WITS – Waste Data Collection with our Palms at our Fingertips

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The waste management and environmental compliance group (NMT-7) at the Los Alamos National Laboratory (LANL) has initiated a project to build a computer-based system for tracking inventory, storage and disposal information for hazardous and radioactive waste and contaminated byproducts. This project, the Waste Inventory Tracking System (WITS), will initially be used in TA-55 (which includes the Los Alamos National Laboratory Plutonium Facility) and the Chemical and Metallurgy Research (CMR) building where wastes are generated. The system will handle numerous waste types with variation in size, disposal method, and hazard classification including: low level waste such as room trash (compactable waste), SEG waste (non-compactable), and over-sized waste, mixed waste, hazardous and chemical waste, universal waste, and waste containing asbestos and PCB's. WITS is designed to provide up-to-date location, status, content information, radioactivity analyses, and other inventory information for every waste item and container managed by NMT-7. The system will support comprehensive reporting capabilities and cradle-to-grave audit trails.

WITS is intended to facilitate handling of waste by NMT-7 staff to help minimize waste disposal costs, ensure compliance with applicable regulations, and standardize waste management methodologies and practices. This paper will compare current management practices with revised methodologies supported by WITS. It will show how automating inventory tracking will help achieve these goals.

WITS is a multi-tiered system consisting of server machines with an Oracle database and web server, PC's with

the client software and web browsers, and PDA style handheld computing devices with integrated barcode scanners for collecting information in the field. Barcode labels will be attached to all waste containers and waste

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storage locations for unique identification in the system. The system will include capabilities for tracking placement of waste items into containers, adding new containers to waste storage areas, putting containers inside other containers, moving containers between storage areas, and shipping containers offsite for disposal. WITS will maintain current inventories of each waste storage area, and facilitate reporting to help monitor waste items with regulatory limits for time of storage before disposal. Attached is an example of the room trash process waste flow.

SOP for Low Level Waste - Room Trash

per LLW-TA55-DP-07,R1.2

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We are currently field testing WITS functionality at LANL for LLW SEG, Inventory, Shipment, and Hazardous & Chemical wastes. We are on schedule and should complete LLW Room Trash and Phase I of WITS implementation by the end of March, 2000. Upon completion of field testing and Phase I, we will do design for the next phase of WITS – which will include Quality Assurance for all of WITS, Inspection of waste areas, Document Tracking, Import/Export utilities, and other functionality as required.

Bernadette Martinez, Los Alamos National Laboratory, bmartinez@lanl.gov
Andrew Montoya, Los Alamos National Laboratory, andym@lanl.gov
Joel Matek, Beta Corporation International, joel@betaci.com

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Bernadette Martinez, Los Alamos National Laboratory, bmartinez@lanl.gov

Andrew Montoya, Los Alamos National Laboratory, andym@lanl.gov

Joel Matek, Beta Corporation International, joel@betaci.com

ABSTRACT

The waste management and environmental compliance group (NMT-7) at the Los Alamos National Laboratory (LANL) has developed a computer-based system for tracking inventory, storage and disposal information for hazardous and radioactive waste and contaminated byproducts. This project, the Waste Inventory Tracking System (WITS), is initially being used in NMT (which includes the Los Alamos National Laboratory Plutonium Facility) and the Chemical and Metallurgy Research building where wastes are generated. The system handles numerous waste types with variation in size, disposal method, and hazard classification including: low level waste such as room trash (compactable waste), SEG waste (non-compactable), and over-sized waste, mixed waste, hazardous and chemical waste, universal waste, and waste containing asbestos and PCB's. WITS is designed to provide up-to-date location, status, content information, radioactivity analyses, and other inventory information for every waste item and container managed by NMT-7. The system supports comprehensive reporting capabilities and cradle-to-grave audit trails.

WITS is intended to facilitate handling of waste by NMT-7 staff to help minimize waste disposal costs, ensure compliance with applicable regulations, and standardize waste management methodologies and practices. This paper will review the current status of WITS, and describe the future plans for process improvements and expansion of WITS.

