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Opportunity Assessments: A Tool for Waste Minimization and Pollution Prevention

Kansas City Division

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ABSTRACT

Waste costs, liabilities, and regulations have been and are today growing concerns for government and industry. Pollution prevention opportunity assessments (PPOAs), formerly known in the Department of Energy as process waste assessments (PWAs), are tools which assist a site in achieving pollution prevention benefits. A PPOA is an important tool in a site's Waste Minimization / Pollution Prevention (WMin/P2) Program which can lead to the identification of pollution prevention opportunities, prioritization of pollution prevention activities, implementation of cost-effective pollution prevention practices and technologies, and creation of a baseline from which to set waste reduction goals and measure progress. PPOAs are applicable to any process or planned activity which has the possibility of generating waste -- this includes activities or projects that handle and manage waste after it has already been generated.

This presentation will provide an overview of PPOAs and their role in WMin/P2. It will describe the importance of bringing WMin/P2 into the planning stages of any process or project and how PPOAs can be used in Decontamination and Decommissioning and Environmental Restoration activities.

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Waste costs, liabilities, and regulations continue to be growing concerns for government and industry. Pollution prevention opportunity assessments (PPOAs) are a tool which proactively manages these concerns. The Department of Energy (DOE) has recognized the benefits of PPOAs in the DOE Waste Minimization Pollution Prevention Crosscut Plan[1] which states that the completion of opportunity assessments is of critical importance to DOE because they are an essential management decision-making tool that tell DOE:

(1) how much waste and environmental releases can be avoided,
(2) through what activity/process changes waste reduction can be achieved,
(3) what it will cost to implement a pollution prevention opportunity, and
(4) what will be the long-term savings in avoided waste management costs.

Before exploring what a PPOA is, a brief discussion of pollution prevention is necessary. Pollution prevention (P2) may also be referred to as waste minimization, source reduction, and/or recycling. The definition used in the DOE-sponsored PPOA training class is: "Pollution prevention reduces or eliminates material releases to air, water, and/or land." The benefits of pollution prevention include a proactive approach to waste management, compliance issues, and liability concerns; economic incentives; improved employee and public health; and environmental stewardship. Basically it all boils down to the phrase, "It's the right thing to do."

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What is a Pollution Prevention Opportunity Assessment?

A PPOA is a tool with the objective of identifying opportunities and methods to reduce or eliminate all wastes.[2] A material balance is performed around a specific process, project, or activity to qualify and quantify the materials entering and exiting. The exiting materials are separated into product, by-product, recycled, waste management (liquid and/or solid), and air release streams. Next, opportunities are identified and evaluated for their ability to eliminate or minimize the non-value-added output streams exiting the process. Therefore, the PPOA provides the basic tool for the identification of opportunities to eliminate/minimize the release of hazardous, nonhazardous, and radioactive wastes. This also provides a comprehensive baseline from which to measure P2 progress. The assessments also identify those processes, activities, and procedures that need to be improved or replaced to promote pollution prevention. Simply stated, PPOAs can be the foundation upon which comprehensive and effective pollution prevention rests.

Application of PPOAs to Nonroutine Activities

Opportunity assessments have commonly been completed on routine processes -- those which occur in a manufacturing plant. However, they can also be useful on nonroutine waste streams and at nonmanufacturing sites such as laboratories. By changing one's point of view, PPOAs can also be conducted on non-routine activities.

Some facilities or groups conduct activities on a project-oriented basis.[3] This means that only one waste-generating activity is done once. Two examples are an engineering laboratory that builds prototypes and a research laboratory conducting experiments. In each case the projects have unique chemical inputs, a defined length of time, and very specific activities.

Project-oriented activities can be assessed in two ways. First, a macro-level view, looking for consistent, general activities that occur from project to project or experiment to experiment, can be taken. Such activities can include material procurement, cleaning techniques, or personal protective clothing use. Common waste streams can be reviewed using a standard PPOA, resulting in facility-wide waste reduction ideas, such as implementation of procurement controls or procedure changes.

