

Evidenced by the fact that we had to turn way over 379 teachers, the need for such a program as CAC is great. The teacher workshops were oversubscribed by 175%. We hope to get some of those teachers trained over the next 18 months with the help of additional sponsorships. It is unfortunate, but in these tough budgetary times, school districts are doing away with laboratory exercises. New schools are even being built without laboratories, not only because laboratories increase the expense of schools, but the laboratory supplies add to the cost of operations. This makes the turn-key program for the teachers and schools all the much more important. The CAC has over 17 hours of labs and lessons that reach to grade levels 7 to 12. This year we instituted a new tracking metric and provided greater assistance to the teachers to facilitate them in bringing the curriculum into the classroom. Over 68% of the teachers actually used the curriculum within the year they were trained. Over 98% of those said they will use the curriculum again and 58% said they intend to increase the number of hours that they use the CAC in the classroom. Just to give you a sample, some of the teacher comments after attending the CAC workshops include:

"- Excellent Hands on opportunities. - Practical information applicable to real life"
David Huxley, Alvord High School, Riverside, CA

"Lisa gave an outstanding presentation of CAC. The program is extremely well organized and easy to follow."
Tish Gaffney, Garden School, Riverside, CA

"This program is terrific. I teach AP Environmental Science and will be able to use all these labs in my air pollution & energy units. All the labs are just the right level."
Daniel Hyke, Alhambra High School, Alhambra, CA

If you would like more information on the Clean Air Challenge Curriculum Program, please contact James Provenzano at 310.472.8633.

Yes! I want to become a Clean Air Now member and help to improve air quality. Enclosed is my tax-deductible membership contribution:
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Clean Air Now
 6960 Magnolia Ave., #200
 Riverside, CA 92506
 (310) 472-8633
 info@cleanairnow.us

"I loved the program – especially because it has activity/labs that can be used in most science classes to increase student understanding of concepts connected to the standards. It is unfortunate that teachers are being forced into narrower and narrower lessons by the current standards. This workshop develops ways of meeting these standards and at the same time teaching students lessons that connect with wider world issues." **Steven Larry Stewart, Ocean View High School, Huntington Beach, CA**

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Summary of "An Overview of the Health Effects of Diesel Exhaust and a Comparison of Conventional Petroleum Diesel to Biodiesel and Straight Vegetable Oil (SVO) in Modified Diesel Engines"

by W. Woodland Hastings

With the rise in interest in biodiesel and straight vegetable oil (SVO) for use in diesel engines, I became interested in the known relative health effects of the emissions of these fuel types, as compared to conventional petroleum diesel. In the fall of 2007 I carried out some research on the topic and produced a ten-page report on the subject. Clean Air Now newsletter readers are very familiar with the deleterious effects of petroleum diesel exhaust, so only a very brief overview is included in this summary. Following that summary is an excerpt of the report that focuses on the health effects of biodiesel and SVO.

Petroleum Diesel

Ten years ago, the California Air Resources Board declared petroleum diesel exhaust to be a toxic air contaminant. It is estimated that exposure to petroleum diesel particulate matter (PM) causes about 250 excess cancer cases per year in California. Over 30 human epidemiological studies have investigated the potential carcinogenicity of diesel exhaust. These studies, on average, found that long-term exposures to diesel exhaust were associated with a 40% increase in the relative risk of lung cancer.¹

A Summary of Health Effects of Petroleum Diesel in California²

- Premature Deaths (2000 per year)
- Lung Cancer (250 per year)
- Decreased Lung Function in Children
- Chronic Bronchitis
- Increased Respiratory and Cardiovascular

Hospitalizations

- Aggravated Asthma
- Increased Respiratory Symptoms

In addition to the above health effects, all attributable to the PM component, petroleum diesel also contains carbon monoxide, polycyclic aromatic hydrocarbons (PAHs), and sulfur-containing compounds each one of which contribute to negative health effects. The trend in discovery over the past 20 to 30 years does not bode well for petroleum diesel. Each new study brings new damning evidence that petroleum diesel exhaust is as bad or is worse than had been thought. We will now turn to examine the comparative emissions of petroleum diesel as compared to biodiesel, and engines slightly modified to run on straight vegetable oil (SVO).

Much of the information that exists regarding these fuels is published in some cases by enthusiastic advocates in which cases the reporting can be very biased. I did my best to scrutinize the source and to present data that is based on reality, not hope or hype.

Biodiesel

Biodiesel is a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats that meets the fuel specification requirements of the American Society for Testing and Materials (ASTM) D6751.³ Biodiesel can be used in unmodified engines designed to run on conventional petroleum diesel fuel.

