DEPLOYMENT OF TECHNOLOGY UNDER AN ACCELERATING CLOSURE SCHEDULE

M. D. Maloney
CH2M Hill

S. E. Hansen
Demand Management Inc.

ABSTRACT

The closure of Rocky Flats is rapidly approaching. The project is now more than two thirds complete (since Kaiser-Hill took over the site in 1995) with closure anticipated by the end of 2006. Intuition says that technology deployments would begin to decrease on a project that will be completed in less than three years and is currently ahead of schedule and under budget. However, deployments of new or improved technologies are actually <u>increasing</u> relative to the amount of work that remains as the project prepares to "round third base and head for home". The Closure Project continues to face a number of challenges to closure and technology is a key component in solving many of these challenges.

INTRODUCTION

Technology deployment has been a key success factor from the beginning of the Rocky Flats Closure Project. The program has flourished under the combined efforts of the DOE Office of Science and Technology, Rocky Flats Field Office (RFFO) and Kaiser-Hill. DOE has funded studies to identify and evaluate potential technology solutions. DOE and Kaiser-Hill have jointly shared the risk and co-funded technology development, qualification and deployment of the most promising solutions. In many cases, Kaiser-Hill has self-funded project innovations. Whether deploying a new technology or a new application of an existing one, these technologies have enabled solutions where there were none; accelerated schedules; saved money; and, most importantly, improved safety.

As the Closure Project begins the final push to closure, several features have emerged in a program that will soon be out of business:

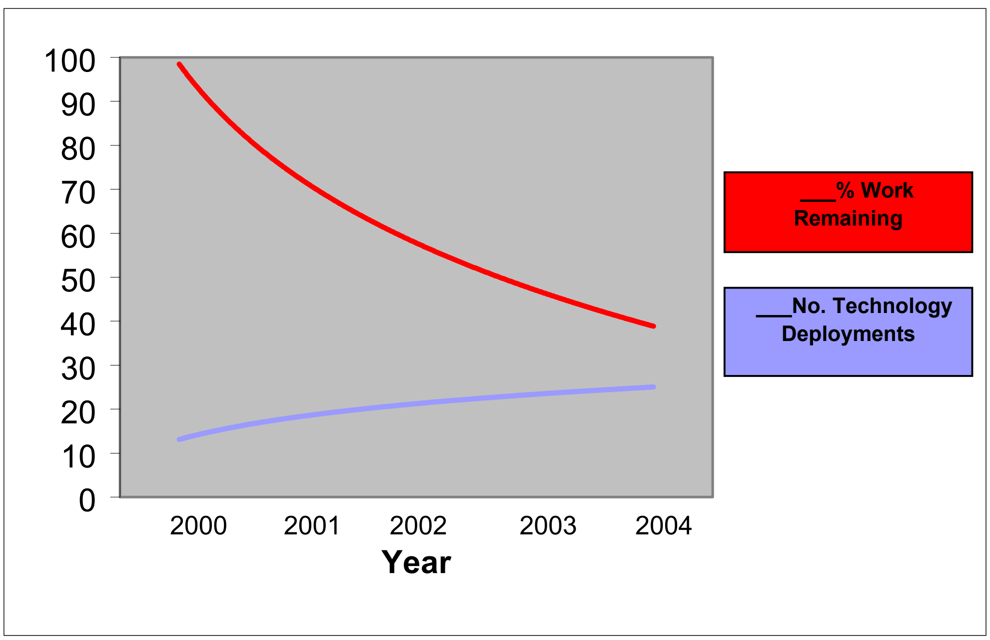
- Continuous year-on-year productivity improvements demanded by the closure schedule means technology that is good enough this year won't be good enough next year.
- Some of the new technologies are "tactical" while some are more strategic
- Some are work-arounds (unanticipated/encountered and solved on-the-job)
- Some problems were "put on the back burner"— shelved until later…and later is now. To compound the situation, these are often the more difficult problems to solve (the wastes with the extra problematic constituents, the walls with the extra or more permeating contaminants and coatings, the technologies that require regulatory changes, etc.)

- Some problems involve pursuing multiple technologies in parallel because there isn't time to check out one at a time
- Some technologies come about from a “divide and conquer” approach; can't wait any longer for a single magic bullet; instead, need to have several technologies—one for each subpart of the problem (break the problem into parts and find a solution for each part separately)

TECHNOLOGY DEPLOYMENT TIMELINE

As work has progressed on the Closure Project, technology deployments have followed the progression. Work and technology deployments earlier in the project focused more on nuclear operations. As nuclear operations wound down, work and technology deployments shifted to supporting D&D activities. While D&D efforts are continuing, the focus of new technology deployments is now shifting to solutions that are needed for environmental restoration and orphan waste disposition.

