

Newsletter



February 2019

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Save the Date for the 99th PERF Meeting: Measurement Challenges in the Oil and Gas Industry

Mark your calendars now for the 99th PERF meeting to be hosted by **National Physical Laboratory** on **May 8-9, 2019** in **Teddington, United Kingdom**. Additional information on the agenda and logistics will be sent out through a separate meeting announcement once these are decided on.



National Physical Laboratory

Call for Volunteers on PERF Model Contract Update

PERF is embarking on its periodic update of its model joint research project contract (the "Model Contract").

The Model Contract is provided for the administrative convenience of members to reduce, if they desire, the administrative costs of engaging in a PERF project. There is no requirement that PERF members only conduct joint research on the terms set out in the Model Contract. The Model Contract may be used, modified, or completely abandoned as suits the needs of any subset of member and non-members engaging in any particular project, whether as a PERF project or otherwise.

The Model Contract has significantly consistently reduced the administrative overhead for projects in the past, but can only continue to do so if it meets the needs of the participating companies and the realities they face, and these of course change over time. The PERF Board therefore hopes as many members as possible will assign an attorney to participate in the updating process for the Model Contract.

If you wish to participate please designate your company's attorney that will be attending the contract conference calls by sending his or her contact information to Joe Gormley, the PERF attorney, at fgormley@gjblawfirm.com. A separate communication kicking off this effort will be sent once interested participants have been confirmed.



Member Companies

- BP
- Chevron
- ConocoPhillips
- Equinor
- ExxonMobil
- Hess Corporation
- Phillips 66
- Qatar Petroleum
- Repsol
- Saudi Aramco
- Shell
- Suncor
- Total
- Tullow

Associate Members

- AECOM
- DNV GL
- Ramboll
- Siemens
- SUEZ Treatment Solutions
- Tetra Tech

Highlights from the 98th PERF Meeting

The **98th PERF meeting** was held on **October 23 & 24, 2018** and was hosted by **ExxonMobil** at The Woodlands Resort in Houston, Texas. The meetings theme focused on Emerging Risk Issues. Day one of the meeting covered a variety of presentations around Per- and Polyfluoroalkyl Substances (PFAS) including their human health toxicity, ecotoxicity, regulatory issues and management of PFAS at industrial facilities. Case studies around water treatment, fate and transport and associated analytical challenges were also presented. The day concluded with an update on a variety of research programs including ongoing phase out work of C8 foam.

The second day focused on a diverse array of topics surrounding emerging issues around water and ocean management. These included presentations of case studies on produced water treatment, methodology for identifying organics in water, work on microplastics, applications of eDNA for environmental monitoring and many more.

In addition, updates were provided from the Research Managers Discussion Group (RMDG), Upstream Water Discussion Group (UWDG) and Waste Management Group (WMG)

Copies of the presentations given can be found on the [PERF Members Area](#). Note that you must be a PERF member to access these areas.

PERF Overview

The **Petroleum Environmental Research Forum (PERF)** is a research and development joint venture, formed to provide a stimulus to and 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 research information relating to practical and theoretical science and technology concerning the petroleum industry and a mechanism to establish joint research projects in the field.



Discussion Group Updates

External Group Liaisons

- American Petroleum Institute
- Argonne National Laboratory
- Battelle
- Centre of Documentation, Research and Experimentation
- U.S. Department of Energy
- Electric Power Research Institute
- Energy & Environmental Research Center
- Houston Advanced Research Center
- Lawrence Berkeley National Laboratory
- International Association of Oil and Gas Producers
- National Physical Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory
- RTI International
- Flemish Institute of Science and Technology
- SINTEF
- Water Environmental Research Foundation
- World Ocean Council

Update on the Research Managers Discussion Group

The Research Managers Discussion Group is a forum for research leaders from PERF member companies to steward and discuss progress of proposed PERF programs. The group meets periodically (3-4 times/year, generally via telecom) to review potential programs. The goal is to ensure a healthy pipeline of projects in PERF. This also provides awareness of potential programs among participating companies. For information, please contact Theresa Hochhalter, RMDG Chairperson, at theresa.j.hochhalter@exxonmobil.com.

