



PERF Newsletter

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Environmental Technical Solutions for the Petroleum Industry

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Happy New Millennium! Welcome!

Happy New Millennium! And welcome to the first newsletter of the Petroleum Environmental Research Forum (PERF), the première environmental research and development organization of the international petroleum industry!

We hope you enjoy this modest journal, and find it informative and useful. We plan to publish it quarterly.

We want to tell you about our organization, who we are, how we operate, and some of our success stories. We will also tell you about

forthcoming meetings.

To find out more, you can read about us and our projects on our web site:

<http://www.perf.org/>

We will gladly welcome any feed back that you may have. Please let us know what you think of this Newsletter and what you'd like to see. You can do this by simply sending a message to the editor's e-mail address below: grievecg@bp.com



Project 98-09: Accidental Release Mitigation

This project was proposed in 1998 and is about to be launched with the support of twelve organizations for approximately \$1.4 million. The goals of the project are two-fold: to improve the 3-D model of the water spray used for mitigating accidental releases in oil refineries, and link it to the HGSYSTEM air dispersion model; and to evaluate the effectiveness of additives in both the released gas and water spray.

The work has a broad base of support from seven oil companies, two chemical companies, the Health & Safety Executive and British Nuclear Fuels in the UK, and the National Institute of Public Health and the Environment for the Netherlands (RIVM). The pro-

ject is led by **Ken Steinberg** of **ExxonMobil**, and work consists of gathering data and information generated by project members, and developing new data through field studies and modeling. Hydrogen fluoride (HF), or a substitute gas will be released in the field studies, for which candidate sites are being considered.

The participants are excited about the project, and look forward to its imminent start. Field work is expected to begin in 2Q2001, and the program is due to be completed within three years of starting.



**Improving the
science of re-
lease mitigation**

Phytoremediation Projects 94-13 & 97-06

Phytoremediation of soils contaminated with weathered crude oil and salt-impacted gas pit sludge was successfully demonstrated in Project 94-13. In side-by-side comparisons, phytoremediation (plants, nutrients) caused greater or equal removal of aliphatic and polynuclear aromatic hydrocarbons than surface bioremediation (nutrients, tilling), and control (no nutrients or tilling) treatments.

A field demonstration of phytoremediation with the EPA, Project 97-06, has followed, using multiple sites and a common field protocol developed by PERF and the EPA Remediation Technology Development Forum (RTDF). The goal is to provide comparable data for evaluating phytoremediation at a variety of sites and climatic conditions. Sites in Alaska, California, Kansas, Ohio, Indiana, Arkansas, Rhode Island and up-state New York have been selected and will be monitored for

three years. Treatments include perennial and native grasses, poplar and willow trees, and unplanted controls.

The project is led by **Evelyn Drake** of **ExxonMobil**.

The cost is \$380,000, and will be complete in 2002.

The participants are **A. D. Little**, **BP Amoco**, **Elf Aquitaine**, **ExxonMobil**, **Kansas State U.**, the **National Risk Management Laboratory of the U.S. EPA**, **Niagra Mohawk**, **Purdue U.**, the **U. of Arkansas**, and **U.S. EPA's Cold Regions Laboratory**.



Phytoremediation at a refinery landfarm site

Project 97-08 Scientifically-Sound, Risk-Based Decision Tools for E&P Sites

This project is nearing completion. The participants are **ExxonMobil**, **Equilon**, **Chevron**, **Unocal**, and **Arthur D. Little**. **GRI**, **API**, **ORNL**, **LBNL**, and **Battelle Pacific Northwest** labs have joined as consociates, with the latter two being funded by **DOE**. **DOE** has also contributed work via a contractor, **ThermoRetec**, who developed communication packages about the project results for regulators and other stakeholders. **API** is funding the same contractor to develop a position paper in a question-and-answer format about the use of risk-based decision tools for Upstream sites. **Sara**

McMillen of **Chevron** is the project coordinator. Four papers written by project participants were presented at the International Petroleum Environmental Conference in Houston in November, 1999. These papers describe a methodology for determining risk-based screening levels for total petroleum hydrocarbons, polyaromatic hydrocarbons, metals, and benzene at Upstream sites. The project is expected to be completed by December 31, 1999.

“. . . a methodology for risk-based screening levels . . . at Upstream sites.”

