

CellInsight CX7 LED and CX7 LZR High-Content Screening (HCS) Platforms



Greener by design™

 **Less hazardous:** generate up to 96% less hazardous waste relative to prior model

 **Less waste:** generate 86% less plastic waste relative to prior model

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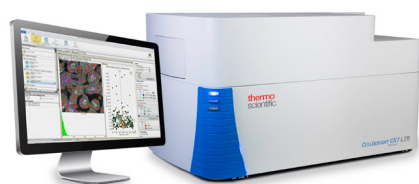


Figure 1. CellInsight CX7 LZR High-Content Screening (HCS) Platform.

Introduction

We are committed to designing our products with the environment in mind. This fact sheet provides the rationale behind the environmental claims that Thermo Scientific™ CellInsight™ CX7 LED and CX7 LZR instruments generate up to 96% less hazardous waste and 86% less plastic waste relative to a prior model.

Product description

High-content screening (HCS)—also known as high-content analysis or high-content imaging—was invented by and registered as a trademark of Cellomics, which is now part of Thermo Fisher Scientific. Thermo Scientific™ ArrayScan™ HCS readers were first introduced in 1998. The 2,000+ peer-reviewed Cellomics™ publications released since then demonstrate a legacy of innovation and scientific excellence from the Thermo Scientific™ CellInsight™ CX5, CX7 LED and CX7 LZR HCS platforms and Thermo Scientific™ HCS Studio™ Cell Analysis Software.

Our HCS instruments combine fluorescence imaging, image processing, automated cellular measurements using our cutting-edge algorithms and informatics tools to extract quantitative data from cell populations. They support single-cell to whole-population analysis [1]. This powerful technology has enabled fundamental discoveries in basic research and advancements in drug compound discovery.

The powerful image analysis tools, intuitive interfaces and EurekaScan™ Finder

“seek-and-find” double-pass feature of HCS Studio software significantly reduce instrument runtime. The HCS Studio Cell Analysis Software expertly balances flexibility and ease-of-use with intelligent design capable of accelerating the next life sciences discovery [2].

Green features

Less hazardous

EurekaScan Finder is a new “seek-and-find” feature for the CellInsight CX7 LED and LZR HCS Platforms. It helps automate the identification and subsequent capture of irregularly seeded biological samples at progressively higher magnifications [2]. Applying EurekaScan Finder accelerates identification of specimens including spheroids, tissues and rare cellular events during “seek” operations at low magnification and a large field of view. Once “found” and with their X, Y and Z coordinates marked, specimens are efficiently scanned at higher magnifications for optimal resolution (Figures 2, 3 and 4). CellInsight CX5 and other comparable and commercially available instruments have only high-resolution imaging, which

requires scanning more fields to obtain results. EurekaScan Finder was designed to enable multiple pass scans, such as identifying samples at low magnification across large fields of view, capturing samples at intermediate magnification, and evaluating for rare events or improved resolution at higher magnifications. Running the CellInsight CX7 instruments with EurekaScan Finder allows you to obtain results using fewer plate wells. A large area of the sample well can be viewed at low magnification to identify a field of interest for subsequent high-magnification imaging. To obtain the same results, comparable instruments that do not have EurekaScan Finder would need, on average, 7–25 sample wells with reduced surface area for cell growth viewed with high magnification scans.



With EurekaScan Finder applied, validated specimens including spheroids and tissues are identified during low magnification “seek” operations and, once “found”, efficiently scanned at higher magnifications for optimal resolution.

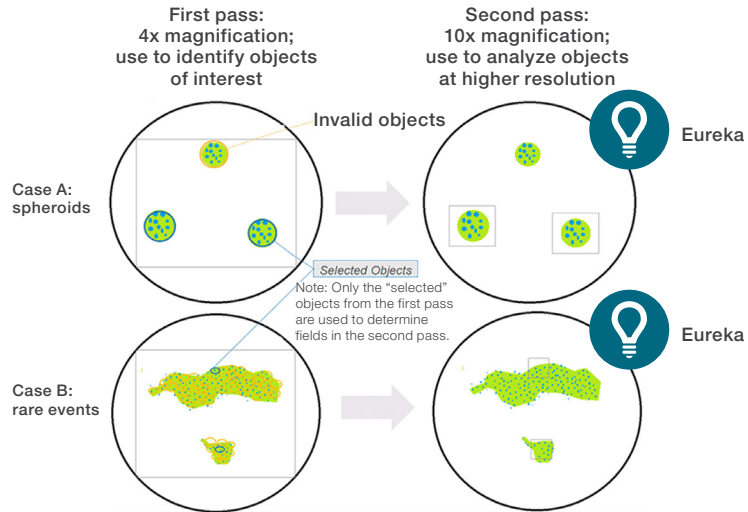


Figure 2. EurekaScan Finder “seek-and-find” functionality.