Update on the Upstream Water Discussion Group

The Upstream Water Discussion Group champions research projects to optimize water management in upstream operations. The Discussion Group seeks and develops proposals with the potential to lower the cost of upstream water management, including produced water, while managing risks of reuse and/or disposal to the environment. Oil companies who participate in the Discussion Group have included Anadarko, Aramco, BP, Chevron, ConocoPhillips, ExxonMobil, Hess, Petrobras, Shell, and Total. Discussions are currently taking place to decide an individual to chair this group.

Update on the Waste Discussion Group

The Waste Management Discussion Group was established late in 2016 with the mission to provide strategic direction, guidance, and assistance to PERF members on critical and emerging environmental issues related to waste management. There are three main objectives of this group:

1. Identify and prioritize waste management environmental technology needs for PERF members
2. Help develop and facilitate resources to implement PERF programs related to waste management
3. Develop and maintain organizational competency to ensure the viability and sustainability of PERF organization

The discussion group has met last fall 2018 and agreed initially on a number of potential projects. Conference calls will be conducted as needed to discuss scope, progress and action plans. Contact Tamim Alburaikan (Chairman of the group) at tamim.buraikan@consultant.aecom.com or Carl Lam (Vice Chairman) cwlam@chevron.com should your organization decides to join the group.



Complete Projects

◆ Onshore Unconventional High TDS Produced Water Treatment

Ref. 2015-06

Company leading	Chevron	Starting Date	November 2017
Project type	Shared + Funding	Duration	Phase 1 – 9 months Phase 2- 6-9 months
Participating Companies	Saudi Aramco, Total, UNEERC	Final report expected in	Phase 1 - Complete Phase 2 - Complete
		For more information, please contact	Eve Zuo YiZuo@chevron.com

Brief Description:

Alternatives to deep underground injection for PW disposal are important for the industry. The objective of this project is to share company experiences, challenges, or barriers with onshore unconventional high total dissolved solids (TDS) produced water treatment (greater than 50,000 mg/L). The project will investigate and assess cost-effective, reliable, and sustainable technology alternatives for high-TDS produced water disposition.

The project will be executed in three phases:

- *Phase 1:* Completed sharing company experiences and challenges with onshore high TDS PW treatment
- *Phase 2:* Completed RFP request and selected a consultant to conduct comprehensive analysis for technology as well as regulatory landscaping and technology development areas
- *Phase 3:* If opportunities are identified, collaborative research or joint funding for a technology partner or research organization

Focus: Upstream



Active Projects

◆ Assessment of Commercial Airborne Methane Remote Sensing Capabilities Ref. 2014-06

Project type	Funded	Starting Date	November 2016
Leading Company	Chevron	Duration	Ongoing
Participating Companies	Phase 1: ExxonMobil Phase 2: TBD	Final report expected in	Phase 1 Complete December 2016 Phase 2: Project currently on hold. Assessing work completed by other JIPs before updating project plans
		For more information, please contact	Andrea Steffke Andrea.steffke@chevron.com

Brief Description: The goal of this project is to perform a review and assessment of the capabilities of currently available commercial airborne remote sensing systems for fugitive methane emissions detection and mapping. Phase 1 was a desktop evaluation of several potentially viable technologies, identified to meet the criteria for field-scale methane detection with required spatial resolution and sensitivity to detect medium to large emissions sources.

Phase 2 will include the following:

- Field tests to evaluate capabilities of prioritized airborne methane remote sensing technologies identified in Phase 1 technology review through a controlled release experiment (metered methane releases)
- In addition to deploying the airborne technologies, industrial standard ground-based measurements will also be deployed for comparison
- Meteorological and environmental data will also be collected to evaluate how those conditions impact the technologies detection limits
- Use data collected from the variety of sensors to evaluate and compare the detection capabilities of the different technologies
- Compare the results against one another to evaluate the pros and cons of the different platforms and sensors based on:
 - Sensitivity in detecting leaks across operating fields
 - Data processing methods/techniques/models
 - Associated uncertainties
 - Operational deployment requirements

Focus: Upstream

◆ Impact of Processing Unconventional Crudes on Refinery WWTP Operations Ref. 2014-12

