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WASTE MINIMIZATION MEASUREMENT AND PROGRESS REPORTING AT THE SAVANNAH RIVER SITE

by

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ABSTRACT

Westinghouse Savannah River Company is implementing productivity improvement concepts into the Waste Minimization Program by focusing on the positive initiatives taken to reduce waste generation at the Savannah River Site. Previous performance measures, based only on waste generation rates, proved to be an ineffective metric for measuring performance and promoting continuous improvements within the Program. Impacts of mission changes and non-routine operations impeded development of baseline waste generation rates and often negated waste generation trending reports. A system was developed to quantify, document and track innovative activities that impact waste volume and radioactivity/toxicity reductions. This system coupled with Management-driven waste disposal avoidance goals is proving to be a powerful tool to promote waste minimization awareness and the implementation of waste reduction initiatives. Measurement of waste not generated, in addition to waste generated, increases the credibility of the Waste Minimization Program, improves sharing of success stories, and supports development of regulatory and management reports.

INTRODUCTION

The Savannah River Site (SRS) is a key Department of Energy (DOE) facility, focusing on national security work; environmental and waste management activities; and economic development and technology transfer initiatives. Owned by the DOE and operated under contract by the Westinghouse Savannah River Company (WSRC), the complex covers 310 square miles near Aiken, South Carolina, bordering the Savannah River.

Waste Minimization and Pollution Prevention (WMin/PP) at the Savannah River Site is a continuous improvement process. Recall the basic elements of the cyclical continuous improvement model: Baseline process; Identify and implement improvements; Define performance expectations; Measure and evaluate performance; Repeat the cycle.

Obviously, the continuous improvement model breaks down if the measures and metrics chosen do not relate to performance goals. This paper addresses

improvements the SRS has made in aligning measures with program WMIN/PP performance goals.

TRADITIONAL PERFORMANCE MEASURES

The performance objectives of the SRS WMin/PP program are to eliminate unnecessary waste generation and maximize the life of SRS waste storage and disposal facilities through cost-effective source reduction, recycling, and volume reduction initiatives. The traditional measure used at SRS, and across industry, to gauge WMin/PP progress is the volume of waste generated and placed in Treatment/Storage/Disposal (T/S/D) facilities. There are several reasons for the widespread use of this measure:

> **Convenience** - The systems to track and measure waste generation were in place long before waste minimization became a focused initiative. Why develop new measures when we have one already?
>
> **Credibility** - Waste volume is not a subjective measure. The reliability of waste volume data is rarely subject to dispute and cannot be manipulated.

SRS WMin/PP program planners have concluded that the total waste volume, when used exclusively as a WMin/PP measure, is a poor barometer of program effectiveness. As stated, our WMin/PP performance objective is to eliminate waste, yet our only measure is the waste we fail to eliminate. Bowling provides an analogy; the performance objective is to knock down as many pins as possible and the performance measure is the number of pins knocked down. If we approached bowling in the same manner as waste minimization, the metric would be the number of pins left standing, i.e., a measurement of failure.

There are instances where measuring the amount of waste generated can be an effective indicator of WMin/PP progress. Specifically, when baselines permit accurate predictions of waste generation. You're familiar with the widget example where waste per widget can be calculated and used as a baseline. Waste minimization success can be concluded by measuring waste per widget, before and after waste minimization initiatives. In the utility industry, waste per outage can be an effective measure. This can be further illustrated with the bowling example. Even if we measured the pins left standing, we could draw conclusions about how well our performance was because we have a fixed baseline of 300 pins per game.

NEW PERFORMANCE MEASURES NEEDED

The nature of waste generating activities at the SRS, and across the DOE Complex, is changing. Production missions have all but been replaced with environmental remediation and D&D missions. Yesterday's production facility

has become today's waste. Volumes of this legacy waste, and secondary waste generated during cleanup, are predicted to spiral upwards. Budget uncertainty, land use issues, and evolving regulations make predictions of waste volumes, even on a short-term basis, extremely difficult. Utilizing total waste volume as a measure of WMin/PP effectiveness is fruitless; the measure bears little, if any, relationship to the process being measured. In the bowling analogy (last time, promise), our situation resembles a modified game where the number of pins available each frame or game changes unpredictably and we choose to measure our performance by counting pins we fail to knock down.

