

Enabling 60 μ L Lyobead Dispensing via Sequential Drop Software Mode

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Purpose

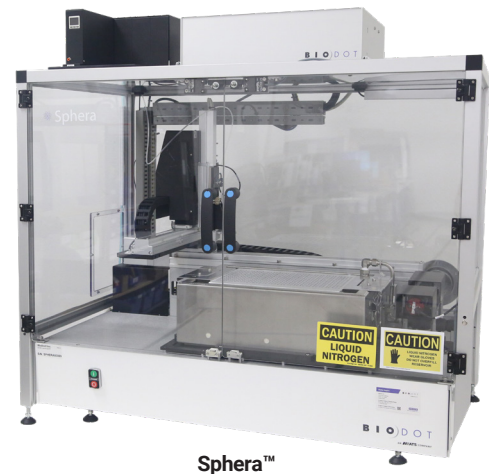
To document and evaluate a newly implemented software dispense mode that enables reliable production of 60 μ L lyobeads by dispensing two sequential 30 μ L drops at a single location.

Background

A customer request required production of 60 μ L lyobeads, a dispense volume not previously supported by standard dispense modes. Existing configurations were limited to single-drop volumes below this threshold, necessitating a controlled approach to achieve higher-volume beads without compromising uniformity, placement accuracy, or repeatability.

Challenge

The primary challenge was achieving a consistent, single 60 μ L lyobead using existing hardware while maintaining low coefficient of variation (CV) for volume, bead size, and weight. Dispensing two separate drops introduced the risk of lateral misalignment, incomplete merging, and inconsistent bead morphology.



Solution

A software modification was implemented to enable dispensing of two sequential 30 μ L drops at the same dispense location. To promote reliable merging of the two drops into a single uniform bead, the motion speed during the dispense cycle was reduced. This reduction minimized lateral movement between the first and second drop, improving bead shape consistency and placement accuracy.

Materials

- Sphera dispensing system.
- Placebo A formulation.
- Placebo B formulation.
- Standard lyobead substrates.



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Junaid Shaikh is an Applications Specialist with three years of hands-on experience supporting, maintaining, and optimizing laboratory automation platforms. He has worked across several reference laboratories, giving him a practical understanding of diverse operational workflows and compliance standards. Junaid is known for his strong troubleshooting skills and collaborative approach. He excels in cross-functional teamwork and user training. His focus lies in helping laboratories achieve peak performance by improving workflow efficiency and maximizing system uptime.

Method

Setup:

The system was configured with a new dispense mode allowing two sequential 30 μ L dispenses at an identical XY location. Motion parameters were adjusted to reduce speed during the dispense cycle.

Process:

1. Dispense the first 30 μ L drop at the target location.
2. Maintain reduced motion speed.
3. Dispense the second 30 μ L drop directly onto the first drop.
4. Freeze and process beads according to standard lyobead protocols.

Additional Tests and Processes:

Both placebo formulations were evaluated to confirm performance consistency across materials.



Lyobeads collected from liquid nitrogen bath and stored in test tubes for storage and transportation.

Results

The modified dispense mode performed as expected. All completed runs produced uniform 60 μ L lyobeads with high accuracy and consistency.

Table 1:

| Volume | Average Weight (CV%) | Average Diameter (CV%) | # of Frozen Beads |
|----------------------|----------------------|------------------------|-------------------|
| 60 μ L Placebo A | 2.01 | 2.5109 | 100 |
| 60 μ L Placebo B | 1.715 | 1.75832 | 100 |

Table 1:

| | Average volume (UL) | Average size (mm) | St deviation | CV% |
|----------------------|---------------------|-------------------|--------------|---------|
| Placebo A 60 μ L | 60 | 5.5734 | 0.139944418 | 2.5109 |
| Placebo B 60 μ L | 60 | 5.436 | 0.0955 | 1.75832 |

Conclusions

The software-enabled sequential drop dispense mode successfully expanded system capability to support 60 μ L lyobead production. Reduced motion speed during dispensing was critical to ensuring reliable drop merging and consistent bead formation. The resulting CV values below 3% confirm that the new mode meets performance expectations for accuracy and repeatability.

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