

ASOPE™ Newsletter

The American Society of Power Engineers, Inc.

From the ASOPE™ News Team

ISSUE: 2 REVISED

MARCH/APRIL, 2010



Welcome to the American Society of Power Engineers, Inc. 2010 newsletter. This newsletter is brought to you by the ASOPE™ News Team and is meant to give you the latest and greatest news and information in regards to the power and steam generation industry.

CONTENTS

Section 1 – Safety Training is Continuous by Dave Preston	1
Section 2 – How Algal Biofuels lost a Decade in the Race to Replace Oil by Alexis Madrigal....	2
Regional News.....	6

SECTION 1 – SAFETY TRAINING IS CONTINUOUS

Anyone who has worked around Power Generation equipment for any amount of time, becomes quickly aware that this equipment can be your best friend or your worst nightmare. Run it properly, clean and reliable megawatt production is the reward. Drop your guard and catastrophe can strike. Equipment damage, environmental upsets, lost production, increased costs, downtime, can become many of the negative results. What's the common denominator in all this? People. People at work, every day. Planning, selling, buying, operation, maintaining, inspecting, working to make a product. Each person must do their part in making this equipment run or not. What makes this process successful? Knowledge! Not just knowing how to do your job correctly and efficiently but also how to do your job safely.

The Occupational Safety & Health Administration (OSHA) is the primary regulatory agency in the nation for Worker Safety. Their regulations and guidelines are all published to help make our workplaces safe. Other organizations like the National Safety Council (NSC) provide information, interpretations, training, and guidance in applying OSHA and other workplace regulations in the workplace and at home. In the December 2009 edition of NSC's monthly magazine called 'Safety & Health' they provided an interesting article called 'OSHA's Top 10 Most Cited Violations for 2009'. "Year after year, falls, struck-by incidents and electrocutions remain some of the highest causes of workplace deaths. And year after year, OSHA focuses its efforts on enforcing the standards that address those very hazards." the NSC article reports. The following is a list of those 'Top 10' standards being violated in 2009, according to the report;

1. 1926.451 Scaffolding – General Requirements
2. 1926.501 Fall Protection
3. 1910.1200 Hazard Communication
4. 1926.1053 Ladders
5. 1910.147 Lockout/Tagout

6. 1910.134 Respiratory Protection
7. 1910.305 Electrical – Wiring Methods
8. 1910.178 Powered Industrial Trucks
9. 1910.212 Machine Guarding
10. 1910.303 Electrical – General Requirements

How many of these regulations are applicable in your workplace?

ASOPE can help you run it right.

OSHA can help you run it safely.

Want more information; check out the National Safety Council WEB site – www.nsc.org

By Dave Preston

SECTION 2 – HOW ALGAL BIOFUELS LOST A DECADE IN THE RACE TO REPLACE OIL

For nearly 20 years, a government laboratory built a living, respiring library of carefully collected organisms in search of something that could grow quickly while producing something precious: oil.



But now that collection has largely been lost.

National Renewable Energy Laboratory scientists found and isolated around 3,000 species algae from construction ditches, seasonal desert ponds and briny marshes

across the country in a major bioprospecting effort to find the best organisms to convert sunlight and carbon dioxide into fuel for cars.

Despite meager funding, the Aquatic Species program (pdf), initiated under President Jimmy Carter, laid the scientific foundation for making diesel-like fuel from the fat that microscopic algae accumulate in their cells. Fifty-one varieties were carefully characterized as potential high-value strains, but fewer than half of those remain.

“Just when they started to succeed is when the plug got pulled,” said phycologist Jeff Johansen of John Carroll University, who collected algal strains for the program in the 1980s. “We were growing them in ponds and we were going to grow enough to have them made into a diesel fuel.”

