

DEPLOYING P2/WMIN PRACTICES DURING ENVIRONMENTAL RESTORATION AT DOE SITES: AN INTEGRATED-INTERNET-INTERACTIVE (I³) APPROACH

Michael A. Krstich
Environmental Management Solutions
Governor's Pointe
4660 Duke Drive, Suite 300
Mason, Ohio 45040
(512) 697-6682
mak@fuse.net

Michael J. Gresalfi
Oak Ridge National Laboratory
12800 Middlebrook Road, Suite 201
Germantown, MD
(301) 916-1136
i32@ornl.gov

Pete J. Yerace
Department of Energy
Fernald Environmental
Management Project
Fernald, Ohio
(513) 648-3161
pete.yerace@fernald.gov

Katherine L. Yuracko
Oak Ridge National Laboratory
1060 Commerce Park
Oak Ridge, TN
423/241-4283
yurackokl@ornl.gov

ACKNOWLEDGEMENTS

Kent Hancock (DOE EM-77), Dale Pflug (ANL – TechCon), Mike Hightower (SNL – ITRD), Annette Gadchett (EPA – SITE), Lisa Burns and Bob Fleming (IT Corp. & DOE EM), Christine Goddard and Ana Gonzalez (IT Corp. & DOE ORO),

ABSTRACT

Driven by the need to reduce cost, schedule and scope of work during ER projects, DOE has taken an integrated-Internet-interactive (I³) approach for deploying pollution prevention and waste minimization (P2/WMin) practices during Environmental Restoration (ER). This approach has combined a number of technical support tools, programs and organizations into a P2/WMin ER Toolbox that supports an integrated approach for decommissioning and remedial action projects that is Internet driven.

Two primary tools created by DOE during the past few years are the *Pollution Prevention / Waste Minimization Users Guide for Environmental Restoration Projects: Decommissioning and Remedial Actions* (Users Guide) and the *Life Cycle Analysis: Decision Methodology* (LCA). The Users Guide is a user-friendly tool with guidelines and worksheets that direct the integration of P2/WMin practices into planning and sequencing of ER projects. The Life Cycle Analysis (LCA) framework and template, incorporating the Decision Methodology, has been developed to help decision-makers to make and subsequently defend their decisions. The LCA is a process of identifying and assessing all of the impacts (benefits and costs) that result from a course of action over the entire period of time affected by the action. Additional P2/WMin tools recently completed, *P2/WMin Training Modules for ER Personnel* and *ER P2 Information Tracking System* (ERP2IMS) support the evaluation and tracking of P2/WMin opportunities.

P2/WMin opportunities are translated into deployment opportunities via a number of Internet-driven programs and tools. The Argonne National Laboratory-based TechCon program and the Innovative Treatment Remediation Demonstration (ITRD) program, based out of Sandia National Laboratory, support the deployment of treatment technologies for ER projects. Additional programs such as the Interstate Technology and Regulatory Cooperation (ITRC) and the EPA Superfund Innovative Technology Evaluation (SITE) programs, and tools such as the *Adaptive Sampling and Analysis Programs* and the *Authorized Release Protocol* further support technology-driven P2/WMin opportunities.

This I³ process draws upon the interactive capabilities available via the Internet for each of these programs and tools. The capability to implement and expand P2/WMin opportunities and technology deployment for ER projects is driven by this I³ approach. The ability to interactively use and access resources that are specific to any ER project, waste stream, or technology provides all DOE sites with the most up-to-date capabilities for implementing P2/WMin practices.

INTRODUCTION

Driven by the need to reduce cost, schedule and scope of work during ER projects, DOE has taken an integrated-Internet-interactive (I³) approach for deploying pollution prevention and waste minimization (P2/WMin) practices during Environmental Restoration (ER). This approach has combined a number of technical support tools, programs and organizations into a P2/WMin ER Toolbox that supports an integrated path forward for decommissioning and remedial action projects that is Internet driven.

Over the past five years the DOE Environmental Management (EM) program has developed an array of tools and programs to facilitate the deployment of P2/WMin opportunities into ER projects. For the most part, these tools and programs have functioned autonomously. In some cases, select tools and/or programs may have been brought together for a specific project. However, the capability of project personnel to access these tools and programs has been somewhat limited, either due to the lack of knowledge of their existence or the ability to access them.

During this same five years, the Internet has grown to become the primary medium for communication and transfer of information. In the first half of this decade, browsers such as MOSAIC and Netscape were first made available for accessing information on the Internet. Since then, Netscape and most recently Microsoft Internet Explorer have become the primary Internet browsers. With the growth of the Internet has come the availability of information on the Internet and the growing presence of Web Sites housing this information. The DOE has seized this opportunity by establishing Web Sites for each of its sites, tools and programs.

