

## **Oil Seepage into Surface Waters – A Chronic Problem in the Caribbean**

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*Presented at  
The 2008 CARILEC Engineering Manager's Conference, Jamaica*

In the Caribbean, oil seepage into surface waters is a chronic problem for the power industry. The seeps, originating from plant operations, not only present a safety hazard but also pose serious environmental threats to the fragile marine ecosystems vital to local economies. Considering that the seeps often migrate through complex hydrogeologic environments, remedies such as absorbent and containment booms only serve as temporary “Band-Aids” resulting in perpetual and escalating costs. Combating oil seeps into surface waters is therefore a serious challenge for the power industry.

To effectively address the seeps, EIC has developed a two-phased approach. The first phase entails preparation of a site conceptual model (SCM) which provides a greater understanding of the seepage hydrodynamics. Based on available data, the SCM typically includes: a chronology of known spills; potential release source(s); horizontal and vertical extent of the oil plume(s); subsurface hydrogeology; plume migration pathways; identification of potential receptors; and an assessment of the overall threat to human health and the environment. Fingerprint analysis is often used to identify the source(s) of spills and account for migration from on-site and off-site sources. In most instances a tidal study is useful in understanding the effects of water level fluctuations.

During the second phase, responsible parties would terminate any on-going release(s) and implement an optimized remedial program to capture the oil up-gradient of the seepage point. Conventional remedial technologies are often ineffective in achieving this objective – especially in heterogeneous and anisotropic environments. Utilizing the data obtained from the SCM, EIC is capable of applying unique remedial tools to reach remedial end points thus eliminating perpetual liabilities. These tools are also designed to optimally recover oil with efficiencies greater than 99% oil-water ratios even in fluctuating water table environments. In some instances, an interim remedial approach may be implemented to address the immediate threat while the development of a site conceptual model is in process.

Numerous case studies in the Caribbean and other geographic regions will be reviewed to provide the most diverse perspective on oil spills and remedies. In rising energy costs, addressing oil spills effectively will not only reduce perpetual liabilities but also eliminate loss of valuable inventory. Additionally, unique remedial tools drastically reduce life cycle costs and provide a means of recycling the recovered product at a profit.



- EIC is an associate member with CARILEC.
- The paper has not been previously presented at any conference.
- The paper will be presented utilizing Microsoft Power Point software.
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Mr. Raj Mahadevaiah is President and CEO of Environmental International Corporation - an environmental engineering firm headquartered in the Atlanta metro area and is an associate member of CARILEC since 2004. Mr. Mahadevaiah has a M.S. degree in Civil Engineering (Groundwater Emphasis) from the University of Oklahoma, USA. Also, he is a registered professional engineer in over 13 states within the USA. Over the last 24 years, Mr. Mahadevaiah has developed expertise in conducting, environmental assessments and remediation, project management, and litigation support at over 200 sites in the North America, The Caribbean, The Middle East, South Asia, and other nations world-wide. At numerous sites, he has conducted multimedia due diligence and compliance audits for ISO 14001-related projects involving air, surface water, soil, groundwater, hazardous waste, and noise issues at various facilities. He has designed, implemented, operated, and maintained remediation systems at petrochemical storage and distribution facilities, public and private electric utilities, refineries, conveyance facilities, superfund sites, landfill, RCRA sites, and other hazardous waste facilities. At several sites, Mr. Mahadevaiah has critically evaluated existing remediation systems and developed cost-effective alternatives. He also developed telemetry-based remediation systems to manage remote sites in the Caribbean. In addition, he has solved environmental puzzles from multiple sources, during litigation support, and successfully served as an expert witness in trials for industrial, insurance, and law firms. Apart from over a dozen technical papers presented at various locations worldwide, Mr. Mahadevaiah has also served as a panelist representing the Electric Utility Industry concerning "The RCRA Reauthorization Bill proposed by the US Congress," at the Air and Waste Management Conference held in Vancouver, British Columbia. As an associate member of CARILEC, he has also actively presented various technical papers at the engineers and CEO conferences.