In 2000, biodiesel became the first alternative fuel in the country to have completed the EPA-required health effects testing under the Clean Air Act. These tests indicated a significant reduction in the emissions of greatest concern with respect to human health. However, there is a need for additional health effects studies to be carried out specifically to investigate health effects of biodiesel. An article in Environmental Health Perspectives reported that it could find only two studies of this nature that have been carried out to date.⁴ That said, there do exist data on the relative emissions of these fuels, so a general sense of the health effect benefit or detriment can be gleaned from these data.

Compared to petroleum diesel emissions, biodiesel emissions have been shown to contain less PM, carbon monoxide, and PAHs, and sulfur-containing compounds are undetectable. However, the combustion of biodiesel in a diesel engine typically does increase the release in nitrogen oxides (NOx), which, in addition to contributing to ill health effects, are well-known as smog precursors. One investigation has demonstrated a 30% decrease in PM emissions with use of 100% biodiesel, but the soluble organic fraction increases by roughly 40%. This smaller production of particles with a greater concentration of soluble organic fraction may impact the health effects and toxicity of biodiesel exhaust particles, but it is not clear what the health effect is, so more study is needed.⁵

The following graph (Page 2) depicts the relative reductions of PM, carbon monoxide and hydrocarbons, and increase in NOx, as the percentage of biodiesel in a mix of conventional diesel and biodiesel increases.

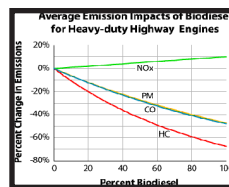
Lastly, a U.S. Department of Energy study showed that the

production and use of biodiesel, compared to petroleum diesel, resulted in a 78.5% reduction in CO2 emissions, the emission of principle concern regarding global climate change.⁷ To the extent that climate change can be perceived as a human health threat, this fact is significant and relevant to the scope of this report.

Straight Vegetable Oil

As the name implies, SVO is straight vegetable oil (e.g., soy, peanut, canola, corn, etc.). It can be from a single vegetable source, or it can be a blend of several sources. Unlike biodiesel, SVO cannot be used in unmodified diesel engines. A system must be added to a diesel engine to first warm and filter the oil in order for it to combust properly and not clog the system.

Most of the information I was able to obtain regarding SVO was from people who are "doing it themselves" within the SVO "community." It does not appear that industry or the agencies that regulate or promote alternative fuels take SVO very seriously. There is not a lot of information, for example, at the Air Resources Board or Air Quality Management District websites about SVO.



SVO appears to have very similar emission characteristics to biodiesel: undetectable sulfur, much lower un-combusted hydrocarbons, slightly lower carbon monoxide and PM, and slightly elevated NOx.⁸

The situation regarding information about health effects of SVO is even worse than that of Biodiesel. I was unable to find a single report or study that examined health effects benefits of SVO. However, as in the case of biodiesel, a sense of the whether SVO is beneficial or not can be surmised by looking at the emissions.

Conclusions

- More study is needed. There is insufficient data in order to make a definitive statement about the relative health effects of petroleum diesel versus biodiesel and SVO. However, some tentative conclusions can be drawn from what is known about the difference in emission profiles.
- Some of the worst constituents of petroleum diesel are either non-detectable, or are greatly reduced with biodiesel and SVO. These include sulfur, particulate matter, carbon monoxide, and other hydrocarbons. In terms of direct exhaust, these reductions can be viewed as a benefit, or advantage to using biodiesel or SVO.
- There is a clear increase in the emission of NOx with both biodiesel and SVO. In congested urban areas, this can be viewed as a serious negative in regard to health, given that NOx is a photochemical smog precursor. Smog, or ground level ozone (O₃), is a serious health threat that causes eye, throat and lung irritation and long term exposure reduces life expectancy.
- The soluble organic fraction increase in biodiesel is a wild card in terms of health effects, again, more study is

needed.

Sources:

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5. Environmental Health Perspectives, April 2007 Biodiesel Exhaust: The Need for Health Effects Research <http://www.ehponline.org/members/2006/9631/9631.html>
6. A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions <http://www.epa.gov/region09/waste/biodiesel/resources/analysis-biodiesel-impacts.pdf>
7. National Biodiesel Board: www.biodiesel.org
8. SVO Emissions Data: <http://www.plantdrive.com/html/emissions.html>

Note: For a copy of the complete report, please email Woody at whastings@cleanairnow.us



A Crude Awakening - The Oil Crash (2006)

by Virginia Field

I recently saw A Crude Awakening - The Oil Crash, a documentary film about the end of oil. Although I was aware of most of the information presented, I was strongly moved by the film. I personally think this is probably one of the most important issues facing our world. Nothing any political candidate is talking about will have the effect on us in the United States, and the world, that the end of the age of oil will bring. I feel this is the major topic we should be addressing.

The film was made by two Swiss directors, one (Gelpke) with a background in anthropology, economics, war reporting, and science films, and the other (McCormack) who holds an honors degree in Environmental Policy and Management. The movie uses footage showing the history of the development of the oil age including oil fields which are no longer producing. There are interviews with scientists, politicians, and economists who tell the impact of the end of the age of oil. As the film points out, we put a man on the moon with a ten year program. We could move to renewable energy if we had the same commitment.