INTRODUCTION

The waste management and environmental compliance group (NMT-7) at the Los Alamos National Laboratory (LANL) has developed a computer-based system for tracking inventory, storage and disposal information for hazardous and radioactive waste and contaminated byproducts. This project, the Waste Inventory Tracking System (WITS), is initially being used in NMT Division (which includes the Los Alamos National Laboratory Plutonium Facility) and the Chemical and Metallurgy Research (CMR) building where wastes are generated. The system handles numerous waste types with variation in size, disposal method, and hazard classification including: low level waste such as room trash (compactable waste), SEG waste (non-compactable), and over-sized waste, mixed waste, hazardous and chemical waste, universal waste, and waste containing asbestos and PCB's. WITS is designed to provide up-to-date location, status, content information, radioactivity analyses, and other inventory information for every waste item and container managed by NMT-7. The system supports comprehensive reporting capabilities and cradle-to-grave audit trails.

ARCHITECTURE

WITS is a multi-tiered system that consists of server machines with an Oracle database and Oracle Application Server (OAS) at the back-end of the system. The Oracle database is the central data repository, where current and historical information for every item and container tracked by the system is maintained. NMT-7 staff or other personnel using the system use their desktop computers to view information in the database using a standard web browser, such as Netscape® Navigator or Microsoft® Internet Explorer. A series of web-based forms and reports are available for entering and reporting information from the system. Handheld computing devices, Symbol SPT 1700's, are used to collect information in the field. These rugged PDA-style handheld computers have integrated bar code scanners, and run the Palm OS operating system. They are used to perform various functions in the field, where portability is required and local intelligence beyond that of a simple barcode scanner is desired. Conduit software on the PC's is used to upload and download information from the Oracle database to the handheld devices. Information that has been modified in the field is uploaded from the handheld to the database, and the latest information is then downloaded onto the handheld each time a synchronization operation is done. Once started, this process does not require any user intervention or input. If there are any errors or problems in synchronizing the data, the relevant information is entered into a handheld log file and error messages are displayed to the user. This architecture is shown in Figure 1.

Figure 1. Sample WITS architecture, showing multi-tier configuration

SYSTEM OVERVIEW

Handheld functionality includes performing inventories of waste areas, adding containers to waste areas, moving containers between waste areas, adding waste items into containers, and placing containers inside of other containers (e.g. overpacks). Creating shipments of containers, and verifying those shipments during loading are also done using the handheld devices. All of the reporting functions are accessed using the web. Authority levels have been instituted to restrict user access and capabilities to the web forms and reports as required. For example, supervisory or higher level is generally required to modify any information about waste items that have been previously entered into WITS. Administrative authority is required to delete any information, or add or modify any reference data in the system. Login using a valid userid and password is required for both the web functions and the handheld devices. Functions for entering radioisotope and dose data, and selecting containers for disposal are done using web forms. This functionality includes automatically preparing the paperwork for disposal of containers that was previously done on paper forms for many of the waste streams (e.g. hazardous and chemical wastes). An automated utility to help process LLW Room Trash (compactible waste) is also available from the desktop PC's. This utility replaces and enhances previous capability that was available using a system based on Microsoft Access. The previous system was limited to handling waste in batches of 90 boxes only, and could only process a limited number of radionuclides. These limitations precluded the use of the previous system at the CMR facility.

CURRENT STATUS

WITS has been in production mode since July 1, 2000 in NMT Division (which includes the Los Alamos National Laboratory Plutonium Facility) and the Chemical and Metallurgy Research (CMR) building where the wastes are generated. During the development of WITS, a strong effort was made to standardize how waste was handled. Previously, methodologies being practiced in these facilities were sometimes very different. SOPs (Safe Operating Procedures) were developed separately for each facility. During both the design and development phases of WITS, meetings and communications between personnel from both facilities were held, to try to reach a consensus on improving methods for handling wastes that could be incorporated into WITS. The development of WITS caused many changes in how waste was handled, including process changes, increased standardization between facilities, and improved availability of information about the waste.

