

## LEARNING THE ABC'S: ACTIVITY BASED COSTING IN WASTE OPERATIONS

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### ABSTRACT

The United States Department of Energy (DOE) is facing a challenging new national role based on current world events, changing public perception and awareness, and a legacy of wastes generated in the past. Clearly, the DOE must put mechanisms in place to comply with environmental rules, regulations, and good management practices so that public health risk is minimized while programmatic costs are controlled. DOE has begun this process and has developed a Five-Year Plan to describe the activities necessary to comply with both cleanup, or environmental restoration, and waste management of existing waste streams. The focus of this paper is how to best manage the treatment, storage, disposal, and transportation of waste throughout the DOE weapons complex by using Activity Based Costing (ABC) to both plan and control expenditures in DOE Waste Management (WM). The basics of ABC, along with an example, will be detailed.

### BASICS OF ABC

Activity Based Costing (ABC) is a method of cost planning and cost accounting that differs significantly from a traditional budget approach (1). The cornerstone of ABC is the focus on each activity and groups of activities required to complete a product or process. The introduction of the activity is an outgrowth of the philosophy that activities consume resources, and that these activities then constitute a process or product. The traditional budget approach links resources directly to product.

The basic characteristics of an activity are 1), a definable scope, 2) quantitative completion criteria, and 3), the relationships of that activity to others. Moreover, activities can be assigned fixed resources such as labor or subcontractors. Scope refers to the technical content of the work within an activity. From a traditional project standpoint the scope is usually well understood, and quite easy to quantify. As a brief example, the scope of work required to construct a sidewalk might read "build a concrete walkway 160 meters long following standard specification 120-12". The scope may contain more detail by elaborating on the specification, such as including remarks as to concrete finish, tolerances, and acceptable completion date. All of the details of scope are used to develop the quantitative completion criteria. To continue this example, the sidewalk is complete when it meets the specifications quantified in the scope (i.e., 160 m. X 1.3 m. wide X 15 cm. thick). If the scope simply read "construct a sidewalk", the boundary conditions (i.e. is it complete?) are not as easy to ascertain. The third activity feature is the relationship of an activity to others planned. To trod further on our sidewalk, the timing of that activity may in fact be critical. If, for instance, this activity was one of a larger set of activities to construct a building, the sidewalk should be placed later in the project, since heavy equipment could damage the new pour. It should occur prior to the opening of the facility, however.

The activity part of activity based costing is well understood as a required planning exercise in developing construction estimates and as a framework for cost control once the project begins (1,2). The concept of the Work Breakdown Structure (WBS) must also be introduced. The WBS provides a hierarchical framework in which activities are placed. The building has sub-components which may include exterior closure, electrical, landscaping, etc. The landscaping sub-activity may describe a lower level activity such as our now famous

sidewalk. The WBS, and for that matter ABC, are not just limited in practice to traditional projects (3). Activities and ABC are now replacing the traditional budgeting exercises on operations in both public and private business sectors (4).

As many organizations attempt to incorporate Total Quality Management (TQM) into their operations/organizations, it is apparent that ABC can supply the "feedstock" of measurable operations information into a TQM program. Product quality can be measured, while process quality is more difficult to quantify. Quality within TQM embodies the concept of efficiency, and therefore ABC may provide the best yardstick to measure process quality.

### ABC APPLIED TO DOE

The Waste Management budget in the DOE Five-Year plan identifies the waste management activities by the use of Activity Data Sheets (ADS's) (5). Each ADS covers a part of the WM program, and approximately 75% of the WM ADS's budgets are for ongoing operations. The rest of the funding (25%) is used to design and construct waste treatment, storage, or handling facilities at locations throughout the DOE complex. In summation, the ADS's within the Five-Year plan allocate billions of taxpayer dollars to support these environmental activities.

Within DOE, projects are controlled by structured cost/schedule control systems and are regulated by DOE Orders (e.g., 4700.1, 5700.2C) and federal, state, and local laws and regulations. The programs, or operations side of DOE are controlled by less formal management control systems but are subject to stringent environmental, safety, and health (ES&H) requirements. At the present time, no DOE order or mandate specifically calls for ABC as the basis for program planning or control.