It should be intuitively obvious that if the objective of WMin/PP is to eliminate waste and pollution, then we should measure the amount of waste that is eliminated (WMin/PP success) versus the amount of waste generated (WMin/PP failure). In concept this is straightforward; the challenge is establishment of a data collection mechanism to support this measure. The SRS has deployed such a system to measure and quantify the impacts of WMin/PP initiatives.

IMPROVED MEASURE

A Pollution Prevention Activity Form (PPAF)[1] was developed to capture and quantify the impacts resulting from discrete WMin/PP actions. The Form is straightforward and requires little effort to complete. A copy of the PPAF, with instructions, is provided as Attachment 1. The intent of the PPAF is to document innovative pollution prevention activities being implemented at SRS. The PPAF helps fulfill regulatory and DOE reporting requirements for waste reduction activities, facilitates pollution prevention technology transfer, and provides a credible basis for WMin/PP cost savings calculations.

Use of the PPAF is being institutionalized at the SRS by mandating completion of the form, by the initiator of the WMin/PP action, in a Company level procedure. Instructions for Form completion are available and key personnel have been trained on proper completion. Further, the DOE has defined WSRC Cost Plus Award Fee (CPAF) goals for waste avoidance with the requirement that avoidance be documented on PPAFs. Since mid 1993, over 90 PPAFs have been submitted and verified to be accurate. Over 4770 cubic meters of solid low level radioactive waste avoidance has been documented representing a savings of $2M in waste disposal costs alone. In addition, almost 60,000 kg of hazardous and low level mixed waste was avoided due to WMin/PP actions. Use of the PPAF at SRS has been successful due to this bottom-up (procedures and training) and top-down (company Award Fee goals) approach.

To illustrate the value of collecting waste avoidance data, refer to Figure 1 which is a measure of total SRS solid waste (sanitary, hazardous, radioactive). The reductions in waste are dramatic, however, going back to the previous

discussion: are these reductions due to WMin/PP or are they simply a result of mission downturns?

Figure 2 shows the same waste generation data as Figure 1, plus an overlay of waste avoidance data extracted from PPAFs. This improved WMin/PP program measure clearly shows the impact WMin/PP has had on reduced waste generation rates.