One example of a change in procedures is that all waste items must have a Waste Acceptance Form (NMT's internal form characterizing the waste item in detail) completed using the handheld device. These forms were not always being completed prior to WITS going into production. The information on those forms will help in tracking the waste as it moves through the system. A critical piece of information is which container the waste item has been placed into. Since each container is associated with a location (specific waste area), it can be determined for every location what waste is present there.

One improvement in capabilities that was emphasized by recent events is the capability to perform inventories of containers present in each waste area, and to generate reports showing exactly what is present in each container, and in each waste area. With the recent Cerro Grande fire in Los Alamos, New Mexico that burned portions of Los Alamos National Laboratory technical areas, it would have

been very beneficial to know exactly what was present in each threatened area. This information was not available during the fire. With the WITS system in place, and if information for the various waste items and containers had been entered, this information could have been readily available. One of the standard reports lists exactly what containers are present in each waste area. Further information could have been gathered by "drilling down" to more detailed reports showing information down to the specific container and waste item level, if desired. These reports show exactly what items are present (including weight, volume, general characteristics, etc.) in each container, or can even show the waste acceptance form detailing the information for a given waste item. Figure 2 shows an example of an inventory of a selected waste area.

CURRENT INVENTORY REPORT							Waste Area SITE480
Container Types			Location Information		Status Information		
Container ID	Container Type	Waste Type	Location	Room #	Status	Accumulation Start Date	Time Remaining (days)
2073043	11 W SFU	11 W SFU	10A		Closed	25-MAR-96	
2171009	5 Gall Plastic Bottle	Hazardous A C	10A		Closed	18-JAN-96	

As the system has been used, LANL staff are finding new opportunities to expand WITS usage, beyond its original intent. One example of this is for direct offsite shipments which consist of waste items that are free of any radiation. This usage extends the utility of the WITS, but still maintains the integrity of the data due to the flexibility of the design. No radioisotope or dose data need to be captured for these items, but other functionality is still valid. The inventory tracking of PCB in-use equipment is another expected expanded use for WITS. TCSA regulations require that LANL have readily access to PCB data... WITS flexibility in design will provide the avenue to comply with TCSA by employing this functionality in NMT Division, and perhaps even throughout LANL.

PHASE II PLANS

Future development efforts for WITS include adding a user-friendly web-based database utility to allow the database administrator to add, modify, or delete missing or incorrect information. This would be especially helpful for the reference data, although it will be useful for actual waste item and container data, as well, if errors are found in that information. This utility will allow the administrator to modify data in tables without introducing errors in related information (e.g. foreign keys and other database constraints). The utility will force the user to keep consistent data, without showing Oracle messages that can be confusing to the non-Oracle expert.

A system for tracking individual documents and packages of related documents is also planned. This would display the location and other metadata about each document, and allow this information to be available through a web interface. Document sharing, version control, and other functionality is planned. Documents could be paper, microfilm, or other types of "documents". Document packages would be used to track all of the paperwork necessary to accomplish some of the waste management activities. For example, the process of preparing all of the documents necessary to send containers off for disposal can be complicated, requiring many documents and other information. The status of each document (whether it is required for that waste type, whether it is completed, its current location, etc.)

would be stored in a central electronic repository, allowing staff to check on the status of each package without searching for all the paper documents. This should help standardize the methodology used in these activities, as well as save time in tracking their progress.

Every time there is activity in a given waste area, regulations require an inspection of that area. Applicable forms must be completed and tracked, and items that require action must be completed. An effort to add functionality to meet these "inspection" requirements is planned in Phase II. This would include digital versions of required forms on the handheld device, and additional reports and functionality for this effort. "Action required" (AR) items would be tracked, to help ensure that these items are corrected.

An additional formal quality assurance effort is planned, in preparation for the rigid requirements necessary to ship waste to the Waste Isolation Pilot Plant (WIPP). This would be a precursor to handling transuranic wastes in WITS. These wastes are not being excluded for technical deficiencies of the system. Instead, NMT-7 personnel chose to expedite development of the system to improve the current practices and methodologies for the other waste types, knowing that transuranic wastes could be included later.