Some technologies deployed focus on a very specific problem (i.e., disposition of a specific orphan waste stream) and the deployment may only be required for a short time—perhaps less than one year. Other technologies address broad needs (i.e., building decontamination methods) and may stretch across several years. The chart below shows the trend of technology deployments compared to the amount of work remaining to be completed on the Closure Project. The lower curve shows that the work activities become more technology laden as the site



approaches closure, for the reasons stated above. It should be noted that the dates reflect the time when the deployment first occurred. Some for example, take a year or less to complete the work activity. Some will continue until the site is closed, generally undergoing continuous refinement, improvement and applications to more and more projects on site.

As expected, technology deployments generally tracked to specific project work activities that were most prevalent during a particular part of the closure schedule. For instance, Special Nuclear Material (SNM) technologies were needed early in the project, as these materials were being stabilized and prepared for offsite shipment. Once the SNM was removed from the site, there was no further need for such technologies. Environmental Restoration (ER) activities showed just the opposite trend. ER activities are scheduled later in the closure project schedule, after the higher priority risk reduction activities have been completed. In the last few years, technology deployments for ER needs have increased and are expected to continue to the end of the project.

Likewise, Waste Management (WM) technologies were not needed early in the project since the majority of the waste to be treated and disposed as part of the closure project had clear disposition pathways. However, as the project winds down, there is a small population of "orphan" wastes for which no disposition pathway is available. Various technologies are now being evaluated for use on these orphan wastes and will continue to be pursued until all of the waste is shipped offsite.

D&D activities are the one area where new technologies have been needed throughout the closure project. D&D technologies tend to be of longer durations because once a sound technology is successfully deployed, it is used over and over in multiple buildings. Consequently, the level of D&D technology deployments is high from the beginning of the project until the final buildings are gone.

RECENT TECHNOLOGY NEEDS AND SUCCESSES

Recent Needs

Following are some examples of problems recently encountered and the technology solutions being pursued to address them.

Problem Encountered	**Technology Solution**
Keep building alarm systems active when a building scheduled for D&D has the power turned off	Deploy wireless alarm systems initially for fire alarms and soon to include rad CAMS
Real-time airborne and surface beryllium for D&D planning and worker safety	TBD: several approaches now in field testing stage
Treat and dispose of depleted uranium chips removed from the T1 Trench for which no disposal pathway is currently available	Explore parallel treatability demonstrations on several options identified to disposition this waste stream
Treat and dispose of PCB solid and liquid wastes for which no disposal pathway is currently available	Explore parallel treatability demonstrations on several options identified to disposition this waste stream
Permanent building lung counting facility is scheduled for demolition	Develop mobile system to be used once facility is demolished

SOME RECENT SUCCESSES

Building Surveys

The Building 771/774 Closure Project is using new equipment developed to perform final surveying to ensure the buildings meet stringent release criteria before demolitions begins next year. The new equipment has proven to be a major improvement over previous large-area survey detectors. The new monitor is highly automated using computer controls. It automatically uploads survey information into a database, eliminating the need for the technician to manually read and write values onto a log sheet. Its speed is also automated. Both features minimize human error. Two types of monitors are being used, one for surveying walls, the other for floors. The wall unit lifts an array of detectors up and down vertical tracks while the floor monitor

Fig. 1 A Radiological Control Technician demonstrates the final survey monitor in an uncontaminated area

follows one-meter wide tic marks placed by technicians. Each monitor is made up of an array of six 100-square centimeter detectors that gather data while simultaneously calculating a square meter average, an improvement over existing large-area detectors. Performing final surveys at B771/774 is the first large-scale use of the new equipment. Given the success, the site plans to order more.

Beryllium Decontamination

Using a new technique, the B444 crew recently removed the building's exterior beryllium (Be) plenum system as an entire unit. The B444 beryllium plenum was a multi-room structure the size of a railcar with heavily contaminated filters. It was the final containment barrier for Be dust vacuumed into the duct system. During Be operations in the building, a vacuum intake was attached to each machining tool. Dust from machining operations was vacuumed into a duct system where it would ultimately collect in the filters of the Be plenum. During production, the filters were changed on a routine basis. With the change in mission, the filters had not been changed in more than 10 years. Without removing the filters and without anyone ever stepping a foot in the structure, the crew removed the plenum as a unit by cutting off the airlocks on each side and spraying foam in each opening to seal in the contamination. InstaCote was later sprayed on the entire plenum for transportation and disposal. Past practice for the removal of beryllium and radioactively contaminated plenums was to enter the plenum, remove the filters and repackage them for disposal followed by a significant amount of decontamination.

Fig. 2 Building 444

The new method was a perfect example of Integrated Safety Management. Workers, management, Steelworkers, Colorado Department of Public Health and Environment (CDPHE) and DOE all participated in the process. Together the parties reviewed potential scenarios for the operation up front. Consequently, the crew was prepared to handle any challenges and the innovative process went smoothly without any injuries or exposures. Significant changes to Be exposure guidelines have occurred in the last 20 years. Practices thought to be safe many years ago are no longer considered an acceptable risk. That's why it was so significant that the crew found a way to handle the plenum as a unit versus the old way of filter removal, decontamination and disposal. Originally, this work was not planned until late FY04, at the earliest. However, because the innovative lessons learned from the project had the potential for application at other DOE sites, EM-50 provided funds to accelerate the development of the necessary work practices and procedures. B444 is the most contaminated Be building and the first major Be decontamination project in the DOE complex.