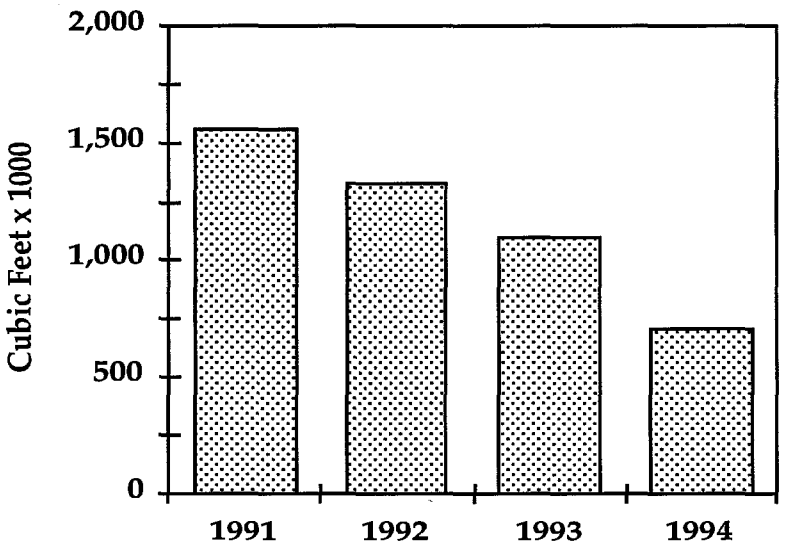

Figure 1, SRS Total Solid Waste Generation

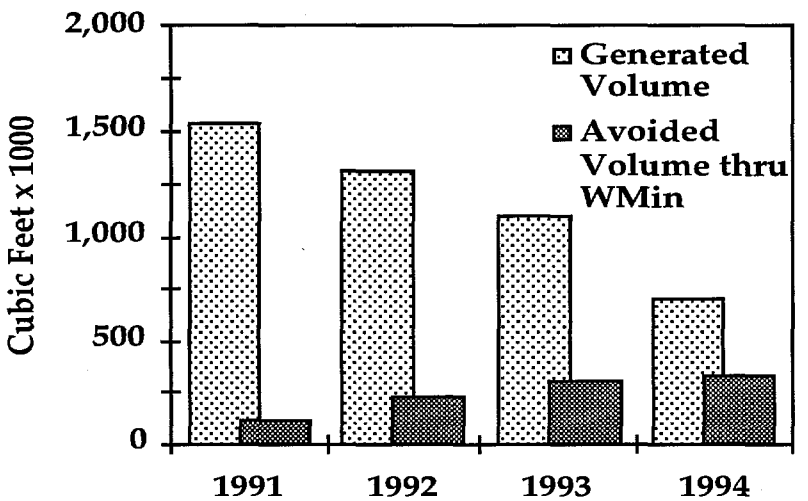

Figure 2, SRS Waste Generation and Waste Avoidance

CONCLUSION

The traditional WMin/PP performance measure of waste volumes cannot be used as the sole measure of WMin/PP program effectiveness. Measuring waste eliminated due to WMin/PP actions is a superior performance indicator. This tool facilitates cost benefit analyses, helps justify additional investment in WMin/PP, and strengthens program credibility.

ACKNOWLEDGMENT

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REFERENCES

1. SMITH, N.W., "Documenting Pollution Prevention Activities at the Savannah River Site," WSRC-MS-94-059, 1994.

ATTACHMENT 1

POLLUTION PREVENTION ACTIVITY FORM

rev. 4/93

(PLEASE COMPLETE BOTH SIDES OF THIS FORM)

SUBMITTED BY: _____ ORGANIZATION: _____

ADDRESS: _____ PHONE: IMPLEMENTATION DATE: _____

AFFECTED ORGANIZATION(S): _____

WASTE TYPE (check only one):

_____HAZARDOUS ____ MIXED ____ TRU ____ LLW

_____HIGH LEVEL _____SANITARY ____NPDES _____AIR

HAZARDOUS WASTE INDEX NUMBER (if Hazardous or Mixed waste stream): _____

POLLUTION AMOUNT PREVENTED:

_____(annualized) lbs / ft3. (circle one, use lbs for hazardous/mixed waste, cubic feet all other waste)

_____(calendar year) lbs / ft3. (circle one, use lbs for hazardous/mixed waste, cubic feet all other)

ACTIVITY OCCURRENCE (check only one): _____one time ____ continual _____other

PREVENTION DESCRIPTION (Explain, attach additional pages as needed)

OLD METHOD: _____

NEW METHOD: _____

BASIS FOR AMOUNT PREVENTED: _____

POLLUTION PREVENTION ACTIVITY FORM (BACK)

rev. 4/93

(PLEASE COMPLETE BOTH SIDES OF THIS FORM)

PREVENTION DESCRIPTION (Check those that apply)

SOURCE REDUCTION :

GOOD OPERATING PRACTICE

____ Management/personnel practices
____ Materials handling/inventory practices
____ Loss prevention
____ Waste segregation
____ Production scheduling
____ Procurement control

TECHNOLOGY CHANGES

____ Process changes
____ Equipment, piping, layout
____ Additional automation
____ Changes in operational settings

INPUT MATERIAL CHANGES

____ Raw material purification
____ Raw material substitution

PRODUCT CHANGES

____ Change in product design
____ Product conservation
____ Change in product composition

RECYCLING:

USE AND REUSE

____ Return to original process
____ Raw material substitute for another process
____ Excess

RECLAMATION

____ Processed for resource recovery
____ Processed as a by-product

TREATMENT :