The second way to approach pollution prevention is to include it in the planning phase of the project, experiment, or activity. The project scope and plan would be reviewed in the same way an on-going activity would be reviewed, except on paper in PPOA form. The steps of the project can be mapped, inputs and outputs identified, and brainstorming done to identify options with the potential for waste minimization. Applicable, cost-effective methods to reduce waste can then be written into the project

plan. In addition, it is helpful to make sure that at least one member of the planning team is an advocate of pollution prevention.

The waste streams from Decontamination and Decommissioning (D&D) and Environmental Restoration (ER) are also often considered "nonroutine" and project oriented. Even when these processes are performed on waste, they generate additional, so-called secondary, waste and there are opportunities to minimize this waste. Decontamination and Decommissioning operations usually involve removal of buildings and equipment, while ER usually includes treating or removing soil and returning the land to its natural state. Therefore, these activities can be addressed on a macro level or in the planning phases. The common waste streams such as personal protective equipment, deactivation, decontamination debris from surface cleaning, and material inputs can be assessed or PPOAs can be completed during the planning phase.

An alternate way to consider D&D and ER waste streams is to view them as part of a long series of routine processes.

D&D Steps	ER Steps
Transition / Preliminary Planning	Preliminary Assessment and Scoping
Shutdown Plan	Characterization
Deactivation	Development of Alternatives
Shutdown Mode	Screening of Alternatives
Monitoring, Surveillance, and Maintenance	Detailed Analysis of Alternatives
Sampling and Characterization	Remedy Selection
Formal D&D Planning and Scheduling	Record of Decision
Readiness Review	Remedial Design
Project Close-Out	Remedial Action

An example is the D&D of buildings. If there are many buildings at a site selected for demolition, then the entire schedule can be viewed as a regular activity to be conducted multiple times. This perspective permits the consideration of equipment and initiatives which may only be cost effective when used on multiple projects, as well as develop lessons learned from one to another. Therefore, PPOAs should be applied to the entire site restoration program to determine common pollution prevention opportunities, since some opportunities may be economically feasible only when multiple projects are considered. By performing PPOAs on the routine sub-tasks within a D&D or ER project and revising these assessments as knowledge is gained, it is possible to continuously improve waste minimization activities.

Decontamination and decommissioning and ER projects are unique in that a large portion of the waste, commonly referred to as legacy waste, already exists. Since these activities involve the tearing down of structures or cleaning up of existing waste or structures, some people claim that no pollution prevention can be accomplished. However, extensive recycling opportunities with concrete and steel and other building materials are present. The key is to prevent as much secondary waste as possible (source reduction) and embrace recycling as an excellent and viable method for successful P2.

PPOA Methodology

The major steps involved in a PPOA are:

Planning and Organization,
Project / Activity Assessment,
    Project Description,
    Flow Diagram,
    Input/Output Summary,
Option Generation,
Option Evaluation, and
Final Report.

In order to perform a successful PPOA, all employees involved in the project must participate, most importantly the operators and workers with the operation and/or program experience. Employee activities can significantly affect the amount of waste generated, and therefore, they can contribute greatly to the assessment. Successful pollution prevention requires actions and ideas from everyone.

After organization, the project needs to be assessed or evaluated. The end result is baseline knowledge of the activity and both qualitative and quantitative measures of the inputs and the outputs associated with it. In order to develop this knowledge, a detailed understanding of the wastes generated and operations performed is required. The assessment should begin by examining information about the process, operations, and waste management practices. Tools such as flow diagrams and material balances are used to achieve this baseline knowledge.

Once the project steps and sources of waste generation are understood, the PPOA enters the creative phase. Following the collection of data and site inspections, the members of the team will have begun to identify possible ways to minimize waste or prevent pollution. Identifying potential options relies both on the expertise and creativity of the team members. Much of the requisite knowledge may come from their education and on-the-job experience; however, the use of technical literature, contacts, and other sources may also be pursued.