

Operation and Maintenance Considerations for Hydrocarbon Remediation Systems

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One of the most significant long-term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, API member companies have developed a positive, forward looking strategy called STEP: Strategies for Today's Environmental Partnership. This program aims to address public concerns by improving industry's environmental, health and safety performance; documenting performance improvements; and communicating them to the public. The foundation of STEP is the API Environmental Mission and Guiding Environmental Principles. API standards, by promoting the use of sound engineering and operational practices, are an important means of implementing API's STEP program.

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The members of the American Petroleum Institute are dedicated to continuous efforts to improve the compatibility of our operations with the environment while economically developing energy resources and supplying high quality products and services to consumers. The members recognize the importance of efficiently meeting society's needs and our responsibility to work with the public, the government, and others to develop and to use natural resources in an environmentally sound manner while protecting the health and safety of our employees and the public. To meet these responsibilities, API members pledge to manage our businesses according to these principles:

- To recognize and to respond to community concerns about our raw materials, products and operations.
- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly appropriate officials, employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters and others in the safe use, transportation and disposal of our raw materials, products and waste materials.
- To economically develop and produce natural resources and to conserve those resources by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health and environmental effects of our raw materials, products, processes and waste materials.
- To commit to reduce overall emissions and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and others in creating responsible laws, regulations and standards to safeguard the community, workplace and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport or dispose of similar raw materials, petroleum products and wastes.



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Manufacturing, Distribution and Marketing Department

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Operation and Maintenance Considerations for Hydrocarbon Remediation Systems

SECTION 1—INTRODUCTION

Limited guidance is currently available regarding operation and maintenance (O&M) procedures necessary to achieve and maintain optimal performance of petroleum hydrocarbon remediation systems. O&M is extremely critical in optimizing effective system performance. Costs for O&M can vary significantly depending on the type of system and the operating environment. Since long-term O&M costs can be the most expensive item associated with a corrective action project, it is important to consider O&M requirements when selecting remediation technologies and to plan and execute routine O&M procedures. API Publication 1628E addresses routine O&M procedures, rehabilitation, troubleshooting, and comparisons that are useful as guidance in selecting appropriate remediation and treatment systems for removal of Light Non-aqueous Phase Liquids (LNAPL) and for remediation of groundwater and soil containing concentrations of chemical(s) of concern above site target levels.

1.1 Common O&M Problems

Typically, O&M problems can be linked to one of three major categories; (a) inadequate routine monitoring/adjustment, (b) the physical environment within which the system is exposed, and (c) poor system design. Any of these factors can result in a significant increase in costs associated with O&M, which can often be prevented.

Routine O&M monitoring and system adjustment can provide for optimal operation of hydrocarbon remediation systems. Common problems associated with inadequate routine evaluations include the following:

- a. Loss of plume containment.
- b. Inefficient recovery of LNAPL.
- c. Water discharge violations.
- d. Other permit violations.
- e. Excessive power usage and utility costs.
- f. Extended remediation time.
- g. Changing regulatory requirements.

In many cases, the physical environment in which the remediation equipment and systems are exposed can cause major O&M problems. When these conditions are persistent, O&M requirements become more difficult and complex, and associated costs escalate accordingly. Examples of the more common problems associated with the physical environment include the following:

- a. Temperature/weather extremes.
- b. Inorganic scaling.
- c. Iron bacteria and other biofouling.
- d. Security problems.

O&M considerations should be incorporated during system design in order to select the most appropriate system for meeting the specific conditions of a particular site. Examples of design issues that can affect O&M include the following:

- a. Withdrawal and/or treatment approach not suited to site;
- b. Incorrect pump sizing.
- c. Equipment not compatible.
- d. Poor well design.

1.2 O&M Planning

Considering the preceding discussion, proper planning of O&M considerations during conceptual and detailed system design is critical for optimizing system performance and cost-effectiveness. The key to successful planning for system O&M lies with developing basic guidelines and consistency. During design, the following basic guidelines should be considered and incorporated into an organized O&M plan:

- a. Identify O&M requirements and potential problems.
- b. Develop an O&M data collection checklist.
- c. Establish O&M frequency.
- d. Develop a plan for routine data evaluation.
- e. Compare O&M data evaluation with design criteria.
- f. Modify system operation based on the preceding comparison.

The following sections of this publication provide general guidance that will be useful for preparing O&M plans and implementing O&M programs. Guidance is provided concerning routine O&M data collection/evaluation criteria for LNAPL recovery systems, groundwater recovery systems, soil remediation systems, and groundwater and air treatment systems. Correction of maintenance problems, including rehabilitation and troubleshooting guidelines for recovery and treatment systems is addressed. Finally, a comparison of O&M requirements and the level of effort for different remedial approaches is presented. This information will be particularly helpful in designing systems to reduce long-term O&M costs.