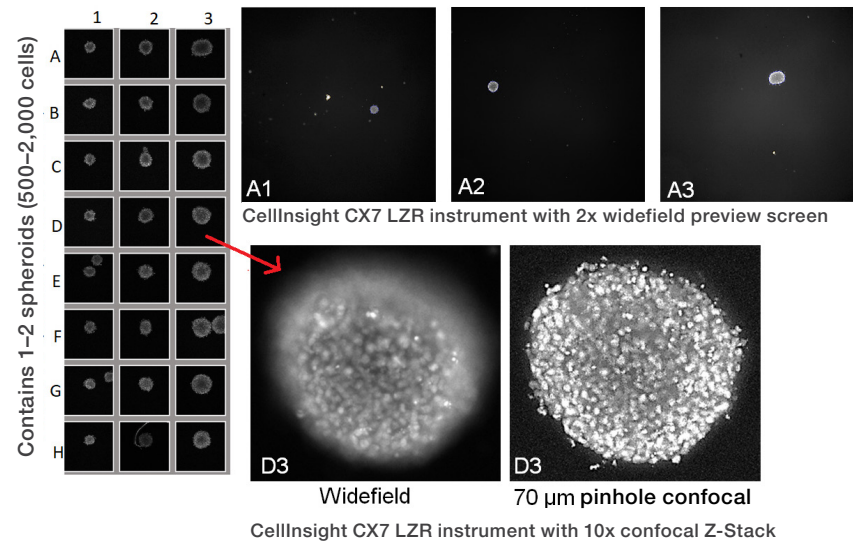


Figure 3. Example of low to high magnification of spheroids using HCS Studio software with the EurekaScan Finder “seek-and-find” functionality.

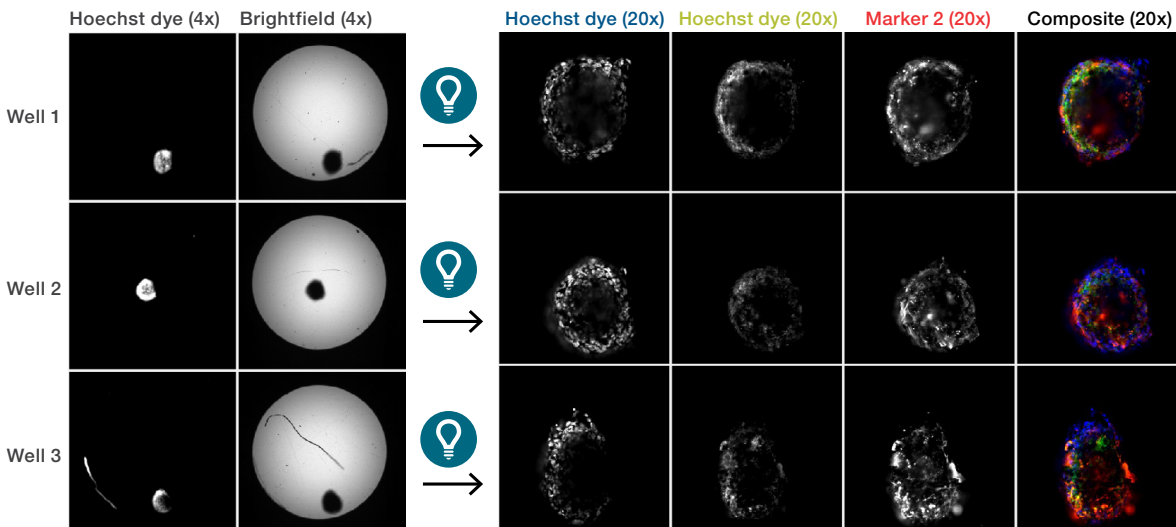


Figure 4. Spheroid example images taken with EurekaScan Finder. Images courtesy of PhenoVista Biosciences [3].

Therefore, EurekaScan Finder reduces the number of samples to be prepared and the corresponding hazardous materials for fixing and labeling the samples. It reduces use of paraformaldehyde as a fixative and Hoechst™ 33258 dye with bisbenzimidazole as

a nuclear counter-label by up to 96%, thereby also reducing hazardous waste to be disposed of by up to 96% (Table 1). For a typical case of four analyses per day, over the working days in one year, this results in a total reduction of up to 960 L of waste.