Company leading	ExxonMobil	Starting Date	November 2014 - Currently finalizing project paperwork
Project type	Shared + Funding	Duration	+21 months
Participating Companies	Chevron, BP, Phillips 66, Valero, Suez, Tetra Tech	Final report expected in	3Q2019
		For more information, please contact	Michael Rabbani michael.rabbani@exxonmobil.com

Brief Description:

With opportunities to bring in unconventional crudes as refinery feedstock, there is a need to better understand the impacts on refining WWTP operations. Potential issues could arise in both primary treatment (emulsion formation) and secondary treatment (damaging for biomass, increased conventional pollutant loading). The objective of this project is to study experiences and issues observed with WWTP operations that were associated with processing unconventional crudes. Minimizing upsets and disruptions to the WWTP will lead to improved WWTP operations and compliance.

Focus: Downstream



Active Projects

Carbon-based injectates for groundwater treatment

Ref. 2016-01

Company leading	Chevron	Starting Date	January 2018
Project type	Shared + Funding	Duration	12 months
Participating Companies	BP, ExxonMobil, Phillips 66	Final report expected in	Sometime in 1Q2019
		For more information, please contact	Kammy Sra kammy.sra@chevron.com

Brief Description: The broad objective of the project is to conduct a series of bench scale tests in order to understand the application of carbon-based injectates to remediate groundwater impacted with petroleum hydrocarbons (e.g., BTEX compounds) under anaerobic conditions. More specifically, the multi-fold objectives of the project include understanding the balance between sorption and biodegradation kinetics, impact of temporal variability of PHC loading on performance, biofilm development, and microbial type and dynamics, impact on hydraulic conductivity, long-term behavior and longevity and use of novel monitoring tools.

Focus: Downstream

Firefighting Foam Human Health and Environmental Risks at O&G Operations

Ref. 2016-05

Project type	Funded	Proposal Date	May 2016
Leading Company	Chevron	Duration	12 months
Participating Companies	ExxonMobil, Shell, BP, Phillips 66, LASTFIRE	Final report expected in	Estimated by 2019 year end
		For more information, please contact	Amanda Bess, abess@chevron.com

Brief Description:

A mixture of Per- and Poly-fluorinated Alkylated Substances (PFAS) are found in aqueous film forming foams (AFFF) used for firefighting. Some of the long-chain PFAS and some of their degradation products are highly persistent in the environment, bioaccumulative in wildlife and humans, and have been linked to environmental and human health impacts. Data supports that short-chain PFAS are less bioaccumulative and less toxic suggesting that use of alternative C6-based (i.e., short-chain) AFFF will reduce overall risk to human health and ecological receptors. C6 purity-compliant PFAS AFFFs with low or no C8 contamination have recently (2015) become commercially available. Further, more fluorine free firefighting foam products are becoming commercially available and research is ongoing to better understand the performance, fate and effects of fluorine free foams. The nature of oil and gas operations necessitates the use of AFFFs to combat liquid hydrocarbon fires and use of AFFFs may result in unintended inputs of PFAS into the environment. The costs and feasibility of long-chain stockpile replacement across O&G operations are unclear and must be balanced with the risk reduction realized from switching to short-chain PFAS-based AFFFs or fluorine free foam. While scientific studies support that C6-PFAS AFFFs are less bioaccumulative and less toxic, a recent compilation of these data is needed to address uncertainty in the extent to which a switch to foams with C6-PFAS reduces risk.

This project aims to capture the state of knowledge of the fate, transport, and effects of short-chain PFAS-based AFFFs and fluorine free firefighting foams and identify limitations of and data gaps in the current studies or data sets. This critical review will address uncertainties regarding environmental risks associated with long-chain PFAS foam alternatives, inform future research opportunities, and support risk-based decision-making on foam replacement and management.

