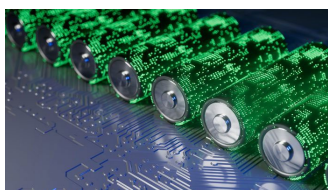


# Importance Of Particle Size And Shape Analysis For Battery Manufacturing Performance Using Canty's Dynamic Imaging Technology

One of the most critical factors in optimisation of the cell performance of lithium-ion batteries is the particle size distribution of the active cathode material. Small particles with narrow distribution lend themselves well to better cell performance than larger, coarser particles. However, if the active material particle size is too small, it can have a negative effect on the cell performance. Not only is the particle size crucial to the cell performance but surface roughness and shape information is important as it impacts on the packing density and viscosity of the particle slurry.

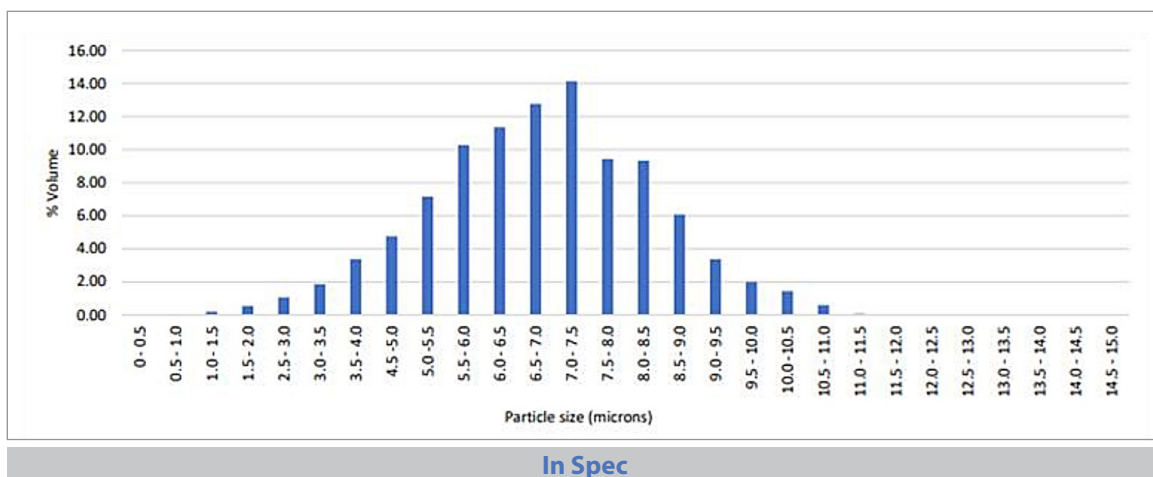


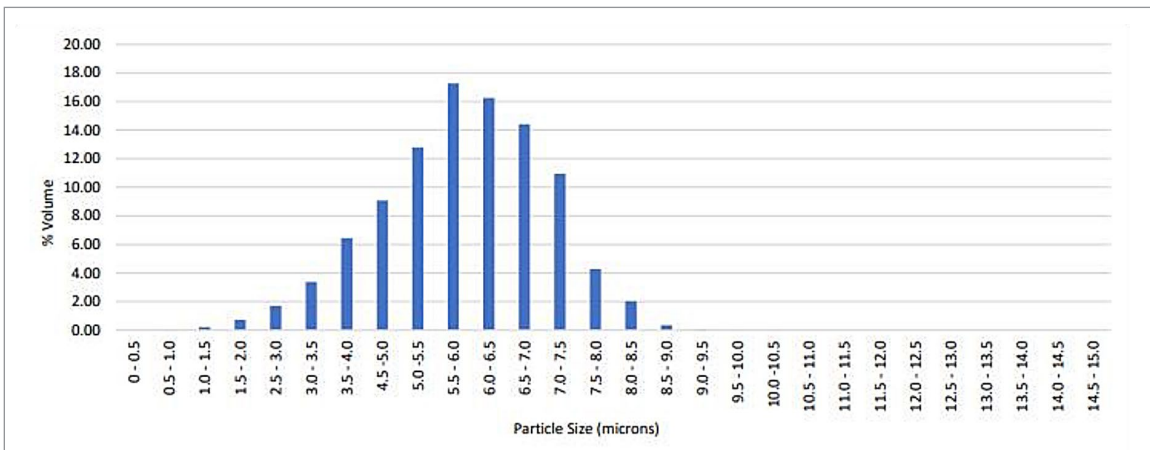
Canty's high magnification 2-Dimensional optical imaging techniques for characterising