Building upon this unprecedented technical revolutionary development, the DOE-EM has also seized the opportunity to use the Internet to facilitate its effort for deploying P2/WMin activities into ER projects. DOE-EM has initiated a strategic approach for bringing together these tools and programs into a P2/WMin ER Toolbox. The primary objective of this toolbox is to give project teams the opportunity to select those tools and/or programs that will add value to their ER project via savings in cost, scope and/or schedule.

The toolbox was initially introduced at the 2nd Annual DOE Ohio Operations P2/WMin Workshop (August 14-15, 1998). The workshop brought representatives of tools and programs together with ER project personnel from the five sites within the DOE Ohio Field Office (OFO). The unique aspect to this workshop was that each tool and program was interactively available on the Internet. The ultimate objective of the workshop was to deploy one or more of these tools and/or programs in support of developing P2/WMin opportunities at an ER project at each of the five sites.

This paper describes the first developmental phase of the P2/WMin ER Toolbox. This phase of development is the product of the Ohio Operations workshop. Although, not all tools and programs that might positively impact the deploying of P2/WMin activities are described, the nucleus for the toolbox is comprised of the tools and programs described in this paper. The first objective of this paper is to describe the current tools and programs contained within the P2/WMin ER Toolbox so that the toolbox will grow, encompassing more tools and programs that are interactively available on the Internet. The second objective is to inform ER project personnel how to access these tools and programs and evaluate whether they can positively impact deployment of P2/WMin activities for their own projects.

P2/WMIN PROGRAMS AND TOOLS

The P2/WMin Users Guide for Environmental Restoration Projects: Decommissioning and Remedial Actions (<http://www.doe.gov/p2wmin/home.html>)

The Users Guide is a user-friendly tool with guidelines and worksheets that direct the integration of P2/WMin practices into planning and sequencing of ER projects. The Guide details a step-by-step approach for incorporating P2/WMin practices into a project's documentation and subsequent activities. The Guide provides project managers, project engineers, P2 coordinators, program planners, contract representatives, procurement specialists and other personnel involved in a site's ER activities with a valuable tool for evaluating where and how P2/WMin practices can be incorporated to benefit their projects.

The organizational structure of this Users Guide draws upon the knowledge of P2/WMin experts, both within and outside the DOE complex, that have been routinely involved in ER projects. Their understanding of the potential to minimize the amount of waste resulting from ER activities has been captured in the Users Guide and translated into a series of opportunities. Project personnel can assess these P2/WMin opportunities by completing the worksheets provided throughout the Users Guide.

The capability to implement and expand opportunities for ER projects is driven by the interactive design of the Users Guide. This design is facilitated by the Guide's accessibility via the Internet. The ability to interactively use the Guide and access case studies specific to a project, waste stream, or technology provides the users the most up-to-date information on the implementation of P2/WMin practices, and the ability to provide suggestions or recommendations expanding the knowledge base of the Guide.

The Users Guide is currently available on the Internet. The Web site for the Users Guide has facilitated its accessibility and expanded its deployment during ER projects. The development of hypertext links within the Guide has allow the user to interactively work within the Guide, and crosswalks the user to exiting Web

sites containing case studies and support documents. The Web site is designed to provide a highly interactive Users Guide that includes inputs from worksheets and forms creating a decision-tree analytical tool designed to reduce the time necessary for project team personnel to evaluate P2/WMin opportunities for specific ER projects.

Life Cycle Analysis – Decision Methodology (<http://ats.ornl.gov/lca>)

A decision-aiding framework based on life cycle analysis (LCA) has been developed to ensure that decisions take into consideration all-important impacts. Too often, decisions are made based on shortened financial goals, without considering the long-term impacts, environmental, health, and economics of those actions. The consequences of such short sightedness are all around us; LCA is a process to help us to avoid such mistakes in the future. Given the enormous scope of the ER work the DOE faces, we have a tremendous opportunity to avoid further insults to the environment through application of life cycle analysis principles.

Using the LCA decommissioning and decontamination (D&D) approach, the evaluation of material disposition alternatives explicitly includes environmental impacts, health and safety impacts, socioeconomic impacts, and stakeholder attitudes—in addition to engineering and economic criteria. Multi-attribute decision analysis is used to take into consideration the uncertainties and value judgments that are an important part of all material disposition decisions.