Project 99-01 Ecological Evaluation for Upstream Site Remediation

This project was proposed in early 1999, and a kick-off meeting was held in September, 1999. The objective is to develop or improve methods for assessing potential ecological impacts. This will be accomplished by developing early exit criteria for excluding those sites where ecological impacts are likely to be minimal (e.g. due to their size or location), and using field surveys to determine appropriate cleanup standards for hydrocarbons or salts in soils at Upstream sites. Because there are many thousands of sites, the impact upon the industry could be very significant. The project is led by **Pat**



Improving ecological risk assessments at upstream sites

O'Brien of **Chevron**, and contracts have been signed by **Chevron** and **ExxonMobil**. **BP Amoco**, **Phillips**, and **Texaco**, and the **Integrated Petroleum Environmental Consortia (IPEC)** have expressed an intent to join the project. Two US Department of Energy labs, **ORNL** and **LLNL** (Lawrence Livermore National Laboratory) will join the project, and **GRI** and **API** (the American Petroleum Institute) plan to join as consociates. The project is expected to last two years, and hopes to demonstrate that current cleanup criteria are protective of ecological receptors.

Project 94-06 Cooperative Bioremediation Program

This project had three research areas: utilization of biologically active barriers; monitoring and prediction of intrinsic bioremediation of groundwater hydrocarbons; and ecological and human risk assessment methodologies and cleanup endpoints based on residual environmental impacts. Total program value was about \$8 million, and the program was led by **Paul Becker** of **ExxonMobil**. Participants included **ALCOA, API, BP Amoco, the Canadian Association of Petroleum Producers (CAPP), Chevron, Conoco, DuPont, ExxonMobil, GRI, Shell, Texaco, and Unocal**.

The first research area focused on biobarriers, which are *in-situ* devices for treating contaminated groundwater. They are lower cost alternatives to conventional pump-and-treat systems. Groundwater is generally directed through a subsurface reactor in which air (and sometimes nutrients) is added to encourage aerobic biological activity. The cleansed effluent returns directly to the aquifer via natural flow. Contributions to the project included the results of seven demonstrations of various configurations of biobarriers.

The second research area focused on intrinsic bioremediation, which is the most significant contributing factor in the remediation process known as natural attenuation. As groundwater or soil vapors pass through the subsurface, naturally-occurring bacteria degrade contaminants to innocuous byproducts. Contributions to the project included models that predict degradation rates and support human health and

ecological risk assessments. Accounting for intrinsic bioremediation enables less conservative, more realistic calculations of contaminant migration.

The third research area, also known as Environmentally Acceptable Endpoints, has advanced the state of knowledge on the "availability" of soil-bound hydrocarbons to the environment and the use of this information for the definition of environmentally acceptable endpoints for these hydrocarbons in soil. The methods, techniques, and data generated by the work support the use of existing risk-based regulatory frameworks. The research results permit a more accurate assessment of risk and the development of more realistic and achievable site management strategies, eventually resulting in reduced cleanup cost.

The final research report for this third research area integrates the results of over 20 technical appendices that are provided on a CD-ROM. The project was performed in cooperation with **GRI**, which was the overall manager of the work and developed the integrated project report.

Please contact **Paul Becker** of **ExxonMobil** if you have any questions. His telephone number can be found on our web site: <http://www.perf.org/>

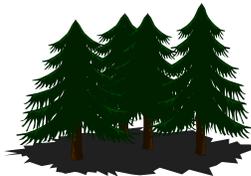


"The research results permit a more accurate assessment of risk . . ."

Project 99-09 (Proposed): Evaluating the Toxicity and Environmental Fate of MTBE in Poplar Trees

This project was proposed at the Fall meeting in Chicago. The objective is to evaluate the potential of poplar trees for treating groundwater contaminated with the common gasoline additive Methyl Tertiary Butyl Ether (MTBE).

Phytoremediation of soils and groundwater is gaining in popularity with both the regulators and the regulated community. This project examines the potential toxicity of MTBE upon poplar trees, a favored phytoremediation plant, and the fate of MTBE within the trees.



Trees are a popular remediation plant

Greenhouse studies will be performed using poplar trees planted in soil columns. **David Tsao** of **BP Amoco** will lead the project, which is expected to cost \$120,000, and be completed within 12 months. He is seeking four additional companies to join the team.

For additional information, please visit our web site at: <http://www.perf.org/>

Highlights of Fall Meeting in Chicago

The Quarterly Fall meeting of PERF was very successfully held on October 12-14, 1999, in Chicago. The agenda and the slides of all of the presentations made at the meeting are available at our web site: <http://www.perf.org/>

John Harju led a strong program presented by the host organization, **GRI** (formerly the Gas Research Institute). Naturally, the presentations from GRI focused on the Gas industry, but many of the technologies and techniques presented have application in both the upstream and downstream parts of the oil industry.