The program was part of the huge investment that Jimmy Carter made into alternative energy in the late 1970s. All kinds of research avenues were explored, but when the funding shriveled during later years, knowledge, experts and know-how were lost. The

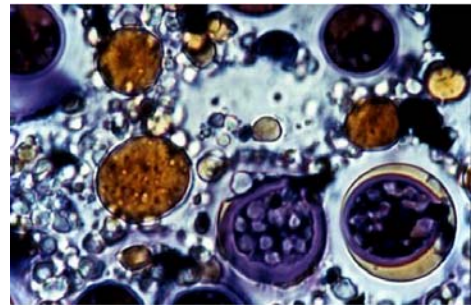
setback highlights the problems created by inconsistent funding for energy research. Now, President Obama has trumpeted the American Recovery and Reinvestment Act, also known as the stimulus package, as the largest increase in scientific research funding in history. Scientists roundly applauded the billions of dollars that went into energy research, development and deployment. But what about when the stimulus money runs out in two years?

“One caution is that much of this has been funded with the stimulus package,” said Ernie Moniz at a Google-hosted panel on energy in late November. “So, we’re going to have to see what happens after these next two years, because what we need is not a drop, but a further increase in R&D commensurate with the task at hand.”

And that’s exactly what didn’t happen in the last big energy R&D push.

From organism to oil

Turning pond scum into oil isn’t easy, but as a hypothetical energy system, it’s elegant. The theory is that algae will produce more burnable fuel on less land than regular crops, perhaps something like a thousand gallons of oil per acre instead of a few dozen from conventional plants. The food-versus-fuel debates that plague biofuels like corn-based ethanol would disappear. Plus, it’s possible the algae could be engineered to make high-energy fuels suitable even for airplanes. It’s these possibilities that sold the Carter administration’s energy officials.



Psychologists, the people who study algae, discovered that under certain circumstances, some algae start cranking out far more oil than normal. Restrict their nutrients, and for some reason they start producing lots of oil. But they also stop growing. If the scientists could keep the algae multiplying and pull the “lipid trigger” anyway, they’d be in fat city. But their understanding of the biology was incomplete, and the task wasn’t easy. It would take some time and effort to know if and when their the process would become cheap enough to compete with crude.

Another challenge was getting the algae to keep growing without injecting a lot of energy into the system. They installed large open ponds near Roswell, New Mexico, and began trying to produce tiny algae at oil tanker scales. It worked, but there were problems. Again, it would take some time and effort to know if and when everything would work together.

The program did not get time or the money to find out. By the time Bill Clinton took office, funding for the program had dwindled to a trickle, and in 1996, the Department of Energy abandoned the program to focus all its biofuel efforts on ethanol. A dark decade fell upon the field of algal biofuel. There wasn’t even money available to take care of the algal collection that had been so painstakingly created.

In an effort to salvage some of the science, a few hundred strains of algae were sent to the University of Hawaii, but the refuge proved less than ideal. When a National Science Foundation grant ran out in 2004, it became difficult to continue the laborious work of maintaining the collection. The organisms sit in rows of test tubes living and reproducing. Every two months, they have to be transferred, “passaged,” to a new nutrient-rich tube. Random genetic mutations can enter a population and lead to permanent genetic changes. The algae can die.

It’s not exactly clear how it happened, but a review released earlier this year found that more than half the genetic legacy (pdf) of the program had been lost. Only 23 of the 51 strains that were extensively studied during the program remain alive and extant. The losses to the rest of the algal cultures in the collection have been even worse.

“The really bloody shame is that of those 3,000, there are maybe 100 to 150 strains that remain at the University of Hawaii,” said Al Darzins, who heads up the resurgent algal biofuels research program at the National Renewable Energy Laboratory.

The way R&D funding has been used in the United States has hurt the efficiency of the research. Programs that started during the late '70s and early '80s were stopped in the years of low energy prices that followed. Despite the best efforts of cash-strapped researchers, not everything can be preserved and recovered, frozen cryogenically while awaiting fresh funding.