The LCA approach considers each of the alternatives on each of the relevant attributes in order to ensure that all effects are considered when making decisions and reduce the likelihood of unintended consequences. Use of the LCA D&D approach should lead to more appropriate selections of material disposition pathways and a decision-making process that is both understandable and defensible.

TechCon Program (<http://www.ead.anl.gov/techcon>)

TechCon is a Department of Energy (DOE) Program, based at Argonne National Laboratory (ANL), connecting DOE's site-specific environmental management needs with private industry capabilities and public sector experience. To facilitate the connection, TechCon solicits information from private industry and the public sector about solutions to specific remediation project opportunities within the DOE complex.

Commercial capabilities are available in the private sector to enhance cost performance and waste minimization of DOE ER projects. Commercial capabilities refer to products, systems, components and/or services available in the private sector and may be available through domestic and/or international vendors.

Generally, these vendors have a level of skill and experience associated with the specific capability they offer in the market place. Their skill and experience enables them to 1) reliably predict the level of performance for specific operating situations, 2) identify the necessary tests for estimating costs, and the results that are achievable.

TechCon, a Department of Energy (DOE) Program, has developed an Internet approach for connecting DOE's site-specific ER needs with private industry capabilities and public sector experience. This TechCon Internet approach solicits information from private industry and the public sector about solutions to specific remediation project opportunities within the DOE complex. Via TechCon's Web page DOE projects managers are able to provide project specific information to private industry. Subsequently, private industry is able to present their company's capabilities and project experience to the respective DOE remediation project team, or review submitted capabilities statements and project histories. The result of this Internet/Interactive (I/I) approach is the speed and accuracy in which the DOE can access the most qualified companies for specific project needs, resulting in a more streamline procurement process.

TechCon's most recent projects that have integrated ER needs with private sector capabilities via this I/I approach include: 1) INEEL Pits and Trenches Forum, 2) Mixed Waste Treatment at the FEMP, 3) High Explosives at the Pantex site, and 4) Hanford 100-N Area Groundwater Contamination.

Innovative Treatment Remediation Demonstration (ITRD) Program

(<http://www.em.doe.gov/itrd>)

The nations cleanup burden in terms of the number of sites and the associated cleanup costs continue to grow daily. Promising new treatment technologies are being developed in an attempt to reduce cleanup costs and accelerate site cleanups. Unfortunately, several barriers exist that have blocked the more widespread use of innovative remediation technologies. These barriers include regulatory and industry concerns of the lack of validated full-scale cost and performance data on new technologies and a lack of industry and regulatory familiarity with new technologies and their lack of involvement in innovative technology evaluations.

Sandia National Laboratory (SNL), as technical coordinator of the ITRD program, is responsible for forming technical advisory groups (TAG) composed of technical representatives from DOE and the national laboratories, EPA and its laboratories, user industries with similar problems, and state and federal regulatory agencies. The innovative technologies considered for evaluation are those that lack the cost and performance information that would otherwise permit their full consideration as remedial alternatives. These technologies have often shown promise in pilot-scale applications but have limited full-scale data.

Many projects are presented on the ITRD Web site in which the TAG have closely monitor the operations, treatment performance, and cost for treatment technologies, e.g., advanced physical separation, biotreatment, geostatistical sampling, soil washing. This cost and performance data for these projects provides the necessary full-scale operational and evaluation data to validate the performance of these new technologies. In turn, validation by the independent technical group ultimately accelerates the acceptance of the technology for use at other sites within DOE and across the country.

EPA Superfund Innovative Technology Evaluation (SITE)
(<http://www.epa.gov/ORD/SITE>)

The U.S. Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) Program was established by EPA's Office of Solid Waste and Emergency Response and the Office of Research and Development (ORD). The SITE program was established in response to the 1986 Superfund Amendments and Reauthorization Act, which recognized a need for an "Alternative or Innovative Treatment Technology Research and Demonstration Program." The SITE Program is administered by ORD National Risk Management Research Laboratory in the Land Remediation and Pollution Control Division (LRPCD) headquartered in Cincinnati, Ohio.

The SITE Demonstration Program encourages the development and implementation of (1) innovative treatment technologies for hazardous waste site remediation and (2) monitoring and measurement.

In the SITE Demonstration Program, the technology is field-tested on hazardous waste materials. Engineering and cost data are gathered on the innovative technology so those potential users can assess the technology's applicability to a particular site. Data collected during the field demonstration are used to assess the performance of the technology, the potential need for pre- and post-processing of the waste, applicable types of wastes and waste matrices, potential operating problems and approximate capital and operating costs.

