Enhancement and Modernization
of an Air Permit Management System:
Is It Worth the Effort?

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INTRODUCTION

The Clean Air Act Amendments of 1990 (CAA-90) was the most sweeping change the environmental regulation ever enacted. The diversity and magnitude of the areas that were identified in the CAA-90 has sent the professionals throughout the industry into a frenzy attempting to comprehend how and what is needed to comply. States have been diligently working to submit State Implementation Plan (SIP) to the Environmental Protection Administration (EPA) by November 15, 1993. Companies have been looking over their state counterpart's shoulders (and often times sitting beside them) hoping to gain knowledge of what their state will required of them, if their state's proposed SIP is approved by EPA. The acquired insight will be incorporated in the company's evaluation of their present Air Permit Management System (APMS) to see what enhancement or modernization will be required to meet the promulgation of their state's proposed SIP.

Martin Marietta Energy Systems, Inc., (Energy Systems) manages three large installations for the U.S. Department Energy (DOE) in Oak Ridge, Tennessee - Oak Ridge Y-12 Plant, Oak Ridge K-25 Site, Oak Ridge National Laboratory (ORNL). The Y-12 Plant shares technology with industries throughout the world.¹ This paper shows a process used at the Y-12 Plant to determine if the modernization of our Air Permit Management System was needed and ultimately whether the effort spent making such enhancements would produce sufficient results to justify such a project.

THE PROCESS

Any project or effort that requires a company to spend major time and money SHOULD have a documented plan. This provides all that are involved in the final decision a road map to understand the factors that were considered. This also eliminates duplication of effort. At Energy Systems we have a saying, "if it is not documented, it did not happen." If you have a documented plan and your final conclusion does not meet the expected result, your work can be reviewed to determine what assumptions or factors may have been in error. Following is an example outline of a plan that can be used to determine if your system needs to be modified.

- I. Developing and Documenting A Plan
- II. Evaluation
- III. Development
 - A. Planning and scoping system
 - Networking and using resources
 - Interface with EPA AIRS system
 - Interface with Tennessee Department of Environment and Conservation
 - Interface with other industry professionals
 - B. System Definition and Requirements
 - C. Hardware and Software Environment

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- D. User Interface
 - Menu driven
 - Graphical User Interface
 - E. Converting Data
 - F. Testing System
- IV. Product

EVALUATION

This is the second and vital part of the plan. Many methodologies can be used (e.g., Kepner-Tregoe Decision Analysis, brainstorming, etc.) or a series of unbiased questions can be developed such as;

1. Do I know all of my emission points? - Emission Identification
2. Do I have a way of maintaining and retrieving the emission information?
 - Permit Administration
3. How will I be assured that the information is current and accurate?
 - Compliance Inspection
4. Do I have the capability to provide all information that will be requested by line management, the State, or EPA (The Customers)? - Data Management/Reporting

If you answer "NO" to any one of these questions, you may want to consider updating your air system.

DEVELOPMENT

The ultimate decision on what modifications are made to your present system will be based on how much money and time your company wants to invest in this project. You must objectively assess your company's current air capability and resources, and offer the most feasible plan for improvements. The key thing to remember is "Once chosen, do not change your plan." If changes must be made, have a thorough evaluation and rationale for each vital change and involved all concern parties in assessing the proposed change."²

Planning

You have decided changes are needed to your present air permit management system management, you must determine what will be changed. At our facility we have developed a series of procedures - Implementation Plan for Y-12 Software Development and Control

Procedures specifically used to assist us in the planning and scoping step. Here is a brief list of factors that should be considered in making an upgrade,

- Do I have the knowledge to do it myself or do I need to hire someone?
- Do I upgrade my current system, or scrap it and start fresh?
- How do I get my old data into the new system?
- What kind of system is to be used - manual or electronic?
- What kind of equipment will be needed to support the system (e.g., computer or file cabinet)?
- How soon do I want the system?
- Do I develop the upgrade in separate phases or as one deliverable product?
- What impacts will the new system have on other aspects of my work, company, etc.?

Scoping

Scoping and planning activities are often done concurrently. You need to determine your wants, needs, and ultimate goals that will be accomplished by the modernization of the current system. Scoping should involve the participation of the final users (end users) of the Air Permit Management System. We found that involving the end users in all parts of the process help to alleviate the possibly of elements of the systems being overlooked. During this part of the process we took the opportunity to:

- See what methodology other environmental disciplines within the Energy Systems were using to handle data
- Have peers within Energy Systems assist in evaluation of the final model to assure compatibility with industry standards and Energy Systems' goals
- Interface with the State (Tennessee - Air Pollution Control) to determine the data they will require and how they would want it transmitted
- Contact the EPA and obtained criteria for the Aerometric Information Retrieval System Facility Subsystem (AFS) Data Dictionary. This is the system the states will ultimately have to interface with.