Focus: Upstream & Downstream



Active Projects

Health Effects Institute Energy Research Program Industry Group - (HIG)

Ref. 2018-01

Project type	Sharing	Proposal Date	January 2018
Leading Company	Chevron	Duration	To be determined
Participating Companies	BHP, Chevron, ConocoPhillips, ExxonMobil/XTO, Halliburton, Noble Energy, Schlumberger, Shell, Equinor and the American Chemistry Council	Final report expected in	To be determined
		For more information, please contact	Ziad Naufal, ZNaufal@chevron.com

Brief Description: The Health Effects Institute (HEI) has commenced a joint industry-government research initiative to assess potential community health impacts of onshore unconventional oil and natural gas operations. HEI is a nonprofit organization chartered in 1980 as an independent research institute to provide high-quality, impartial, and relevant science on the health effects of air pollution. The HEI-managed program represents a first-of-its-kind, comprehensive collaboration between the oil and gas industry and government to assess exposure to chemical stressors associated with onshore unconventional oil and natural gas operations and, the potential impact on public health.

The HEI research initiative has two parts (Part 1 has been defined and agreed to by the industry participants):

- **Part 1** of the research program will last for approximately one year and will result in at least one peer-reviewed publication appraising the existing health and exposure literature as well as two workshops to inform the literature reviews and frame research needs.
- **Future studies will be considered as warranted by the Phase 1 results**

Focus: Upstream



Project Proposals

↘ Analytical Methods for Low Level Detection of Polycyclic Aromatic Hydrocarbons (PAHs) and Sources in Petrochemical Wastewaters Ref. 2015-01

Company leading	Phillips 66	Proposal Date	Fall 2014
Project type	Sharing + funding		Phase 1- Project currently on hold and will revisit in Fall 2019
Interested Companies	ExxonMobil, Marathon, Shell, Hess	For more information, please contact	J Bryant Pollock, bryant.b.pollock@p66.com

Brief Description: Regulations on water borne discharges of sparingly soluble organics (e.g. PAH) are quickly outpacing the ability of analytical methods to detect these species. The viability of new analytical methods is unclear. Existing data on sources and treatment efficacy of PAH is sparse and the need for new treatment technology is unknown. Project goal is to evaluate emerging analytical methods with low detection limits to identify viable techniques for refinery waters.

Focus: Downstream

↘ Water Treatment Technology Catalogue for Environmental Risk Reduction Ref. 2016-10

Company leading	Shell	Proposal Date	September 2016 - currently in contracting
Project type	Sharing + Funding		
Interested Companies	BP, Chevron	For more information, please contact	Mathijs Smit, mathijs.smit@shell.com

Brief Description: Risk based assessment of (on and offshore) water discharges is becoming increasingly incorporated in emerging regulatory and company frameworks in addition to traditional monitoring of oil in water levels and permit regulated constituent levels. The objective of this project is to share company experiences and challenges on risk based assessment of produced water management and water technology performance efficiencies. Further, develop a protocol/ methodology to estimate performance efficiencies and their corresponding environmental risk reduction profiles.

The project will be executed in three phases:

- Phase 1: Sharing company experiences and challenges in risk-based assessment of water discharges for offshore produced water installations. Develop a protocol and scenarios for estimating the risk reduction efficiency of treatment technologies for offshore operations.
- Phase 2: Development of water treatment technologies catalogue with risk reduction profiles under varying offshore operating conditions
- Phase 3: Develop protocol and catalogue for onshore applications

Focus: Upstream + Downstream

↘ Environmental Health Impacts of Shift Work in the Oil and Gas Industry Ref. 2016-12

Company leading	Chevron	Proposal Date	December 2016 – Contracting ongoing
Project type	Sharing		
Interested Companies	Shell, BP	For more information, please contact	Heidi Erickson, heidi.erickson@chevron.com

Brief Description: Conduct robust analysis of relevant health endpoints and rotating and/or night shift work, potentially including, but not limited to, mortality, morbidity, cancer incidence, medical evacuations, and biomarkers of effect.

