptiMVD AS2 model has two integrated, 24-position autosampler carousels, which fit into a relatively small benchtop footprint. It can run with the same sample at the same or different temperatures simultaneously, thanks to a unique style of plumbing that incorporates microvalves and uses positive displacement to load samples.

Achieving Increased Throughput with Smart Sample Order

Smart Sample Order is a standard feature in the OptiMVD AS1 (single-carousel) and AS2 (dual-carousel) models that automatically assesses the samples in the run list and evaluates them for sample type, run temperature, carousel position, and quickly determines the run order that will result in the shortest total run time achievable, regardless of how the samples were placed in the carousel.

The feature can be easily disabled in the system configuration settings. Alternatively, the user can prioritize specific samples, while still permitting the Smart Sample Order function to control the order of the remaining samples.

Example of Smart Sample Order Function

To understand how the Smart Sample Order function works, the following example is shown.

Carousel A:
Sample 1: Diesel, 40°C
Sample 2: Lubricant, 100°C
Sample 3: QC sample tested at 40°C and 100°C

In a typical dual viscometer/density meter, one side (Side A) of the instrument is set at 40°C and the second side (Side B) is set to 100°C. This is the case with the OptiMVD. Without Smart Sample Order, these samples will be run in the order they were placed in the carousel.

However, with Smart Sample Order, OptiMVD automatically changes the sequence so that Sample 3, the QC sample, will be tested first. Then Sample 1, the diesel sample, will be tested second. Finally, Sample 2, the lubricant, will be tested last.

It tests the QC sample first because testing the dual-temperature sample first splits the sample and runs both sides simultaneously, and provides more results faster for the first sample. Once completed, the OptiMVD will proceed to test the diesel sample next at 40°C, and then it will test the lubricant sample at 100°C.

In this example, Smart Sample Order reduces the overall testing time by 25%. Actual time savings depends on the sample viscosities, required temperatures, and the OptiMVD model. Single-carousel models hold 24 samples, while dual-carousel models hold 48 samples.
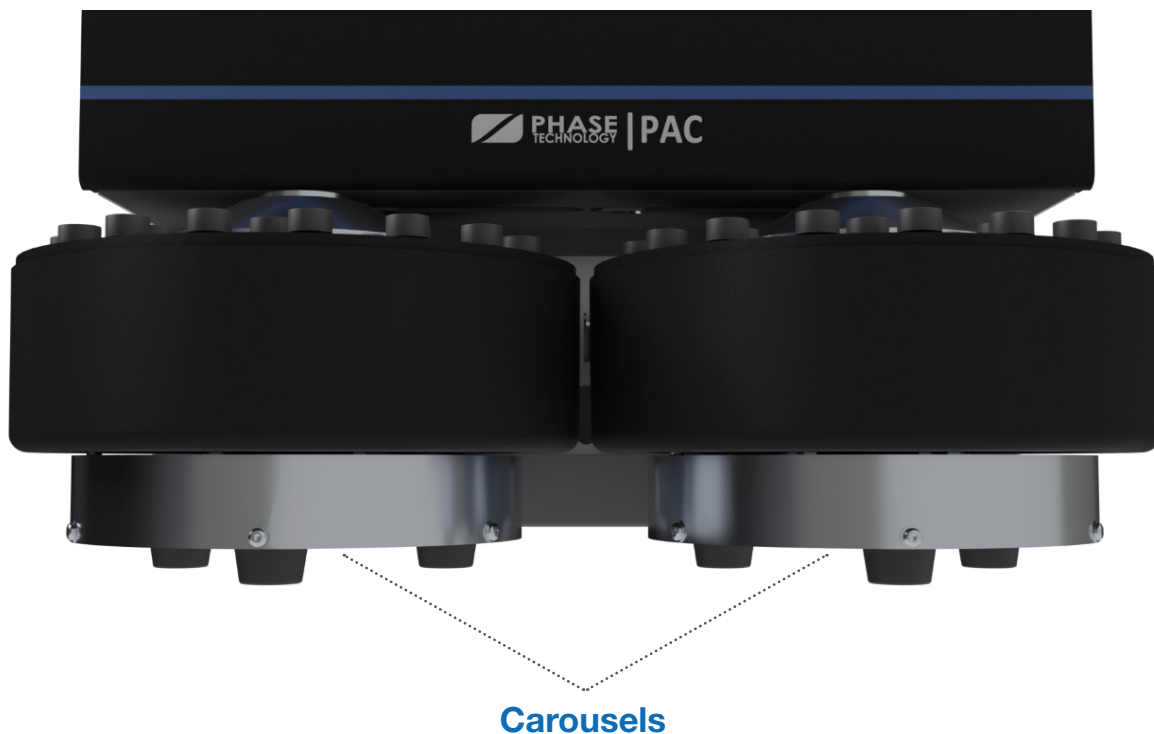