Why is a new approach needed? The primary reasons for introducing ABC within DOE are cost justification, traceability, and consistency. The public is demanding accountability for public funds expenditures and are more concerned and educated about environmental areas. The question of "what do I get for my dollar?" is often asked and not easily answered. As budgets become increasingly tighter, competition for the scarce dollar will require intensive planning to show that monies are being expended within the scope of the mission and that value is achieved. The environmental area is extensively regulated and involves many different groups of concerned parties (e.g., Environmental Protection Agency,

states, tribes) that need to understand that their needs are met. ABC can assist in providing that consistency and quantified data.

### A TANK FARM

A tank farm is a series of storage vessels designed to contain liquid products or waste. Within DOE, a number of tank farms exist and are used in a comparable manner to private industry. The example tank farm (called TF-1) contains three tanks; two hold hazardous effluent and a third holds low-level radioactive wastewater. The facility has been in operation since 1988.

Currently, TF-1 employs 22 full time equivalents (FTE's). The staff performs numerous duties in the operation of the tank farm. A typical budget submittal would call for 6.7 million dollars for "continuity of operations". The scope justification read "continue operations of TF-1 using 22 FTE's, an increase of two FTE's from last year". This staffing plan goes all the way back to the fundamental split between ABC and typical budgets; here resources (FTE's) are feeding product (manage the tank farm).

This year, ABC was introduced to the tank farm manager. A top level mission statement was developed that quantified the planned storage types, and planned waste amounts. It was clear that the manager was the correct person to identify all the activities and sub-activities that occurred at the tank farm. It was also clear that the manager had planned to add two people in response to his perception of increased regulatory demands. The estimate basis for two people was unclear.

The WBS was developed as shown in Table I. The old WBS was considered to be one level deep (Element 1.0). The new WBS shows the hierarchical structure of activities and sub-activities down to level four. Only training is expanded to level four since that will be our example. Other level two activities with their corresponding sub-activities were developed.

TABLE I

WBS Description

WBS DESCRIPTION	WBS CODE	WBS LEVEL
TF-1 Continuity of Operations	1.0	one
Security	1.1	two
Training	1.2	two
Required Training	1.2.1	three
RCRA course	1.2.1.1	four
In-house ES&H	1.2.1.2	four
Desired Training	1.2.2	three
Tank Testing	1.3	two
QA Reviews/Reporting	1.4	two

Each WBS element has an associated activity dictionary. For required training, the description states that "this element contains all planned required training for TF-1 employees, including EPA, DOE, state, local, and company training". The next level shows an element called in-house ES&H (WBS 1.2.1.2). The scope here consists of two required three day

classes for all TF-1 employees on safety and evacuation procedures.

In order to estimate these activities, resources were first assigned. The testing and sampling (WBS 1.3) was planned to be conducted by an outside subcontractor. This impacted the scope of the security element since two security personnel are required as escorts at all times while the sub was on site. It was decided that all activities except for the testing and sampling areas would be conducted by the TF-1 group.

The basic unit for estimating the TF-1 activities is labor hours. The two required ES&H classes, since they required travel, used up 80 hours per person, or a total of 1,600 labor hours based on a twenty person group. The courses were free, but the trips cost \$1,000/trip/person or \$40,000. This activity now has quantified scope, cost, and duration.

Since the activities are now in hierarchal form, ownership is more readily defined. In this case, we hand off the entire training element to the Training Officer so that she owns the plan for TF-1 training. As records of attendance are kept, the plan is compared to the actual so that performance is monitored and control is exercised. A funding cut in the training area could first impact the desired training activities, but further cuts would impact the required training. With ABC, this can be identified as it occurs, and decisions can be made based on quantified data.

The example would continue with all activities fully planned for the upcoming planning period. The scope, durations, and costs are then "rolled up" to the TF-1 Continuity of Operations (WBS 1.0) level. This ABC planning approach provides traceability throughout.

### CONCLUSIONS

ABC is a method used to apply estimating and control rigor when needed to have better control over operations activities. DOE Waste Management is taking a proactive approach in implementing ABC across waste operations. As a reasonable response to planning program dollars and controlling activities, ABC will help DOE provide a better quality product to it's customers - the public.

### REFERENCES

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NOTE: The above paper is based on research performed under the auspices of the U.S. Department of Energy.