Table 1. Comparison showing the reduction in use and waste of paraformaldehyde fixative solution and Hoechst 33258 counter-label when using CellInsight CX7 instruments with EurekaScan Finder instead of prior model. (A) Estimate when using U-bottom 96-well plates with a single field of samples to view per well. (B) Estimate when using 96-well plates with half-area wells to view per well.

A									
Instrument	Low magnification “preview imaging” (No. of wells)	High magnification “high resolution imaging” (No. of wells)	Scaled to 96-well plate (No. of wells)	Total sample wells to process	0.4% paraformaldehyde fixative per sample well (mL)	1mg/mL Hoechst 33258 (bisbenzimidazole) counter-label per sample well (mL)	Total fixative and counter-label used (mL)	Reduction in volume of fixative and counter-label used with CellInsight CX7 instrument (%)	Total waste per year (L)
CellInsight CX7	1	1	96	96	0.2	0.2	38.4	86%	40
CellInsight CX5	0	7	96	672	0.2	0.2	269	–	280
B									
Instrument	Low magnification “preview imaging” (No. of wells)	High magnification “high resolution imaging” (No. of wells)	Scaled to 96-well plate (No. of wells)	Total sample wells to process	0.4% paraformaldehyde fixative per sample well (mL)	1mg/mL Hoechst 33258 (bisbenzimidazole) counter-label per sample well (mL)	Total fixative and counter-label used (mL)	Reduction in volume of fixative and counter-label used with CellInsight CX7 instrument (%)	Total waste per year (L)
CellInsight CX7	1	1	96	96	0.2	0.2	38.4	96%	40
CellInsight CX5	0	25	96	2400	0.2	0.2	960	–	1,000

Less waste and use of fewer resources

Using the EurekaScan Finder also reduces the number of 96-well plates required for screening campaigns (Table 2). A CellInsight CX7 instrument requires a single 96-well plate for analyzing multiple spheroids per well at high magnifications. Comparable instruments require between seven and 25 96-well plates with restricted area (i.e., half-well plates) for cell growth. Choosing a CellInsight CX7 instrument, therefore, corresponds to a reduction of at least six and up to 24 plates for each analysis of 96 samples.

That is the equivalent of up to 12.5 g of plastic and 86–96% reduction in plastic waste. More importantly, a typical usage of four analyses per day, over the course of one year, reduces the mass of plastic waste by up to 12.5 kg. This means less waste to manage in our customers’ labs and fewer plates to purchase—both of which represent cost savings and reduced environmental impact for our customers. Using fewer materials also requires less petroleum feedstock and generates fewer greenhouse gas emissions.

Table 2. Comparison showing a reduction in plastic use and waste of 96-well plates when using the CellInsight CX7 instruments with EurekaScan Finder instead of prior model.

Instrument	96-well plate usage per use (g)	Annual material usage (kg)	Half-area 96-well plate usage per use (g)	Annual material usage (kg)	U-bottom 96-well plate usage per use (g)	Annual material usage (kg)	Material reduction achieved by using CellInsight CX7 instrument (%)
CellInsight CX7	0.5	0.52					86–96%
CellInsight CX5			3.5	3.65	12.5	13.05	–

Beyond the benefits already mentioned, applying EurekaScan Finder enables efficiencies in total scan times and corresponding file memory consumption compared to non-EurekaScan Finder, high-magnification scans. Shrinking file size could reduce energy use related to storing large data files [4]. All of the benefits shown here, would also apply similarly to other comparable and commercially available instruments that do not have EurekaScan Finder or double-pass functionality.

Designing the CellInsight CX7 LED and CX7 LZR instruments to generate less hazardous waste, produce less plastic waste and use fewer resources is a win for our customers, our company and the planet.

References

1. Thermo Fisher Scientific High-Content Screening Homepage: <https://www.thermofisher.com/us/en/home/life-science/cell-analysis/cellular-imaging/high-content-screening.html>
2. Thermo Fisher Scientific HCS Studio Software, including EurekaScan Finder spotlight: <https://www.thermofisher.com/us/en/home/life-science/cell-analysis/cellular-imaging/high-content-screening/hcs-studio-2.html?open=accordion2>
3. Acknowledgement: We thank PhenoVista Biosciences for the spheroid example images provided.
4. Shehabi, A., S. Smith, D. Sartor, R. Brown, M. Herrlin, J. Koomey, E. Masanet, N. Horner, I. Azevedo and W. Lintner. 2016. "United States Data Center Energy Usage Report." Lawrence Berkeley National Laboratory (LBNL), Berkeley, California. LBNL-1005775.

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