Orphan Waste Disposition

After two years of intensive effort, this fall K-H Material Stewardship completed one of the largest and most difficult waste treatment and disposal projects on site. A team of process operators, supervisors and managers built a processing system from the ground up at the 750 Pad. The system was used to mix, pump, treat and package 661,983 gallons of contaminated sludge for disposal as 9.15 million pounds of treated low-level mixed waste. It was shipped to a disposal facility in 305 intermodal containers.

In 1995 the site transferred the final contents of the Solar Evaporation Ponds into 79 10,000-gallon tanks for interim storage until a disposal solution could be found. The first step in the project involved building a special blending machine and erecting a tent to cover it. Then the project team cut the tops off of the 10,000-gallon tanks that were designed to be easily filled but had no simple way to be emptied.

Fig. 3 10,000 gallon tanks used for sludge storage

Once the tops were cut off, process operators inserted two or three large, special pumps that agitated the sludge and, adding water as necessary, mixed the sludge into a consistency that could be pumped. Next, they pumped the sludge into the blending machine, where a specific chemical recipe was added to bind the suspended metals and water into a dry material that met RCRA requirements. Once the right consistency was reached, the material was loaded into reusable, lined intermodal containers and shipped to Envirocare in Utah for disposal. The empty tanks were cut into pieces and either loaded into the intermodals with the treated sludge or, depending on the level of residual contamination, sent to the Nevada Test Site for disposal as low-level waste.

Paint Sampling

A site Radiological Control Technician (RCT) Supervisor used inexpensive, off-the-shelf equipment to create a new tool that saves time and improves the accuracy of paint sampling operations at the Building 771/774 Closure Project. Paint sampling is part of the final stages of building decontamination at Rocky Flats. RCTs take samples to determine if a painted area can be free-released for demolition or needs further decontamination. The work is particularly important because paint was traditionally used during plutonium processing operations to fix contamination in place that was otherwise difficult to remove. Prior to this innovation, RCTs would hammer and chisel areas of painted surfaces to obtain a sample. The painstaking effort not only took a great deal of time but was imprecise in collection of the sample mass. The RCT solved the problem by simply looking beyond the intended use of a power tool that has an adjustable tungsten carbide blade for shaving paint from wood siding. An enclosure was attached to

Fig. 4 A technician demonstrates paint sampling tool in an

the tool’s guard to capture shavings when the tool is operating. The RCT developed a paint sample collection assembly using connections and a standard hand vacuum filter he found at a hardware store. The assembly was fitted to the shaver’s dust collection port. A HEPA vacuum is used in the building to draw the sample and contain fine particulate that slips through the hand vacuum filter.

Paint samples can now be taken in less than 30 seconds versus 10-15 minutes using the previous method. The improvement in efficiency is impressive considering that approximately 800 paint samples have been taken in B771 to date. More significantly, the ability to collect appropriately sized samples allows laboratory analysis to more accurately determine the level of contamination. Prior methods often resulted in the collection of too much material, skewing results to produce false-positives and creating additional, but unnecessary, decontamination work. According to the radiological engineer for the Building 771/774 project, the innovation will have a major impact on cost, schedule and safety as other buildings begin final decontamination and survey efforts.

High Resolution Gamma Spectroscopy Assay Technology

In the past, radiological characterization of low-level (LL) and low-level mixed (LLM) waste was frequently based on the lower limit of detection (LLD) for the assay instrument. Ninty-two percent (92%) of the current LL/LLM waste inventory was characterized based on the LLD. Of that amount roughly 60% is greater than the 10 nCi/g limit for disposal at Envirocare in Utah. LLM waste greater than 10 nCi/g, but under 100 nCi/g, is considered orphan waste and may not be shipped to a commercial treatment facility. Currently, this waste must be repackaged for disposal at the Nevada Test Site. This repackaging requirement is creating a schedule risk for the Rocky Flats Closure Project. Repackaging also increases the safety risk to workers and would best be avoided. An advanced counting technology is needed that will avoid or reduce the repackaging of this waste.

Rocky Flats is now demonstrating the innovative application of high resolution gamma spectroscopy assay technology combined with real time radiography (RTR) and statistical analysis to determine a more accurate measure of source activity. The overall goal is to improve the distinction between wastes that are greater than or less than 10 nCi/g. Application of this technique is expected to eliminate up to 60% of the existing LLM orphan waste inventory from the greater than 10 nCi/g category. Any waste recharacterized as <10 nCi/g, may be disposed at currently available commercial facilities. Recharacterization is expected to avoid repackaging approximately 1500 LLW containers with the associated reduction in accident potential. The combination of these benefits will reduce the overall schedule risk to the RFETS Closure Project.