Algae comes back

While the valuable NREL archive of algae biodiversity languished in a Hawaii basement, the world around it changed. Genetic and genomic research and understanding skyrocketed. Oil demand grew, particularly in massive developing countries like China, India and Indonesia. Oil usage outpaced new oil field finds. Interest in algae-based biofuels exploded. Venture capital and corporate money flowed back into the field. On January 2, 2008, oil hit \$100 a barrel for the first time. Despite some ups-and-downs, the price of oil remains substantially higher than it was through much of the 1990s. As a result, more than 50 companies are now at work on some aspect of biofuel production from algae.

In the latest move, Exxon Mobil decided to invest \$600 million into a joint venture with Craig Venter’s Synthetic Genomics for research into next-gen algal fuels.

Over the past few years, Darzins has revived the program at NREL. They’ve been hard at work on the biology of microalgae. Graduate student Lee Elliott of the Colorado School of Mines has collected 500 new species in just the last year and a half. To a certain extent, the problems of maintaining a microorganismal library have been solved. Cryogenic freezing techniques were developed at the University of Texas UTEX Culture Collection of Algae. The NREL team has been able to freeze and then revive 91 percent of their microorganisms.

Despite the lost decade, algal oil makers are optimistic that they are about to ride a steep cost curve down to much, much cheaper biofuel. As they apply new biological knowledge

and optimize growing algae, the cost will drop. And as they capture economies of scale, the costs will drop again. In the best-case scenario, when all is said and done, algal biofuel could cost \$50 per barrel. But that won't happen anytime soon, and it could take a decade.

Or maybe it will remain expensive for a long, long time. There are some legitimate reasons to be skeptical of algal biofuel's potential for large-scale oil production.

So far, nobody has been able to make fuel from algae for a cost anywhere close to cheap, let alone competitive. Some researchers question whether any kind of energy-conversion process based on photosynthesis will ever play a major role in our transportation energy system. One life-cycle analysis found algal biofuels would not have a positive energy balance, in other words, you'd have to put more energy in than you would get out. The prominent startup GreenFuel, which grew out of Harvard and MIT research, went bust earlier this year after blowing through \$70 million.

We just don't know how well algal biofuel production might work. It's true that the 18 years of research at the National Renewable Energy Laboratory yielded a lot of knowledge, but it resulted in nothing resembling a commercial product or process.

"The cultivation of microalgae for production of biofuels generally, and algal oils specifically, is not a near-term commercial prospect," John Benemann, an algae scientist who worked on the final report of the Aquatic Species Program, wrote in an e-mail to Wired.com. "Larger-scale algal biofuels production still requires considerable, long-term R&D."

So many questions, so little time

Just \$25 million was invested over the life of the Aquatic Species Program, which is just 5.5 percent of the total money the DOE dedicated to biofuels over that time. Adjusted for inflation, the program's total budget in today's dollars was less than \$100 million. To put this tiny number in oil industry context, Exxon Mobil made \$142 million in profit each day of 2008.

"They came up with this idea and in four years, they almost demonstrated the technological feasibility, and then the funding fell out," said Johansen, the phycologist who collected algae for the program. "The maximum of funding was about \$4 million a year. When I left, it was \$800,000 a year. Now, there is all this biofuel work going on, and they are all going back to that public domain research. It kind of drives me crazy."

The neglect of the Aquatic Species Program and subsequent resurgence of algal biofuel interest is one of many examples that show that the lack of coherent, consistent energy policy has left the world's most oil-dependent nation scrambling in times of crisis.

Johansen even went so far as to say that "if the Reagan and Bush administrations had not ended" the growth of the algal biofuels program, our country would have algal biofuels now.

Even under far less optimistic scenarios, if the Aquatic Species Program had been fully

funded from its start until now, there is no question that we'd know a lot more about the potential, and limitations, of algal biofuels.

Instead, we're left with some lessons learned, a partially missing library of microorganisms, and a lot of questions that investors and entrepreneurs want answered before the next oil price spike.

Reprinted by permission from Alexis Madrigal unedited.

