

# Cell Analysis Systems Manufacturing

## Background

Advent Design was asked by a research and development company that develops ultra sensitive detection and assay technology for pharmaceutical and biotechnology companies to build four Cell Analysis Systems. Advent's client had developed the Cell Analysis System, a multi-channel, line-scan confocal imager formatted for imaging of cell-based assays for High Throughput Screening (HTS) applications. It utilizes a rapid autofocus approach and optics that can image samples in traditional 96/384 well microtiter plates. Three excitation laser lines, UV (364nm), blue (488nm) and red (635nm), are simultaneously focused to a line on the sample. Fluorescence emission from the entire line is imaged through a confocal slit mask, and spectrally separated onto three cameras operating in the blue (430-495nm), green (505-595nm) and red (605-760nm) regions. Within each color channel, band pass filters optimized for specific fluors can be selected.



## Project Description

Advent Design's client had to build and ship four Cell Analysis systems, and two spare control cabinets, in an eight-month period of time. Advent Design began the project by organizing all of the engineering documentation developed by the client into a set of assembly documents. Advent organized the bill of materials, procured all of the necessary components, assembled and wired each machine, and performed final product testing.

Each machine consisted of two major components; a workbench, and a 19" rack based control cabinet.

The workbench housed the following components:

- A 1.2 watt, multi-hue Ion Laser system.
- Optics for focusing all three laser beams together within one micron onto the target in a microtiter plate.
- Three cameras for receiving the laser signal
- 16 Stepper driven axes, for focusing optics, moving the microtiter plate from cell to cell, automatic load and unload of plates, and adding solutions. Two of these axes were capable of .1 micron steps.
- 860 mechanical part numbers, most of which were precision custom fabricated.
- CE certified EMI shielded outer enclosure.

The control cabinet housed the following:

- Rack mounted PC
- Laser power supply
- 12 stepper controllers
- Camera power supplies and controllers
- UPS for critical control components
- Custom circuit boards for shutter and Digital I/O
- Temperature Control Module for regulating internal bench temperature with TE coolers
- CE certified EMI shielded outer enclosure.

During the project Advent's client requested that systems be modified so that they could be CE certified. This required a number of design changes. Advent Design was able to modify the design, perform all of the necessary testing and get the CE stamp of approval while still maintaining the original schedule.



## Impact

Advent Design was able to provide the client with the necessary resources from both a man power and technical perspective to complete this project in a reasonably short time frame while also accommodating significant product changes. Advent's client was able to meet the market demand, and generate \$6 million in revenue for their product while they waited for the release of the production machine.

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