Topics covered were GRI's air program, which included software for estimating emissions of greenhouse gases. Also presented were technologies for down hole gas/water separa-

tion, produced water treatment by freeze-thaw/evaporation, *in-situ* treatment of chlorinated solvents, bioavailability, and pipeline rights of way.

Presenters from **EPRI**, **WERF**, **ORNL**, and **CPPI** (see later article) also told us of the programs of technology development in their respective organizations.

Finally, several new projects were proposed, the status of existing projects was reviewed, and Officers elected for 2000/2001 (see later articles).



Successful meeting hosted by GRI in Chicago

New Project Proposals

During the Fall meeting, three new projects were proposed:

- 99-08 Development of Sub 10 vppm Ultra Low NOx Burner for Fired Heaters
- 99-09 Evaluating the Toxicity and Environmental Fate of MTBE in Poplar Trees: Laboratory Studies
- 99-12 Remote Sensing for Environmental Baseline and Monitoring

Additional information on some of the proposals is given elsewhere in this Newsletter. But, for more detailed information

on any of these proposals, please visit our web site, <http://www.perf.org/>, where you will also find a way to contact the project leader.

“. . . details of all of the projects . . . since our formation in 1986 are presented on the web site.”

Note that details of all of the projects performed under the PERF umbrella since our formation in 1986 are presented on the web site. Also note that specific results of projects are not generally published, as these remain proprietary to the participating companies.

Next Quarterly Meeting at Equilon/Shell in Houston March 7-9

The Quarterly Winter meeting of PERF will be hosted by **Equilon Enterprises LLC/Shell International E&P** at its Westhollow Technology Center in Houston **7-9 March, 2000**. Details of the meeting and of accommodations are posted on our web site: <http://www.perf.org/>



See you next in Houston in March!

One of the themes of the meeting will be best practices in the handling of synthetic drilling muds. Additionally, there

will be sessions of the Downstream and Upstream Discussion Groups, a full complement of technical presentations, and new project proposals. As usual, we will review the progress of existing projects, as well as progress with the new proposals from the Fall meeting.

You will have noted that this will be five months after the Fall meeting in Chicago in 1999. This is because we hold seven meetings in two years; eliminating one quarterly meeting every two years reduces meeting expense for both the hosts and attendees. **See you in Houston!**

Liaisons with External Groups

The following organizations provide liaison with PERF, the benefits of which are at least three-fold: the non-PERF group learns about PERF and the needs for development of environmental technology in our industry; PERF members learn of opportunities in the liaison groups for joint development; and all groups learn of the availability of expertise.

We have found that there have been many examples of PERF members joining a program in a liaison organization, and vice versa, of liaison members joining a PERF project. The current liaison groups are:

American Petroleum Institute (API) Howard Feldman
Chemical Industry Environmental Technology (CIETP) Chris Widrig
Electric Power Research Institute (EPRI) Ammi Amarnath

Gas Research Institute (GRI) John Harju
Lawrence Berkley National Laboratory (LBNL) Will Stringfellow
Oak Ridge National Laboratory (ORNL) Sharon Robinson
Water Environment Research Foundation (WERF) Linda Blankenship



Liaisons help to ensure good communications

Liaison members usually attend the Quarterly meetings, and often present summaries of their R&D programs to the membership.

There is a link to each liaison organization on our web site: <http://www.perf.org/>

Thanks, John, François! Welcome, Zara, Sara, and Elisabeth!

John Wilkinson, ExxonMobil, and François Canal, Elf Aquitaine, have completed their terms on the Board of Directors as Chair and Archivist/Webmaster, respectively. At the recent meeting in Chicago, both were given a vote of thanks for doing an outstanding job, and moving the organization forward during difficult times for the industry. John will be remaining on the Board, as Former Chair, while François moved back to France from Washington D.C. at year end.

The members elected **Zara Khatib, Shell**, formerly Vice Chair, as Chair. **Sara McMillen, Chevron**, former Secretary,

was elected Vice Chair/Secretary, reflecting the combining of the two positions. **Elisabeth Adam, Elf Aquitaine**, was elected to replace François as Archivist/Webmaster.

Thank you again to John and François for giving so freely of your valuable time.