Focus: Upstream + Downstream



Project Proposals

◆ Surface detection of mercury

Ref. 2017-P4

Company leading	Chevron	Proposal Date	March 2017- Contract expected to be executed 1Q2019. In Person Workshop expected 2Q2019.
Project type	Sharing/industry guidance	For more information, please contact	Janelle Lewis, janellelewis@chevron.com
Interested Companies	Equinor, Shell, Woodside, ConocoPhillips, Phillips 66, Saudi Aramco		

Brief Description: Evaluating and identifying best practices for mercury surface detection (XRF and others) on equipment and waste in O&G industry

Focus: Upstream + Downstream

◆ Methane Detection – Remote Satellite Detection

Ref. 2017-P11

Company leading	National Physical Laboratory (temporary)- Project will be able to move forward pending having another member company sponsor it. Discussions ongoing.	Proposal Date	April 2017 - Feedback will be gathered from interested members on the project to determine industry need and an update on the project presented during the May 2019 PERF meeting at NPL
Project type	Sharing + funding	For more information, please contact	Fawzi Abou-Chahine, fawzi.abou-chahine@npl.co.uk
Interested Companies	Chevron, ExxonMobil, Total, ConocoPhillips		

Brief Description: Evaluate effectiveness of using existing satellite infrastructure to remotely detect methane emissions

Focus: Upstream



Project Proposals

◆ Benchmarking & Investigation of the Most Efficient Hydrocarbon/Crude Oil Tank Cleaning Method

Ref. 2017-P12

Company leading	Saudi Aramco	Proposal Date	October 2017
Project type	Sharing		
Interested Companies	Chevron	For more information, please contact	Tamim Al-Buraikan, Tamim.buraikan@consultant.aecom.com

Brief Description: One of the major sources of hydrocarbon waste is crude oil or refined products tank bottoms. Manual skimming and dig and haul has been the practice for tank owners/operators during T&I events. This waste must be recovered, where possible, as per the waste management hierarchy. This proposal aims to survey and benchmark all proven methods practiced by the oil and gas companies for cleaning crude oil tanks. The proposal covers both upstream and downstream operations and the scope includes a full assessment of the identifies methods/Technologies from operational, economic, environmental and safety aspects.

Deliverables:

- Phase 1: Identify cost effective Hire a contractor to Identify all proven methods, practices and technologies that recover valuable hydrocarbons from crude oil and refined products tank bottoms
- Phase 2: Write SPE paper about the result of this project.

Focus: Upstream & Downstream

◆ Refinery Wastewater Operating Expense Benchmarking

Ref. 2018-P3

Company leading	TBD	Proposal Date	October 2018
Project type	Sharing & Funded		
Interested Companies	Chevron, BP, Shell, Phillips66, ExxonMobil	For more information, please contact	Currently looking for a company to lead this effort

Brief Description:

Many refinery effluent treatment plant engineers do not have information on whether their unit operating expenses are good or bad. Enable better focus on improving operating costs thru understanding how one's facility compares with others. Participants would share operating expense information through a third-party contractor, who will blind the info and add additional insights and analysis to the data.

Focus: Downstream



Project Proposals

↔ Biomass DNA PERF Project

Ref. 2018-P4

Company leading	Chevron	Proposal Date	October 2018
Project type	Sharing & Funded		
Interested Companies	Chevron, BP, Shell, Phillips66, ExxonMobil, Siemens	For more information, please contact	Fernando Almada Calvo, FAlmadaCalvo@chevron.com

Brief Description:

Many refinery effluent treatment plant engineers do not have information on whether their unit operating expenses are good or bad. Enable better focus on improving operating costs thru understanding how one's facility compares with others. Participants would share operating expense information through a third-party contractor, who will blind the info and add additional insights and analysis to the data.

Focus: Downstream

↔ Sewer Inspection and Repair

Ref. 2018-P10

Company leading	ExxonMobil	Proposal Date	October 2018
Project type	Funded		
Interested Companies	BP, Chevron, Shell, Total, Phillips66, ExxonMobil	For more information, please contact	Contact currently being identified

Brief Description:

With aging infrastructure and potential increase in regional inspection requirements, this program will investigate cost-effective technologies to proactively manage petrochemical sewers. Potential areas to investigate include sewer monitoring, remote sensing, acoustic inspections, and robotic repairs. The objective of this study is to identify potential technologies to be used in petrochemical sewer systems.

Focus: Downstream

If you and your company are interested in any of these proposals, please contact the project lead or the [webmaster](#) for more information.