Feature Article

50th Anniversary Product

Laser Diffraction/Scattering Particle Size Distribution Analyzer LA-950

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HORIBA has begun selling the new model *Partica* LA-950 Laser Diffraction/Scattering Particle Size Distribution Analyzer, which uses light scattering phenomena as a measuring principle. This measuring method can measure many particles simultaneously in a short time, without contact, with high precision, and with high repeatability. To maximize the benefits of this measurement principle and make the analyzer highly flexible and easy to operate, the following parts are contained in a single unit with the optical system at the core: Control circuits such as a circulation system for performing sample pretreatment, measuring signal processing circuit, and actuators. The LA-950 is a model change for the first time in seven years. It is a top-of-the-range Laser Diffraction/Scattering Particle Size Distribution Analyzer. During this time, development has proceeded with drastic improvements to satisfy future requirements as a global standard analyzer.

Introduction

It is very important to control particle size and distribution for research and development, as well as quality control, of particulate substances and products.

Particulate substances are used in various fields from state-of-the-art technology such as in food, pharmaceuticals, and chemistry to daily consumer products, therefore particle size distribution analysis is indispensable.

HORIBA has more than 20 years of experience in particle size distribution analysis, and has developed and sold many types of analyzers for this purpose.

The most important objective for the newly-developed Laser Diffraction/Scattering Particle Size Distribution Analyzer *Partica* LA-950 (Figure 1) is that users should be able to perform high precision particle size analysis with no difficulties.

Figure 1 LA-950

Improved Points and Effects

The optical system, which is the section that has the biggest influence on the performance of the analyzer, has traditionally been arranged horizontally. The *Partica* LA-950's optical bench mounts the optical components vertically (Figure 2), allowing a clear path horizontally through the optical bench.

This allows the measurement cell to be mounted on a sliding cell tray that passes through an opening in the bench (Figure 3). This allows for up to three different measurement cells to be mounted simultaneously and the sampling systems to remain in place.

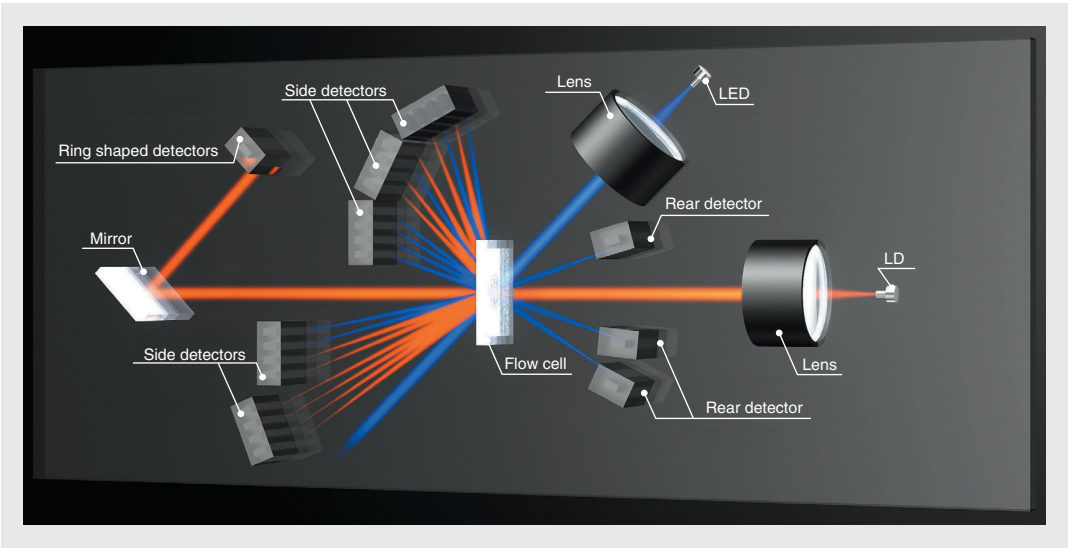

Figure 2 LA-950 Original Optical System, Capable of High-precision Measurement

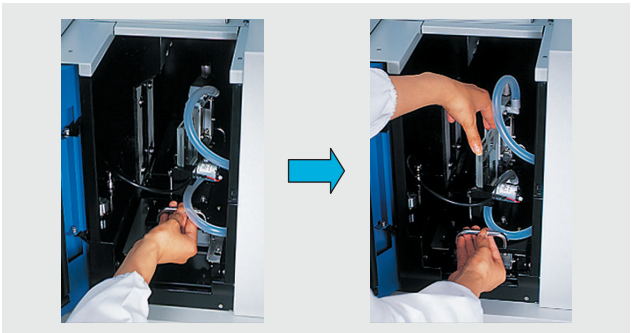

Figure 3 Large Sample Chamber Located at the Center of the Analyzer and Slide Holder Mechanism for Quick and Simple Cell Change

The maximum particle diameter that can be measured by this analyzer is 3 mm; 1.5 times that of a conventional analyzer. To achieve this, the focal length of the optical system needed to be increased, but without increasing the width and depth of the analyzer. As a solution, the optical path was folded back halfway and the height of the analyzer was increased to make the bench area occupied approximately the same as that of a conventional analyzer. This also allowed the sample chamber to be enlarged, resulting in improved maintenance workability.

However, changing this optical arrangement was a big burden for the designers, because there were fears that this new structure would distort more easily due to reduced mechanical strength.

To avoid this risk, we have simulated the distortion and added strengthening - an advantage of having 3D design tools.

The beam axis alignment mechanism as the drive section is verified using four sets of units.

Careful development has led to a stable, reliable analyzer.

Circulation System

Users directly access the sample circulation system unit that feeds samples to the optical system, therefore, this influences the operability greatly.

