BECKMAN COULTER
Life Sciences

Beckman's new LS 13 320 XR Vs. Malvern Mastersizer

Industrial Application Dry Carbon

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Abstract

Beckman Coulter Life Science performed a side by side measurement comparison of their LS 13 320 XR Laser Diffraction instrument against the Malvern Mastersizer running a customer's High Purity Carbon in a typical Industrial application. The LS 13 320 XR proved its superior capability in peak discrimination, particle sizing accuracy and run to run repeatability.

Instruments

The 2 instruments used for comparison were:

1. A Malvern Mastersizer using the liquid dispersion unit.
2. A Beckman Coulter LS 13 320 XR using the Dry Powder System (Tornado).

Setup

Malvern

The 4 primary setup elements for the Malvern were the particle type (shape), material type which includes the index of refraction, optical analysis model (General purpose, Narrow Mode, PSL verification), and obscuration %.

1. It was necessary to choose a material shape from the following 3 options
    a. Non-Spherical **(selected)**
    b. Spherical
    c. Opaque
2. The Malvern had a "Material" option in its menu for selecting and creating the profile for the material of interest which included the index of refraction, absorption, and material type to match our test materials.
3. There were 3 analysis models to choose from in the Malvern software:
    a. Verification Latex
    b. Narrow mode
    c. General purpose **(selected)**
4. Obscuration percentage set to 0.1 - 2%

LS 13 320 XR

The primary setup elements for the Beckman Coulter LS 13 320 XR was the Method setup which included: Module Settings and Sample Properties.

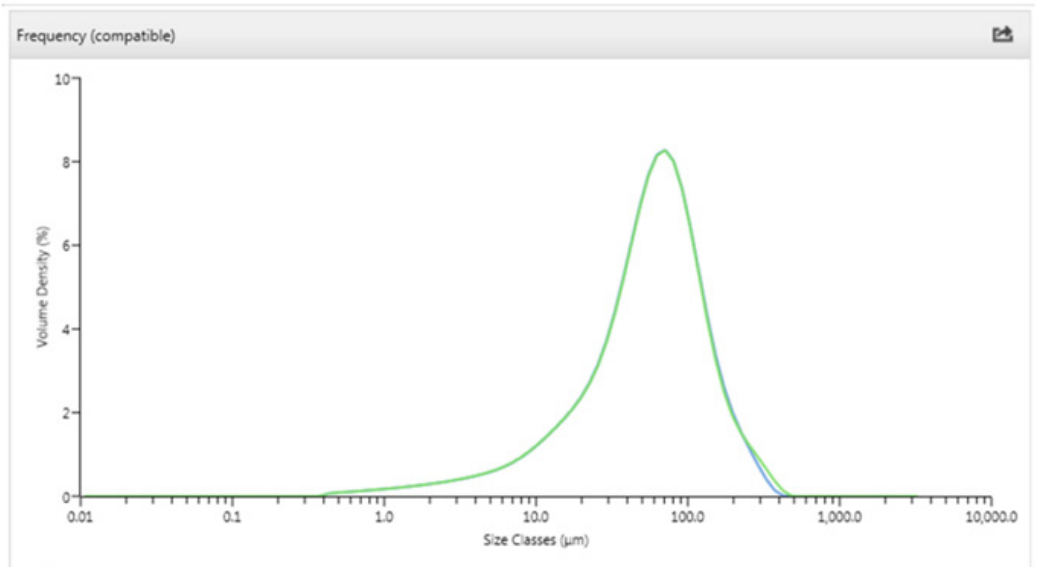
1. Created and selected an optical model called "Carbon" from the Optical Model library.

Material be to tested

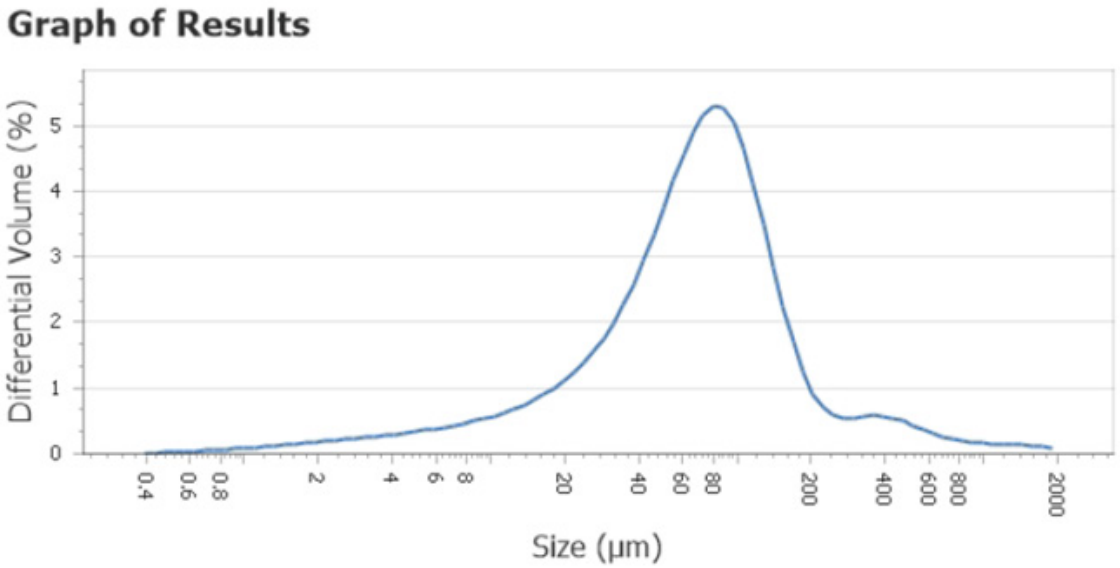
Customer furnished – High Purity Carbon Powder