____ Compaction ____ Evaporation ____ Incineration ____ Stabilization

IMPLEMENTATION COSTS (check only one, provide bases, & attach supporting documentation):

____ 0 - $1K ____ $1K - 10K ____ $10K - $50K ____ over $50K

Bases for estimate: _____

_____

_____

_____

_____

ESTIMATED COST AVOIDANCE (completed by Waste Min. Group)

SUBMITTED FOR QISS/HARD DOLLAR SAVINGS (YES/NO):____ QISS NUMBER:

_____

REVIEWED BY:

PP/WMT Member: _____ Date: _____

Waste Min Group: _____ Date: _____

PLEASE RETURN FORM TO WASTE MINIMIZATION GROUP, 705-3C

Pollution Prevention Activity Form Instructions

Waste generators shall document new waste minimization initiatives/activities and submit them to the Waste Minimization Group (WMG). They may be submitted as generated or along with a quarterly report. This documentation is required by DOE-SR in order to take credit for waste reduction accomplishments. The WMG will compile, review, and summarize the documentation and quarterly reports to quantify waste minimization in the annual waste minimization reports to DOE, the state of South Carolina, and EPA.

Information should be documented on the "Pollution Prevention Activity Form." This form, or equivalent, must be submitted when an activity has been implemented with Waste Minimization potential. The process for completing this form is explained below.

1. Please provide a contact person in the "submitted by" entry. The "organization" entry should be the department or group of the submitter. The "address" and "phone" entries are those of the submitter. The "implementation date" is the date when the pollution prevention activity was implemented. The "affected organization" entry helps identify facilities/departments that may be impacted by the pollution prevention activity, and should prompt the submitter to consider if the activity would affect other organizations.

2. The "type of waste" entry should be checked and the "hazardous waste index number" provided, if it is a hazardous or mixed waste.

3. The "annual pollution amount prevented" entries are an important part of this form as they are used to arrive at a site total pollution amount prevented when all forms are totaled at year end. Provide both an annualized amount (projected amount of waste reduced over a 12 month period upon full implementation of the activity) and the amount reduced in the calendar year of implementation for each waste stream.

5. The "activity occurrence" entry identifies if the savings was from a "one time, continual, or other" occurrence. A "one time" occurrence is explained as a single event where pollution prevention was realized (e.g., establishing a recycling contract for a specific group of items no longer in use on site.) A "continual" occurrence realizes pollution prevention over an extended time period once implemented (e.g. change in process, or establishment of a recycling contract for a product that continues to be used on site). An "other " occurrence realizes pollution prevention that does not meet either of the first two criteria. A typical example of this occurrence would be a temporary change in process.

6. "Prevention description" entries for "old method" and "new method" require the submitter to describe the differences in the old method and the new method. In addition, the submitter is required in the "basis for amount prevented" entry to provide supporting information on how the annual pollution amount prevented was derived.

7. "Prevention description" entries for "source reduction, recycling, and treatment" requires the submitter to designate a specific pollution prevention activity type.

8. An estimate of implementation costs are needed to assist WMG in determining the estimated cost avoidance for each prevention activity. The submitter should check one of the four ranges of "implementation costs", provide a brief summary to support this cost, and attach copies of supporting documentation.

9. WMG will complete the "estimated cost avoidance" based on all information provided. The variable life cycle waste cost report prepared by the AP&A group of SRTC will be the primary basis for analysis.

10. The submitter should indicate on the form if this activity has been submitted for "QISS/Hard Dollar Savings." If it has not been submitted and WMG believes it warrants submission, the submitter will be notified with a recommendation to submit this for QISS/Hard Dollar Savings.

11. Once work has been implemented and potential savings as reported on the form were/are being achieved, the responsible Pollution Prevention/Waste Minimization Team (PP/WMT) member and a WMG member will sign off as reviewers of this pollution prevention activity.

12. Copies of the completed, approved forms will be returned to the submitter for facility files and maintained by the WMG to support site reporting.