In the development, reducing burdens on the operator is an important objective, and the following significant improvements have been made:

The time to fill the dispersion medium has been reduced. The time to drain the sample solution after measurement has been reduced. The sample feed inlet has been enlarged. Sample segregation during circulation has been prevented. Maintenance is easier. Capable of circulating large, dense particles, and so on (Figure 4).

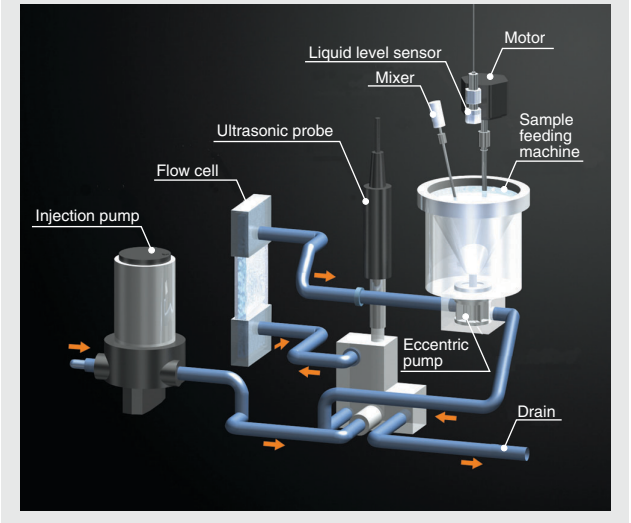

Figure 4 High-speed Circulatory System with Good Repeatability

Electrical and Electronics Hardware

It is necessary to process the scattered light signals at high speed to improve repeatability, to shorten measuring time, and to detect small-quantities of particles which are only momentarily detectable.

To make these improvements, we improved the whole design of the signal-processing circuit, so that 4000 integration times for approximately 100 optical signals can be performed in approximately 1 second with a high S/N ratio. This is built in.

Software

It is easy for both beginner and expert operators to use the software of the LA-950. It has been developed on the basis of HORIBA's new software platform, and the following functions have been provided:

"Navigation function" (Figure 5) for operators unfamiliar with the system operation, which can perform the measurement by proceeding according to the guidance displayed on the screen.

"Automatic sequence" (Figure 6) for operators, which can perform measurement automatically by displaying desired operating procedures.

This new platform unifies the design of HORIBA's software, and easily corresponds to the requirements of different users with its newly added features.

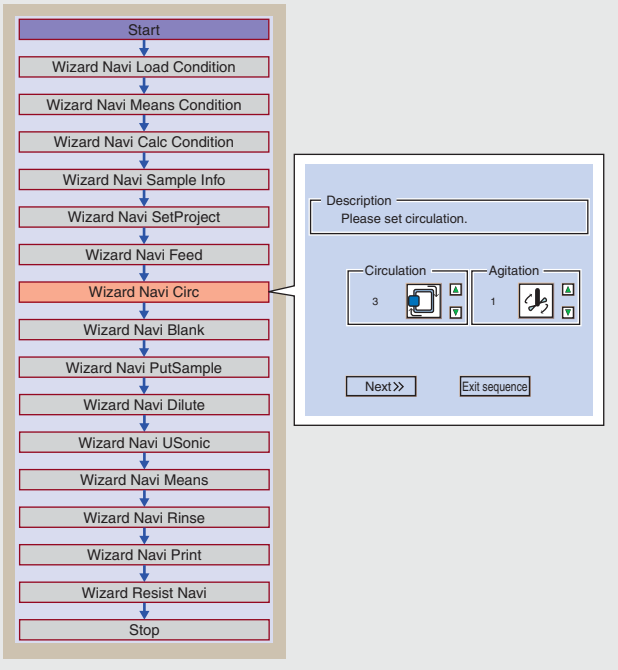

Figure 5 An Example of the Screen while Executing the Navigation Function

Buttons and descriptions are displayed, which are required for the process that performs sample pretreatment condition setup. Operators only operate the buttons displayed on the screen to proceed to the following process.

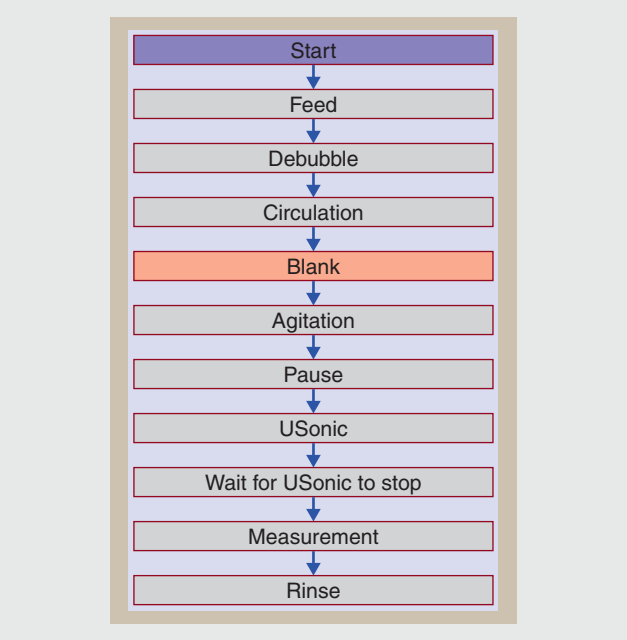

Figure 6 Measuring Sequence Indication

Conclusion

The LA-950 has been developed by improving all its elements, based on experience in conventional particle size analyzer development and user's requests. We appreciate that many people inside and outside Japan have participated in planning and designing this analyzer, and we appreciate their support and numerous ideas.

We will be pleased if this analyzer finds more applications in the field, contributing to the improvement of new materials including nanotechnology and also to quality improvements of our user's products by enabling/improving quality control.