Existing Malvern sample prep process was labor intensive as described above, time consuming (~3 minutes per sample), and loaded with operator to operator variability which leads to inconsistent answers and the possibility of poor decisions. The new process was to run it dry… simply load it and run it!!

Results: Malvern Mastersizer



Results: Beckman Coulter LS 13 320 XR



The Story:

1. Clearly a second peak @ 400µm is shown using the LS 13 320 XR
2. Beckman is accurate, dependable, and repeatable as proven by the customer's feedback of the instruments answer matching their specs of their materials.
3. You can trust the answer

The rest of the Story...

The customer contacted our Applications Lab through our Sample Analysis Request website at www.beckmanparticlelab.com to request free sampling of their material. Their complaint was that their current Malvern couldn't provide discrimination of multiple populations especially beyond the primary peak and the instrument struggled to accurately report results above 150µm which was a critical need to the customer due to the negative impact those larger particles had on their customer's processes and applications. Approximately 40 of their samples were run by themselves in the Beckman Coulter Applications Lab and this was their response; "I believed the LS 13 320 XR was a more accurate instrument but these results and repeatability were far beyond our highest expectations." The below questions were submitted to the customer and their answers provided.

1. How long did their current sample preparation process take before the material was ready to be introduced to the Malvern instrument?

   Customer: The typical sample prep for wet dispersion particle size analysis using the Malvern system was ~3minutes.

2. How long did it take to run the samples?

   Customer: On the Malvern one sample takes ~15mins to run, from start to start. This included the automated cleaning cycle completed after one sample measurement, and all sample preparation. On the Beckman, the typical dry sample took ~2 minutes start to finish.

3. How many samples are you able to run in one shift with your current method/ equipment (typical)?

   Customer: In a typical 8 hour shift I am able to complete ~35 measurements on the Malvern. This includes all sample prep, clean up, testing, and data entry. On the Beckman it would translate to over 250 samples per 8 hour shift.

4. How often does the sample prep process have to be repeated when the results were not acceptable or typical?

   Customer: The sample prep process is repeated with every measurement we conduct on the Malvern 2000. When results are not acceptable or typical we just run another measurement. That happens about once every 10 measurements. In other words, approximately 45-60 minutes were lost per shift or ~12.5% lost productivity.

   There is no sample prep on the Beckman Instrument, just load a small amount of material, load it into the Tornado and run it!

5. What was the approximate Deviation of 5 samples at d10, d50, and d90 for both systems?

Malvern	d10 = 0.933	d50 = 3.158	d90 = 10.972	
Beckman	d10 = 0.167	d50 = 0.765	d90 = 5.9160	d99 = 26.98

6. How long did it take for your equipment to clean up between samples?

Malvern	The cleaning cycle between each sample is ~8 minutes.
Beckman	0 minutes: There is no cleanup required between samples using the Tornado.

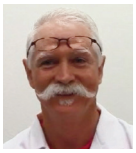
7. What size range(s) were difficult for your current Malvern instrument to measure and size correctly?

   Customer: We have two carbons. The first tested very similarly between the two instruments, and their distribution is entirely < 25µm. Our larger carbon has a distribution between 10 - ~600µm. There is a significant difference in the results the Tornado provided for the d10, d50, and d90. With the Malvern, the difference between both instruments is small on the d10, maybe ±5µm. The difference is more like ±15µm on the d50, and as much as ±100µm on the d90. The Malvern has a hard time measuring this carbon above 60µm, and a very hard time above 150µm.

8. How important was the LS 13 320 XR's ability to demonstrate resolving individual peaks?

   Customer: Being able to "see" multiple peaks within a single distribution is absolutely critical for our manufacturing process. We strive for the highest quality material that we can produce, including manufacturing the particle size distribution that our customers require. Being able to "see" the true particle size distribution with precision is absolutely what we need to satisfy our customers, both internal and external. The Beckman LS provided superior precision in PSD results, especially at the larger particle size ranges, to the Malvern Mastersizer 2000. We are very pleased!

About the author



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For Beckman Coulter's worldwide office locations and phone numbers, please visit "Contact Us" at **beckman.com**

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