Various import and export of electronic data to other systems is also planned in Phase II development. This would include transferring information to organizations responsible for the final disposition of the waste containers, among others. This effort would examine where potential information bottlenecks are or might be to try to improve the whole waste management process lab-wide. We have already met with staff that coordinate waste management for the rest of the organizations at LANL. We anticipate taking WITS lab-wide, to handle waste created by the remainder of the facilities not involved in our pilot effort. The two facilities chosen for our pilot are the largest waste generators at LANL, where many of the potential development problems can be resolved before rolling out the system to the rest of the facilities.

CONCLUSIONS

We plan to roll out WITS to the remainder of LANL at some point during or after our Phase II effort. This would help standardize waste management operations throughout the LANL facilities, while allowing staff to have greater information about the waste available for their usage. We have discussed commercializing WITS, using the technology transfer mechanism in place in the national laboratories. However, we want to wait until WITS is further developed and has had more extensive testing and usage. With commercialized WITS, we would probably replace the back-end Oracle database with a different ODBC-compliant database such as Microsoft SQL7 or some other database.

REFERENCES

1. B. MARTINEZ, A. MONTOYA, J. MATEK, "WITS – Low-Level Waste Data At Our Fingertips", WM'00 Conference Proceedings, Tucson, AZ, (2000).

HEAD: Los Alamos uses its WITS: Waste data at our finger tips

The waste management and environmental compliance group (NMT-7) at the Los Alamos National Laboratory (LANL) is building a computer-based system for tracking inventory, storage, and disposal information for hazardous and radioactive waste and contaminated byproducts. Known as the Waste Inventory Tracking System (WITS), the system is designed to provide up-to-date location, status, content information, radioactivity analyses, and other inventory information for every waste item and container managed by NMT-7, providing comprehensive reporting capabilities and cradle-to-grave audit trails,

The WITS system will handle numerous waste types, whatever their variation in size, disposal method, and hazard classification, including low-level radioactive (LLW) compactable waste ("room trash"), non-compactable LLW, over-sized LLW, mixed waste, hazardous and chemical waste, universal waste, and waste containing asbestos and PCBs. The system will initially be used in LANL's Technical Area 55, which includes the Plutonium Facility, and the Chemical and Metallurgy Research (CMR) Building.

WITS will facilitate handling of waste by NMT-7 staff to help minimize waste disposal costs, ensure compliance with applicable regulations, and standardize waste management methodologies and practices. It is a multi-tiered system consisting of server machines with an Oracle database and web server, PCs with client software and web browsers, and PDA-style handheld computing devices with integrated barcode scanners for collecting information in the field. . This device is shown in Figure 1.

Figure 1: <http://www.symbol.com/australia/news/06-26-99.html>

At the heart of the WITS system are barcode labels attached to all waste containers and waste storage locations, which serve as identifiers in the system. The system will include capabilities for tracking placement of waste items into containers, adding new containers to waste storage areas, putting containers inside other containers, moving containers between storage areas, and shipping containers offsite for disposal. WITS will maintain current inventories of each waste storage area, and facilitate reporting to help monitor waste items with regulatory limits for time of storage before disposal.

WITS, after an aggressive development and implementation schedule of less than one year, has been in production at LANL since July 1, 2000. Users have been trained in the system, and WITS is now the primary waste management tool for CMR and the Plutonium Facility. As use of the new technology has increased, staff have suggested innovative and alternate uses for the system, including tracking in-use PCB equipment, direct-off-site

shipments, documents, and other high value items. Other groups within LANL, such as security and other waste management areas, as well as other DOE and government facilities, have shown great interest in WITS because of its flexibility and customizability. WITS' development is set to continue as additional modules are added to the system, including inspection of waste areas, document tracking, import/export utilities and administration tools.

Contact Bernadette Martinez, NMT-7, 505-667-9332 or bmartinez@lanl.gov; Andrew Montoya, NMT-7, 505-665-1654 or andym@lanl.gov; and Joel Matek, Beta Corporation International, 505-822-1968 or joel@betaci.com

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