- Interface with other industry professionals to gain a perspective on what technology was available that may be used to modernize our system.^{3,4,5}

System Definition and Requirements

Based on the previous two phases of the process, we determined to handle our modification in-house. In this phase of the process, we sat down and modeled how we did our job. This exercise took the equivalent of six (6) full day sessions over a two month period with the computer modeler, computer programmer, and air experts. The system was to be developed using Texas Instruments' Information Engineering Facility (IEF) Computer Aided Software Engineering (CASE) toolset, therefore an consultant from Texas Instruments was in attendance to facilitate the discussion. During the sessions we mapped out every aspect (e.g., identification an emission point -> quantification of emissions -> reporting of emissions) of what is required to regulate our air sources. This, I felt, was the most beneficial part of the whole process for many reasons, 1) The use of a facilitator who was familiar with the capabilities of the IEF software, however who had no previous knowledge of the business area we were attempting to model, motivated us to be more precise and definitive in choosing each parameter being place in the system. 2) The exercise of modeling our air system provided a better understanding of how we managed our air emission sources. I felt this was the key success of this entire process, for if we never updated our present system (Phases I, II, and III of our air system modernization are near completion), we had documented the Air Emission Management System (AEMS) for our facility. The model of our system is shown in Figure 1.

If you noticed, during this phase we went from calling our Air Permit Management System (APMS) to Air Emission Management Subsystem (AEMS). We determined by modeling that our current way of doing business was inefficient. The model activity showed that it would be more efficient to integrate all the activities (e.g., permits, monitoring results, inspections, etc.) associated with air quality management into one (1) integrated system instead of having individual systems to handle each activity. Due to the size of the proposed modernization, we decided the system would be developed in phases. The air experts prioritized the development phases as follows:

- Catalog Emission Points (Implemented in Phase I)
 - a. Identify each Emission point
 - b. Identify Pollutants Emitted
- Identify Emission Sources (Implemented in Phase II)
- Track Air Emission Source Inspections (Implemented in Phase III)

- Inventory Air Emission (Partially implemented Phase I, Phase III, and IV)
- Monitor Stack Emission (Implemented in Phase IV)

Initially, we perceived that a separate module would be need to handle our emission inventory. During the modeling sessions, we also came to the realization that the emission inventory is just a report. We determined that as long as we had all the data elements associated with the inventory identified and stored in the system we should be able to derive and produce any emission report required by The Customers. The data could be obtained by a stack and vent survey¹, previous permits applications, calculations³, and other sources.

Hardware and Software Environments

The hardware and software environments was a specific decision made during the system definition and requirements phase of the process. Special emphasis was given to the choice of these environments. A well planned hardware and software environment can help assure that your final system is used. Key factors that help to determine what kind of an environment is used are,

- Type of computer the system will be run on (e.g., Mainframe .vs. Desktop)
- Capability and compatibility of operating system running the software
- The amount of data the system will be required to handle
- Administrative and security controls you desire on the system

Since our system was being developed using IEF, we had flexibility in the choice of equipment we could chose to run the system. The initial phase (Phase I) will operate on a Personal Computer (PC). The versatility of the toolset has given us the capability to upload Phase I and future phases (Phase II, III, IV) of the system and run them on the VAX mainframe computer. Many systems may not need such flexibility. The hardware and software environment must be assessed and determined for each specific application.

User Interface: Menu Driven .vs. Graphical User Interface

The choice of the user interface complements your hardware and software environment. The recent evolution of Windows has made this component an even bigger factor in the ultimate acceptance and utilization of a system by it's users. A well designed user interface, what is classified by the industry as "user friendly", can ease the apprehension of the user when operating the most complex and intricate management system. A poor designed interface can leave the most simplified system underutilized and the target of user criticism. Often times

the hardware and software environment can influence your choice in user interface. The two choices we looked at were, Menu Driven and Graphical User Interface (GUI). The menu driven interface (Fig. 2) is a text based interface. This is the commonly used interface on mainframe computer applications at the present time. The GUI (Fig. 3) is a picture oriented interface. This interface is popular with PC applications. When you are planning and scoping the system you may chose to go one step further and decide to use a Graphical Information System (GIS) as an user interface. The end user interface may be one of your easier development decisions, however it can be a very vital one in gaining user confidence and acceptance of your system.

Converting Data

The enhancement or modernization of any air permit management system must address the question, "What do we do with the data we have?" If you have no present data, this is not a concern. However, a majority of the companies choosing to upgrade their current system have some form (e.g., paper files, Wordperfect files, dBase files, FormTool files, etc.) of data that they would like to use to populate the new system or at least use as test data. There is no simple rule for data conversion, due to the diversity of formats, each design team should evaluate and investigate methodologies that best fit their specific application. We did develop and have implemented business rules for our present system to aid in transition of data into our future system. In addition, we will be able to convert our present FormTool files into a format so that we can import this data into the new system.

Testing System

"What works in theory, does not always work in reality." This quote sums up why you should develop and employ a system test plan before final implementation of any application. It does not matter if the application is developed commercially or in-house. You want to be assured that the product you are giving to your users does indeed do what they requested, how they requested, when they requested; or be able to explain and get their acceptance to any variation in the goals set during the planning and scoping steps. The best method to assure the user accepts the final product is to have the users involved throughout the entire process. This approach can avoid last minute retrofitting or shortcomings in the final product.