particle size, shape and surface roughness are key to optimising the performance of the battery cell. Traditional 1-Dimensional particle counting methods are unable to characterize particles, misrepresent droplets and bubbles as particles and are unable to provide surface and shape information. They are often limited to off-line lab environments where a process sample is taken to a lab allowing the sample to stratify and change prior to measurement. These methods do not provide continual analysis of the battery slurry.

High magnification dynamic imaging using Canty's vision-based systems provides at-line, real time analysis of size and shape of the particle slurry. Critically, the 2-Dimensional system is capable of distinguishing solid particles from droplets in addition to reporting surface and shape information of the particulates. Imaging filters are applied to the analysis that can distinguish solids from droplets/bubbles, thereby doubling the capability of the instrument over non-visual equipment, which cannot make this distinction. This reduces the likelihood of characterization errors and enhances reproducibility, repeatability and accuracy. The visual capability allows the user to input his or her knowledge of the process to work in making meaningful analyses decisions.

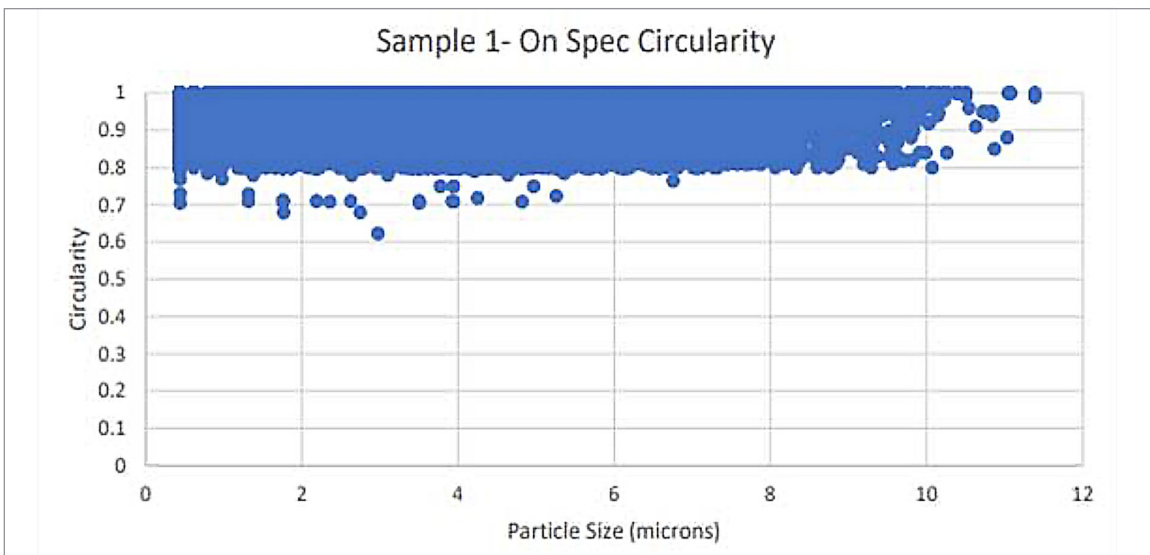
## Particle Size Comparison Volumetric particle size distributions. In-Spec vs Out of Spec particle size distribution.