REGIONAL NEWS

Region 1

ASOPE Region 1 would like to extend a thank you to Lawrenceburg Distillers and their Unions for accepting ASOPE as part of their curriculum in progression.

On March the 9, 2010 Region 1 attended and exhibited at the Industrial & Facilities Maintenance & Building Show in Indianapolis, IN at the River Walk Banquet Center & Lodge.

April 21-22, 2010 don't miss the Industrial & Facility Maintenance Show at the Indiana State Fairgrounds, Indianapolis, IN. This is one of the best shows you will find. If you need free tickets please contact Larry Tarvin @1-866-926-1821. ASOPE will be exhibiting and Speaking at this show, please plan to attend and stop by our booth.

In the fall of 2010 ASOPE Region 1 will offer a one day refresher course, with testing the following day. Dates and location have not been finalized.

Region 2

Region 2 is very active with the area technical colleges and has established license certification for the power engineering courses offered. Students write for the FOE 3 License.

Currently we are in the process of providing exams at the following Schools:

- Milwaukee Area Tech. College about -80 exams per semester.
- Gateway Technical College Racine -30 exams per semester.
- Mid State Technical College Stevens Point - 20 exams
- North Central Technical College Green Bay - 25 exams
- Western Iowa Community Technical College, Sioux City Iowa – 25 exams
- Vatterot Technical College, St. Louis Missouri - 52 exams

The Wisconsin Board of Examining Engineers is sponsoring seminars in the Milwaukee and Madison areas for license preparation, which are very popular. One is starting on April 5th. in Milwaukee and one will start in late April or early May in Madison. These seminars are being put on to help people who have been laid off or lost their jobs due to the recession or are just trying to get into the power engineering field.

We also have some members who provide training at the Great Lakes Naval Training Center in Illinois. This training is to prepare sailors who are returning to civilian life and want civilian certification for jobs they have been doing for the Navy. These classes are presented in Spring and Fall.

Some of our members put on training and provide testing for Traction Engines and

Locomotives. The Wisconsin board has given a grant to the Traction Engine Group to help with their training.

Region 2 also participates in trade shows. The most recent was the Plant and Facility Managers Association annual trade show. The Wisconsin Board sponsored a booth to represent ASOPE and Region 2. There is a lot of interest in licensing facility operators. The Ticking Time Bomb presentation was very popular. Our next trade show will be with the Wisconsin State Boiler Inspectors in May.

Region 3

ASOPE Region 3 will be at the Greater Philadelphia Building & Facility Maintenance Show November 10-11, 2010 Greater Philadelphia Expo Center-Oaks, PA. ASOPE will be exhibiting and Speaking at this show please plan to attend and stop by our booth.

Region 4

Set your calendar:

ASOPE Region 4 will be at the Florida Building & Facility Maintenance Show April 26-28, 2010 at the Florida State Fairgrounds Tampa, FL. ASOPE will be exhibiting and Speaking at this show please plan to attend and stop by our booth.

ASOPE Region 4 will be at the Hampton Roads Industrial & Facility Maintenance Show May 5-6, 2010 at the Virginia Beach Convention Ctr., Virginia Beach, VA. ASOPE will be exhibiting and Speaking at this show please plan to attend and stop by our booth.

ASOPE Region 4 will be at the Carolina Industrial & Facility Maintenance Show Nov 3-4, 2010 at the Carolina First Center- Greenville, SC. ASOPE will be exhibiting and Speaking at this show please plan to attend and stop by our booth.

ASOPE Region 4 will be at the Capital Building & Facility Maintenance Show Nov 17-18, 2010 at the Dulles Expo Center-Chantilly, VA. ASOPE will be exhibiting and Speaking at this show please plan to attend and stop by our booth.

Region 5

ASOPE Region 5 is negotiating shows at Jackson Mississippi, Las Vegas Nevada, El Paso Texas, and San Diego California, watch for announcements to be made.