BECKMAN COULTER
Life Sciences

Sieves to Laser Diffraction… Hours to Seconds see what you've been Missing!

Introduction

This application note will provide a detailed explanation of the LS13 320 using the Tornado Dry Powder System to demonstrate to the customer how to easily and confidently transition from their current dry powder sieving method to an automated method utilizing LS13 320 instrument which enables them to reduce processing time, improve accuracy, and reproducibility, which in the end will translate into better overall Quality Control process.

Background

[1] Sieving (gradation) has been the traditional method for dry particle size analysis that dates back centuries in civil engineering as it is critical component to determine how materials performs in use. A sieve analysis can be performed on any type of non-organic or organic granular materials including sands, crushed rock, clays, granite, feldspars, coal, soils, a wide range of manufactured powders, grain and seeds. In today's dry powder particle size analysis world the sieving method is still prevalent. The drawbacks can be many; i.e. environmental factors (noise, dust, and vibration), labor intensive sample and equipment preparation, (sieve preparation and cleaning, and manual data processing), operator to operator variability, size resolution (only 4-6 data points), accuracy and precision, random bias from the particle shape which translates into poor R & R, in essence, the accuracy of the measurement integrity. The LS 13320 Laser diffraction method offers the following advantages: reduced environmental impact (low noise, no dust, and no vibration), minimal instrument setup, virtually no sample preparation, and the measurements require only seconds to run! Further, the total amount of sample required for the LS13 320 is generally much less than for the sieving method. For example, when measuring medium ground coffee the total volume of 35cc (Figure 2) weighs approximately 10 grams, versus the 100 grams typically required for the sieves (Figure 1), which provides a ratio of 10:1 less material required for the Laser Diffraction method. Results can be presented with a direct correlation from the customer's historical sieving data to the Beckman Coulter LS13 320 Laser diffraction result.

Figure 1. Sieve Pans – Minimum sample amount is typically 100 grams

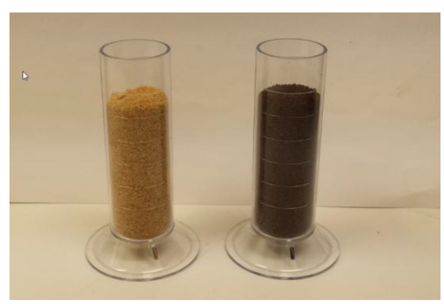

Figure 2. LS13320 sample vials – Sample amount is typically 35cc

Current state

Step 1 – Cleaning the sieves to ensure there is no carryover contamination from a previous sample

Step 2 – weighing sieves (tare) ind ividually prior to processing the material

Step 3 – Manually logging the information

St ep 4 – performing a mechanical setup (stacking the Sieves).

Step 5 – Then it is necessary to perform a sample preparation which can include drying, weighing and loading of the sample material.

Figure 3. Typical Sieve stack

Step 6 – Run the testing on the material.

Step 7 – Manual data retrieval and processing includes:

- Weighing the sieves post process
- Logging the data manually
- Analyzing and processing the data, (important to note that shape influence can require a broad acceptance criteria which could add up to a 50% error)
- Determining pass/fail
- Equipment cleanup.

THIS PROCESS IN SOME CASES CAN TAKE HOURS!

Future state

Below are the minimum steps required for the customer to confidently transition from sieving to Laser diffraction. After the instrument has been configured with the SOP (Standard Operating Process) that is custom designed specifically for a particular product, the steps are simply:

Step 1 – Load the SOP (This can be electronically sent to multiple sites to maintain QC co nsistency across the business platforms)

Step 2 - Load sample into the measurement vessel.

Step 3 - Press Start SOP and within seconds your results will be presented in the desired format. This data can be electronically saved for archiving, trend analysis, and also easily presented in a multitude of statistical and graphical options which reflect the accuracy and repeatability of the instrument.

Figure 4. LS 13 320 with Tornado Module

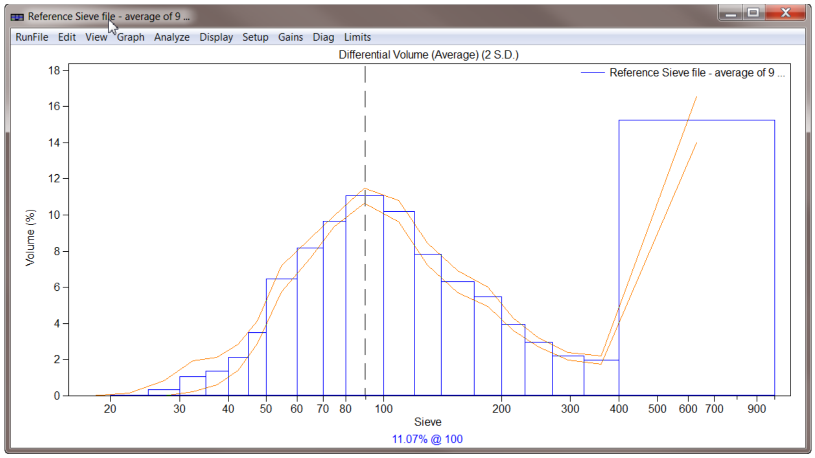

Figure 5. Correlation Graph LS 13 320 to historical Sieve data

Conclusion

Equipped with a few pieces of historical data from a sieving process (number and mesh size of the sieves and the typical differential volume percentages) the LS13 320 can accurately measure and correlate your sieve data (Figure 5) while providing nearly a 100 more measurement points. This application note has demonstrated a practical method for simple and accurate correlation from a manual sieving process to an automated method using the Beckman Coulter LS13 320 Laser Diffraction system. The advantages are: low environmental impact, increased accuracy, reliability, and reproducibility. The time savings alone would be reasonable justification for transitioning to this modern method, but the fact that no special training or skills are required the operator can enjoy the ease and freedom of a single push button measurement. Contact the Beckman Coulter Life Science sales team today to request a demo.

References

1. p231 in “Characterisation of bulk solids” by Donald Mcglinchey, CRC Press, 2005

Authors

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Bill F. Bars is a Sr. Applications Scientist for the Beckman Coulter Particle Counting and Characterization organization. He has created and developed many of the liquid systems production processes for the BEC Particle products. These include but are not limited to the: 8011+, PODS+, ROC, and HRLD Sensors. He has been in the Particle Counting Industry for 22+ years in a multitude of engineering and technical capacities ranging from Metrology to Customer Service, Technical Training and Applications Support. He is a member of the NFPA U.S. TAG to ISO/TC 131/SC 6 – Contamination control group.