At the conclusion of a SITE demonstration, EPA prepares an Innovative Technology Evaluation Report, Technology Capsule, and Demonstration Bulletin. These reports evaluate all available information on the technology and analyze its overall applicability to other site characteristics, waste types, and waste matrices. Testing procedures, performance and cost data, and quality assurance and quality standards are also presented.

Interstate Technology and Regulatory Cooperation
(<http://www.westgov.org/itrc>)

The Interstate Technology & Regulatory Cooperation (ITRC) Working Group was created through the Western Governors Association to expedite the use of innovative hazardous waste and remediation technologies. Currently the ITRC has expanded to include more than 25 states, three federal partners, stakeholders, and two state associations. Through these mechanism, the ITRC develops guidance documents intended to help regulatory staff conduct an expeditious review of the use of a specified technology and to help technology developers/vendors collect performance data that can be used to support regulatory approval.

The ITRC:

- Provides a forum for states to exchange technical information;
- Creates a network of state contacts to promote the use of innovative technologies;
- Identifies interstate barriers to the deployment of technologies;
- Benchmarks state perspectives about innovative technologies; and,

- Develops consensus among state regulators, with input from industry and public stakeholders, on technical regulatory aspects of using innovative technologies.

Pollution Prevention and Waste Minimization Training Modules for Environmental Restoration Personnel

ER project managers and project teams are faced with the challenge of completing cleanup activities on an accelerated schedule with smaller budgets while continuing to meet milestones and regulatory requirements. Integrating P2/WMin techniques and principles into a project can help meet this challenge and achieve the vision of DOE's *Paths to Closure* by reducing project costs and enhancing project efficiencies.

This training and awareness program is designed to provide ER personnel with the P2/WMin tools to realize significant project savings. The complete P2/WMin training module is useful for every member of the ER project team. Background information is included for implementing P2/WMin into ER projects in every phase from planning to field implementation. The Project Managers Module is tailored for project managers and supervisors and provides a brief overview of P2/WMin in ER. The module focuses on current program drivers, tracking and reporting requirements, and P2 resources.

The objectives of the P2/WMin training are:

- Introduce project teams to the cost benefits of integrating P2/WMin into an ER project;
- Identify examples of P2/WMin techniques successfully integrated into ER projects;
- Provide specific P2/WMin tools and references;
- Encourage project personnel to assess waste reduction opportunities;
- Assist project teams in utilizing P2/WMin tracking and reporting systems;
- Explain the life-cycle costs for waste.

Environmental Restoration Pollution Prevention Information Management System (ERP2IMS)

The Environmental Restoration P2 Program has developed an innovative new database for the collection of P2 successes on all remedial action and decontamination and decommissioning projects. The database is being developed for DOE at its Oak Ridge Operations Office (ORO) in Oak Ridge, Tennessee with support from Sandia National Laboratory/New Mexico. The software provides the ability to capture, document, and report P2 successes so that they may be shared with all the DOE Sites. Oak Ridge Operations Sites, Sandia National Laboratory/New Mexico, Los Alamos National Laboratory and the National Metals Program are all participating in the pilot project. The Hanford Site and Rocky Flats may be added to the pilot project in the next month. The successful implementation of the pilot project may culminate in its use across the DOE complex.

The database, termed the ER Pollution Prevention Information Management System (ERP2IMS) is a Microsoft Windows-based Access 97 application that provides users with a centralized information management system where data consistency, reliability, security and maintainability

can be ensured. The system allows the user to track and document P2 strategies implemented on projects that result in cost savings associated with waste avoidance. The ER P2IMS consists of the following six components:

SUMMARY

The P2/WMin tools and programs described in this paper are not a totally inclusive listing of all tools and programs available to ER project teams. This partial listing reflects those tools that have been recently developed, such as the Users Guide and the LCA, and those programs that are technology driven. There are many additional tools and programs that can support an ER project team.

The construction of a P2/WMin ER Toolbox is a dynamic strategic approach that could provide project teams access to these tools and programs. The availability of the tools and programs is being driven by fact that they can be interactively accessed via the Internet. The other dynamic aspect to these tools and programs is that over the past year they have integrated their efforts, realizing that they contribute only a piece to the overall ER puzzle.

As we progress through this fiscal year (1999), we should see consolidation of these tools and programs into a more cohesive toolbox that is made available to the ER project teams on a more consistent basis. Our challenge is to create a network of tools and programs, make the project teams aware of their services, and provide as needed P2/WMin support. The return to DOE on supporting this strategy is the cost savings derived by project teams using these tools and programs for evaluating P2/WMin opportunities. The most attractive aspect to this approach is that most, if not all, of these tools and programs are available via the Internet.