

# Ensuring the Quality of Hawaiian Microalgae

## THE CUSTOMER

Cyanotech Corporation produces BioAstin and Spirulina Pacifica lines of high-quality microalgae products for health and human nutrition. They are produced in a sustainable, reliable, and environmentally sensitive operation based out of Kailua Kona, Hawaii.

Quality monitoring of Cyanotech's production ponds requires information on the quantity of algae and the health of the cultures. Optical density methods are a quick way to measure culture growth but cannot monitor algal health. Manual microscopy can supply data about the health of small quantities of algal cells, but it is slow and labor-intensive, rendering the method inefficient and non-scalable. FlowCam can provide both types of data simultaneously and with better accuracy, allowing algae cultures to be analyzed quickly, easily, and economically.

## MAKING THE CASE

Charley O'Kelly, Director of Applied Research at Cyanotech, had known about FlowCam for decades. He was a Senior Research Scientist at the Bigelow Laboratory for Ocean Sciences when the inventors of FlowCam, Chris and Mike Sieracki, were developing

the technology for imaging flow cytometry and producing the first FlowCam instruments.

Having seen the instrument in use, he knew that FlowCam data would greatly improve Cyanotech's ability to assess the growth and quality of its production ponds. O'Kelly also knew that FlowCam was perceived primarily as a tool for academic research and was not well known in the algae cultivation industry. He felt that FlowCam had potential to be a valuable tool for his industry – that it would make critical improvements to both R&D and production at Cyanotech.

How do you convince a commercially-successful algae company that a novel technology like FlowCam is going to be their best solution for pond monitoring and assessment? Show them the data to prove it.

To make the case, he arranged to have nine laboratory and production samples submitted to the Yokogawa Fluid Imaging Technologies lab to obtain results he could present to his management team.

O'Kelly and his Applied Research team analyzed the FlowCam results. They immediately recognized that the cell growth and health data were far more accurate than had previously been achievable.

**"No other technology that we have tested offers the power of FlowCam to assess growth and quality of algal cells in production ponds, and does it at the speed of business."**

**Charley O'Kelly, Director of Applied Research**



BioAstin and Spirulina Pacifica lines of microalgae

The decision to purchase was easy, and thanks to FlowCam’s speed of operation, many more samples can be processed daily than was previously possible. The instrument is now an essential part of Cyanotech’s standard pond operating protocols and is in constant use by both the Applied Research and the Cultivation departments.

HOW FLOWCAM HAS HELPED

Cyanotech uses the power of FlowCam to count microalgae, image the organisms present in the sample, and automatically classify the organisms. The methods are leveraged as part of the routine monitoring of production cultures as well as research to identify and implement productivity improvements.

In production, FlowCam is now an essential component of daily routine monitoring. It is a key source of information on:

- How fast the algae are growing
- Whether the shape and size of the algal cells are within normal parameters
- Whether the quality of the culture is within normal parameters

“Data, especially on algal cell shape and size, and on culture quality, that was too labor-intensive to collect is now routinely acquired and shared. We have found that the data obtained by a single person using FlowCam would have required three people prior to the FlowCam acquisition to obtain” says O’Kelly.

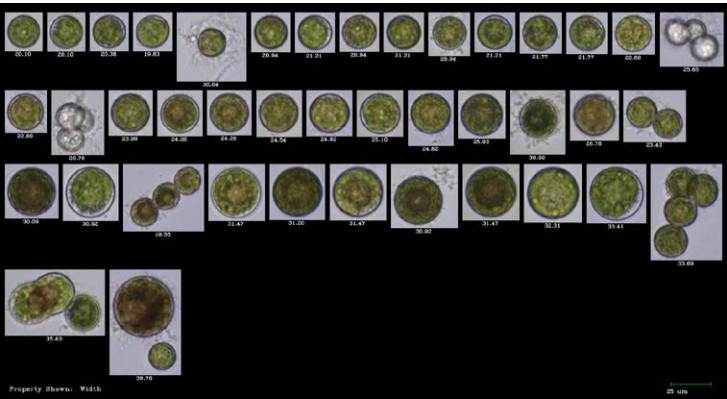
Cyanotech has had success training FlowCam users. The initial trainees, in the Applied Research department, trained other Applied Research staff, and these staff members have successfully trained others in the Applied Research, Cultivation, and Quality departments.

Additionally, staff have developed daily dashboards and other software tools to organize their FlowCam data, assess its significance, and present the results across the company. These tools present critical information to decision makers in a timely and accessible form. Any issues with the cultures are quickly spotted, are better understood, and are expeditiously addressed.

Cyanotech constantly seeks to improve its cultivation practices. In applied research, FlowCam is an essential tool for monitoring laboratory and mid-scale experiments dedicated to boost the growth rate, productivity, and quality of the algae being reared. Since FlowCam can quickly and effectively collect information on algal shape and size, the Applied Research department can more easily design and conduct ongoing experiments. The department also seeks ways to streamline FlowCam data so that it is even better aligned with the needs of commerce.

RESULTS AND FUTURE OUTLOOK

As a publicly traded company, it was important for Cyanotech to justify the decision to purchase a FlowCam. Considering the cost of acquiring the data from production ponds, the FlowCam instrument purchased by Cyanotech paid for itself in less than eight months. As the accelerated research findings from FlowCam-assisted projects become integrated into Cyanotech’s production practices over the anticipated decades-long lifespan of the instrument, the return on investment will continue to increase.



Haematococcus pluvialis microalgae imaged by FlowCam 8400 at 20X magnification. *H. pluvialis* is a source of antioxidants and is used by the food, pharmaceutical, and cosmetics industries.