



Sandia National Laboratories

Biofuels: Real-time Monitoring And Diagnostics

Detecting pathogens and predators to quickly recover from pond crashes

Algal Pond Crash Detection

Sandia National Laboratories is developing a suite of complementary technologies to help the emerging algae industry detect and quickly recover from algal pond crashes, an obstacle to large-scale algae cultivation for biofuels.

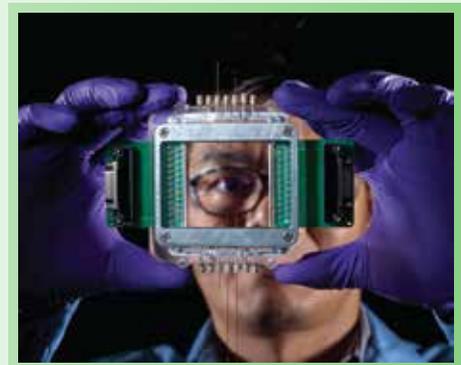
Because of the way algae is grown and produced in most algal ponds, they are prone to attack by fungi, rotifers, viruses or other predators. Consequently, algal pond collapse is a critical issue that companies must solve to produce algal biofuels cost-effectively.

Real-time Monitoring With Online Algal Reflectance Monitor System

Researchers have developed continuous monitoring instruments that are set up alongside the algal pond to measure the algae concentrations, examine its photosynthesis and performing other diagnostics. These instruments allow pond operators to track in real-time the growth of algae and the beginning signs of trouble before a pond crash.

Quick Pathogen Identification Is Key To Mitigation

Following a pond crash, Sandia researchers are leveraging RapTOR, a technology that rapidly characterizes a biological organism with no pre-existing knowledge, to help quickly and accurately identify pond agents through ultra-high-throughput sequencing. By using hyperspectral imaging, researchers identify spectroscopic signatures of diseases arising from changes in algal pigmentation. These signatures could be exploited for early detection and subsequent mitigation of diseases in algal ponds.

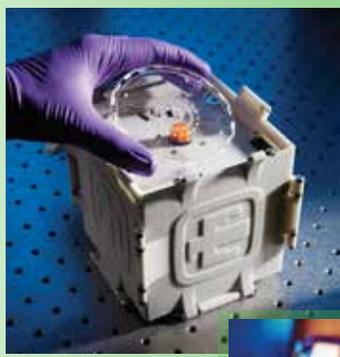


Sandia's three-pronged technical approach to detect and prevent pond crashes

- Developing a real-time monitoring tool for algal ponds that can detect indications of a problem days in advance of a crash
- Successfully applying pathogen detection and characterization technologies honed through Sandia's Rapid Threat Organism Recognition (RapTOR)
- Employing Sandia's innovative SpinDx diagnostic device at pond-side to identify deleterious organisms at low concentrations to control and eradicate without causing irreversible harm to the algae

Pond-side Diagnostics With SpinDx Technology

Sandia researchers are developing a rapid, low cost, pond-side detection technology to aide algal producers in identifying pond crash agents at low concentrations so that early interventions can be applied. Leveraging the SpinDx platform, an innovative fieldable technology that consists of sedimentation-based separation and detection within disposable microfluidic disks using centrifugal force, researchers are developing assays for pond contaminants relevant to algal mass culture. The technology will drive down the cost of production at scale by minimizing outbreaks and reducing loss of both biomass and production days.



Sandia National Laboratories' SpinDx-like device could run early detection tests for algal pond operators whenever they sensed instability in their ponds. Issues could then be investigated more thoroughly, with SpinDX helping to determine the root biological cause of the problem.



Leveraging AzCATI Algae Testbed

The Sandia team is applying these technologies and collecting more data at the Arizona Center for Algae Technology and Innovation (AzCATI). The facility is the first national algae testbed and is a key component of the Algae Testbed Public-Private Partnership (ATP³) led by Arizona State University (ASU). It features algal ponds and closed photobioreactor algae cultivation systems of various sizes and serves as a hub for research, testing and commercialization of algae-based products.

Partnership Opportunities Available

Contact Sandia for more information on partnership opportunities and technology available for commercialization.

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