“. . . thanks for doing an outstanding job . . . and giving so freely of your valuable time.”

A complete listing of the Board Members appears on page 1.

Farewell, Lee! We will miss you! Welcome aboard, Joe!

At the meeting in Chicago, **Lee Loevenger**, the Legal Counsel for PERF since its inception in 1986, announced that he was retiring from the position. We will miss Lee, our chaperone, as he was fond of saying.



Au Revoir, Lee!

What will we miss? His wit, his inside knowledge of Washington D.C., his diatribes against political graft, his tremendous experience, and last but not least, his scholarly, technical treatises. Yes! Despite having a law degree, Lee is an accomplished author of scientific papers! His writ-

ings on the “Significance of the Millennium” and “Evolution Elsewhere” are still favorite reads of this editor. Lee tells us that he will not really be retiring, as he will continue to work at his technical writing.

Lee: Thank you for chaperoning PERF for thirteen years! We wish you well, and KEEP IN TOUCH!

Welcome, **Joe Gormley!** You will have a hard time filling Lee's shoes!

Environmental Technical
Solutions for the Petroleum Industry

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TEAMWORK: Together we achieve the extraordinary!



PERF

We're on the web:
<http://www.perf.org/>

The Petroleum Environmental Research Forum (PERF)* is a research and development joint venture, formed to provide a stimulus to and a forum for the collection, exchange, and analysis of research information relating to the development of technology for health, environment & safety, waste reduction and system security in the petroleum industry. PERF is a non-profit organization of Members which are corporations engaged in the petroleum industry that recognize the importance of a clean, healthy environment and are committed to support cooperative research and development. PERF does not itself participate in research projects but provides a forum for Members to collect, exchange, and analyze research information relating to practical and theoretical science and technology concerning the petroleum industry, and a mechanism to establish joint research projects in that field.

*The name Petroleum Environmental Research Forum and its acronym PERF are registered service marks

Letter from the Chair

Dear Members and Associates:

Thank you for all of your contributions in 1999, which was another remarkable year for PERF. You did an outstanding job that led PERF through the many challenges faced.

These were not trivial and included transformation to a global organization, the proposals of several cooperative joint industry projects, the mergers of four PERF member companies, and the motivation of the non-PERF organizations to attend quarterly meetings and to actively participate in PERF joint research projects.

Not only did **Statoil** and **EniTechnologie** become active members, but **Elf Aquitaine** hosted a highly-successful, quarterly meeting in Lyon, France. Despite the mergers of our members "BP Amoco" and "ExxonMobil", and the general reduction in research and development funds, 15 projects were proposed and large cooperative projects such as "Removal of Soluble Organics (~ \$1.8 million)" and the "Development of Sub 10 vppm Ultra Low-NOx Burner for Fired Heaters (~ \$6 million)" were initiated.

PERF will face new and additional challenges in this new year. The Board of Directors is planning three quarterly meetings with relevant themes such as "Best Practices in Synthetic Drilling Mud Handling and Discharges" hosted by **Equilon Enterprises LLC/& Shell International E&P in March in Houston**, and "Reduction in Produced Water Discharges" hosted by **Statoil in June in Stavanger**.

Together with our web site, this quarterly newsletter will provide summaries of ongoing and proposed projects, and will address environmental issues that may arise in our industry. However, for PERF to grow and succeed, more project proposals need to become active projects. One way to achieve this is to increase the participation of PERF members and associates. Although PERF officers and board members are highly motivated and give freely of their time, they need more volunteers to share the planning activities. Please take it as your goal to propose and participate in new projects and to recruit new member companies.

Member Companies & Representatives

Amerada Hess	Robert Bartzokas
Aramco Services Co.	John Miller
BHP Research	Nancy Liberts
BP Amoco	Colin Grieves
Canadian Petroleum Products Institute (CPPI)	Adolfo Silva
Chevron Research and Technology	Sara McMillen
Conoco, Inc.	Stephen Jester
Elf Aquitaine	Elisabeth Adam
EniTechnologie	Renzo Boni
ExxonMobil	John Wilkinson
Marathon Oil	Teresa Monger-McClure
Oryx Energy	Patrick Grizzle
PetroCanada	Bruce Kennedy
Phillips Petroleum Company	William Prevatt
Shell Oil	Zara Khatib
Statoil	Per Gerhard Grini
Texaco, Inc.	Sheryl Maruca
Unocal	Todd Ririe

Best wishes for a prosperous and happy year! **Zara I. Khatib**