PRODUCT

You start to use your air emission management system to handle your company's air sources. We are beginning to use Phase I of our system.

CONCLUSIONS

In this paper we attempted to show the steps used to help determine if enhancement or modernization of your current air permit management system is worth the effort. In each step of the process we attempted to show that the knowledge and improvements being identified and developed while updating the system will make your future air emission administration system more efficient and productive. In addition, there were many items identified during the process that were implemented immediately which has made our current air permit administration more productive. As more regulations are promulgated in support of Clean Air Amendments, the industry has and will continue to require more data and effort in order to verify compliance. The more efficient and "smarter" you handle your data, the easier you will be able to respond to these requests. Does your present system have the efficiency to handle these upcoming requests or should you?

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Figure 1: Y-12 Air Emission Management System Model Overview

AEMS System

Figure 1. AEMS Main Menu.

The AEMS System allows the user to:

- * Catalog Emission Points
- * Identify Pollutants
- * Identify Sources
- * Permit Sources
- * Calculate Annual Fees
- * Record Inspection of Sources

Figure 2A: Example of a Menu Driven Interface

TRANCODE
MM/DD/YYYY

AIR EMISSIONS MANAGEMENT
VIEW HAZARD LEVEL

UNCLASSIFIED

LINES 11 TO 12 OF 13

Select	Code	Description
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX
X	X	XXXXXXXXXXXXXXXXXXXX

Enter selection and press <RETURN>: <<< CHD
<<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<<
F09=EF F10=EX
<<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ER

TRANCODE
MM/DD/YYYY

AIR EMISSIONS MANAGEMENT
VIEW EMISSION POINT FLOW RATE

UNCLASSIFIED

Site: XXXXXXXXXXXX Building: XXXXXXXXXXXX LINES 11 TO 12 OF 13

Point Id: XXXXXXXXXXXX

Beginning effective date: mm/dd/yyyy

Select	Effective	Flow Rate	
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX
X	mm/dd/yyyy	99999.99	XXXXXXXX

Enter selection and press <RETURN>: <<< CHD
<<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<< PFK >>> <<<
F09=EF F10=EX
<<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ERA >>> <<< ER

Figure 2B: Examples of a Menu Driven System

ABMS
H2M0073 AIR EMISSIONS MANAGEMENT UNCLASSIFIED
02/11/1994 VIEW ENVIRONMENTAL MEDIUM PARAMETER RATE RANGE

Parameter Addr. is like: _____ LINES 1 TO 11 OF 15

Select	Parameter	Lower Emission Range Value	Upper Emission Range Value	Rate Amount	Emission Range Unit Abbr
	HC	10.00	20.00	\$1.00	kg
	HC	20.00	30.00	\$2.00	kg
	HC	30.00	40.00	\$3.00	kg
	HC	40.00	50.00	\$4.00	kg
	HC	50.00	60.00	\$5.00	kg
	CL	10.00	20.00	\$1.00	gram
	CL	20.00	30.00	\$2.00	gram
	CL	30.00	40.00	\$3.00	gram
	CL	40.00	50.00	\$4.00	gram
	CL	50.00	60.00	\$5.00	gram
	FL	1.00	10.00	\$1.00	kg

Enter selection and press <RETURN>:
F01=SELECT F04=DISPLAY F05=MAINTAIN F06=HELP F07=PRFV F08=NEXT
F09=EF F10=EX

Rate Ranges can be specified for Pollutants in a standard unit of measurement.

ABMS
H2M0071 AIR EMISSIONS MANAGEMENT UNCLASSIFIED
02/11/1994 VIEW ENVIRONMENTAL MEDIUM PARAMETER FEE BILLING AMOUNT

Parameter Addr. is like: _____ Site Code is like: _____
Year: _____ LINES 1 TO 11 OF 11

Select	Parameter	Year	Site Code	Annual Emission Value	Billing Fee Amount
	SO2	1980	V-12	6.00 E -02	\$9.40
	SO2	1981	V-12	4.00 E -02	\$9.60
	SO2	1982	V-12	0.00 E -00	\$0.00
	SO2	1983	V-12	4.00 E -02	\$9.60
	SO2	1984	V-12	4.00 E -02	\$9.60
	SO2	1985	V-12	4.00 E -02	\$9.60
	SO2	1986	V-12	3.00 E -02	\$9.70
	SO2	1987	V-12	3.00 E -02	\$9.70
	SO2	1988	V-12	3.00 E -02	\$9.70
	SO2	1989	V-12	3.00 E -02	\$9.70
	SO2	1990	V-12	3.00 E -02	\$9.70
	SO2	1991	V-12	0.00 E -00	\$0.00

Enter selection and press <RETURN>:
F01=SELECT F04=DISPLAY F05=MAINTAIN F06=HELP F07=PRFV F08=NEXT
F09=EF F10=EX

Using the Pollutant's Rate Ranges, and the recorded Emission Points' Pollutant Emissions, the system can calculate the billing fee amount.

Figure 2C: Examples of a Menu Driven System

Figure 3: Examples of Graphical User Interface (GUI) Systems

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