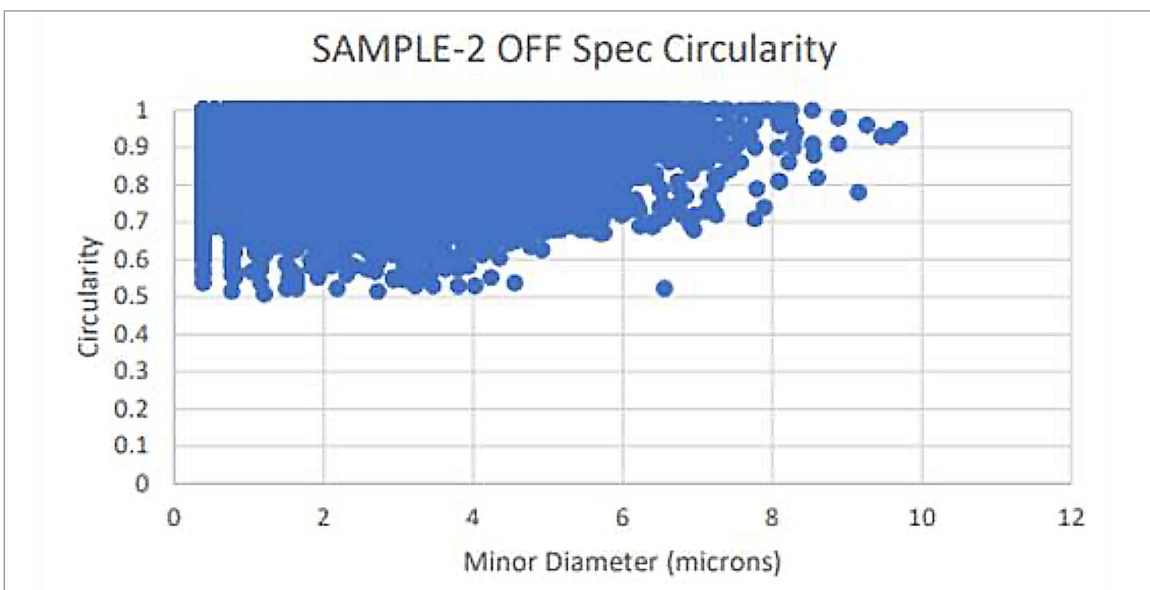


Out Of Spec

Particle Shape Comparison based on Circularity. Circularity of 1 = Perfect Sphere. In Spec vs Out of Spec Sample.



In Spec



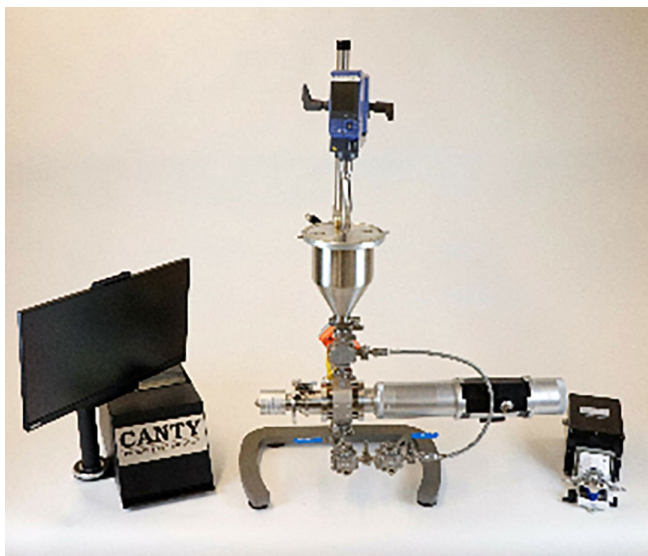
Out Of Spec

measureable

Solutions. Support. Success. A news article from ABL Instruments



High magnification dynamic imaging using Canty's vision-based systems provides at-line, real time analysis of size and shape of the particle slurry.



*Lab Dilution Particle Size and Shape Analysis System*



*Inline Automated Dilution Particle Size and Shape Analysis System*

### How it works

The InFlow Dilution System is used to run high-concentration samples and perform automated dilution based on advanced image analysis and particle classification. Base fluid such as water or oil is used as the diluent in this process. An embedded control system automatically operates valves and pumps to control dilution based on measured particle concentration. A high-resolution Ethernet camera coupled with advanced optics and a fused glass flow cell allow for high precision particle analysis and size distribution. A machine learning classifier system can be trained for automated recognition of different particle types based on morphology.

In addition to analysis of particle size and shape, the Canty Dilution system does not require a defined dilution to function properly as do laser systems. The software controls the dilution and provides sufficient, minimum diluent volume based on particle density per image. This avoids error due to touching particles. There are no counter effects for excess dilution.

For more information, please contact ABLE Instruments on +44 (0)118 9311188 or by email: [info@able.co.uk](mailto:info@able.co.uk)

Critically, the 2-Dimensional system is capable of distinguishing solid particles from droplets in addition to reporting surface and shape information of the particulates

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