It is ironic that the Holland/Provenzano book, The Age of Hydrogen, is also available, and seems like the answer to

the questions raised by this documentary. I urge everyone to see this important movie.

A Brief Overview For Natural Capitalism

by Dan Morton

Natural Capitalism: Creating the Next Industrial Revolution, may be read online at <http://www.natcap.org>

Nature creates no waste. The death or waste from one organism is the nourishment of another organism. Why not an economy based on the same principle? The waste stream from Company A provides the raw materials for Company B. Company B's waste provides the raw materials for Company C and so on. Zero waste is good for the bottom line, the environment and keeps us out of resource wars.

California's Clean Air Future Discussed at Annual Clean Air Roundtable

CCA hosted the annual Clean Air Roundtable in Sacramento in January. This year, more than 40 clean air advocates representing environmental, public health, environmental justice, and both community and labor organizations came together to discuss successes and challenges of the past legislative session and clean air priorities for 2008. The one-day event included a lunchtime discussion of 2008 regulatory activities with the executive officer of the California Air Resources Board, James Goldstein. A celebratory spirit filled the room as participants applauded the five-year effort to successfully pass legislation to add a doctor and a scientist to the board of the San Joaquin Valley Air District.

CCA was pleased to host this year's roundtable. The Kirsch Foundation, which hosted the first Clean Air Roundtable in 2001 and each year thereafter, announced last fall that it would be changing its focus and would no longer be hosting the event. Former Kirsch Foundation President Susan Frank graciously agreed to moderate the roundtable again this year, and the foundation remained an event sponsor. Also sponsoring was Clean Air Now. CCA would like to thank the members of the planning committee for helping to orchestrate the event.

Diamond Bar Energy and Water Faire

A CAN Co-Sponsored Event

The California Chautauqua Center at the California State University Dominguez Hills has combined efforts with The Air Quality Management District (AQMD), Clean Air Now, The Walnut Water District, Southern California Edison (SCE), and local industry, to present the Diamond Bar Energy and Water Faire. The program will be held starting on the evening of Friday May 16, and over the next two days on the 17th and 18th, at the AQMD Building in Diamond Bar.

The cost for attendance is \$5 for any one day and \$10 for all three. For additional information you may call (909) 861-4202 or (909) 717-7528. For up-to-the minute information check <http://www.calchautauqua.net>.



The Hydrogen Age, Empowering a Clean-Energy Future

by James Provenzano

An exciting opportunity for me was being able to co-author, with my good friend Geoffrey Holland, the new book "The Hydrogen Age, Empowering a Clean-Energy Future" Gibbs Smith Publisher, 2007. The book is geared to the layperson and for the uninitiated. However, those with knowledge of hydrogen energy technologies will learn a lot of new things. We point out that hydrogen is nothing new to our economy, how it holds promise as an energy carrier, what it can do for society, the technologies that utilize hydrogen, and what we need to do to realize a future that is truly pollution-free.

As a biologist I am concerned for all living organisms that inhabit our beautiful planet. I feel that if we are to have a bright future, hydrogen has to be part of our energy economy. This wonderful substance will provide the world with so much. As we state in the book, why wouldn't we choose a fuel that is non-toxic, provides no polluting emissions, is limitless in supply, is relatively safer than gasoline, can provide all the world's people with needed energy, can be made at our own homes, and produces its own feedstock when it is used? Well we can, and that fuel is hydrogen. We are providing our members a copy of the book when they join or renew their membership at the \$75 level. The book is also available on Amazon.com and BN.com. If you would like to discuss the book or just learn more about it, feel free to contact me at 310.472.8633 or jjpro@cleanairnow.us. Visit our website at www.theh2age.com.

Clean Air Challenge Curriculum Program Update A Big Thank You to Our Sponsors

For 2007, the Clean Air Challenge Curriculum Program (CAC) was a very big success. We trained 217 teachers (6% beyond our goal) and provided materials for 25,341 students (3% beyond our goal) from all of the South Coast Air Quality Management District's four counties, Los Angeles, Orange, Riverside and San Bernardino. We want to thank our sponsors for contributing to such an important program which teaches our children about air pollution, its causes, its impact on public health, and what they can do to help mitigate the toxins in our air. The South Coast Air Quality Management District contributed over \$130,000 to the cause, with Shell Hydrogen right behind with \$100,000. (Shell has already committed more money to fund the forthcoming 2008 CAC teacher workshops.) The City of Riverside contributed another \$10,000 to this worthy effort; they are now in their 3rd year of sponsorship of the CAC. The publisher themselves, Enterprise for Education, also contributed time, effort, and materials to the teacher workshops. And thanks to our members and sponsors, CAN also contributed time, money, and effort to the cause.