Carousels

Table 1 below shows a comparison of two series of test runs. The first was conducted with Smart Sample Order disabled, while the second series of tests was conducted with Smart Sample Order enabled. With Smart Sample Order disabled, the total time to complete the 24 test runs was eight hours. Enabled, Smart Sample Order allowed the test run series to be completed in four hours and 10 minutes, a time savings of three hours and 50 minutes.

Table 1:

A comparison of Smart Sample Order disabled and enabled using the OptiMVD, with viscometer A set at 40°C and viscometer B set at 100°C when the sequence started

Smart Sample Order DISABLED

Test#	KV Temperature	Test Duration	Accumulative Time (H:M)
1	70°C+100°C	0:20	
2	40°C+100°C	0:20	0:40
3	70°C+100°C	0:20	1:00
4	40°C+100°C	0:20	1:20
5	70°C+100°C	0:20	1:40
6	40°C+100°C	0:20	2:00
7	70°C+100°C	0:20	2:20
8	40°C+100°C	0:20	2:40
9	70°C+100°C	0:20	3:00
10	40°C+100°C	0:20	3:20
11	70°C+100°C	0:20	3:40
12	40°C+100°C	0:20	4:00
13	70°C+100°C	0:20	4:20
14	40°C+100°C	0:20	4:40
15	70°C+100°C	0:20	5:00
16	40°C+100°C	0:20	5:20
17	70°C+100°C	0:20	5:40
18	40°C+100°C	0:20	6:00
19	70°C+100°C	0:20	6:20
20	40°C+100°C	0:20	6:40
21	70°C+100°C	0:20	7:00
22	40°C+100°C	0:20	7:20
23	70°C+100°C	0:20	7:40
24	40°C+100°C	0:20	8:00

Total Time to Complete 24 Tests   **8:00**

Smart Sample Order ENABLED

Test#	KV Temperature	Test Duration	Accumulative Time (H:M)
1	40°C+100°C	0:10	
2	40°C+100°C	0:10	0:20
3	40°C+100°C	0:10	0:30
4	40°C+100°C	0:10	0:40
5	40°C+100°C	0:10	0:50
6	40°C+100°C	0:10	1:00
7	40°C+100°C	0:10	1:10
8	40°C+100°C	0:10	1:20
9	40°C+100°C	0:10	1:30
10	40°C+100°C	0:10	1:40
11	40°C+100°C	0:10	1:50
12	40°C+100°C	0:10	2:00
13	70°C+100°C	0:20	2:20
14	70°C+100°C	0:10	2:30
15	70°C+100°C	0:10	2:40
16	70°C+100°C	0:10	2:50
17	70°C+100°C	0:10	3:00
18	70°C+100°C	0:10	3:10
19	70°C+100°C	0:10	3:20
20	70°C+100°C	0:10	3:30
21	70°C+100°C	0:10	3:40
22	70°C+100°C	0:10	3:50
23	70°C+100°C	0:10	4:00
24	70°C+100°C	0:10	4:10

Total Time to Complete 24 Tests   **4:10**

Conclusion

In refinery laboratories, where maximizing efficiency and increasing throughput are always imperative, it's often the small performance improvements that have the biggest impact over time. With its OptiMVD, PAC has designed intelligent functionality to reduce the maximum amount of cycle time for every unique test run. Smart Sample Order is deceptively simple, but results in the shortest total run time achievable, regardless of the original order of the samples. Smart Sample Order is just one of many clever, innovative features a user will find on the OptiMVD. Ask for a demonstration and discover how these advantages will positively improve your laboratory's bottom line.