

AN OVERVIEW OF THE SAVANNAH RIVER SITE (SRS) DECON FACILITY

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ABSTRACT

This paper traces the development of the Savannah River Site (SRS) Decon Facility, examines current decontamination technologies employed there and estimates cost savings generated from their use. At SRS, these decon technologies are being used as part of an aggressive deactivation, waste minimization and resource reuse program. Many technologies have previously been used at commercial nuclear plants, and their applicability to DOE nuclear facilities has been recognized. By implementing some of the commercial nuclear industry's innovative decon techniques and technologies, SRS has been able to realize significant cost savings.

Most of the decontamination technologies described here have been centralized at a newly developed Decon Facility. The staff has been trained on the use of CO₂ blasting, plastic blasting, superheated water cleaning, surface profiling, and grit blasting for decon. They are also trained to handle an array of radiological hazards and to use engineering controls to contain contamination at its source while deconning. Most of the technologies are portable and have been transported across SRS to rollback contamination areas in other facilities in an effort to reduce exposure to personnel and minimize waste costs. The Decon Facility has achieved \$8.2 million in savings for SRS and DOE in fiscal year 98 and is expected to continue this savings trend over the next several years. This paper will expand on the future uses and savings of the Decon Facility.

INTRODUCTION

What is now known as the Savannah River Site Decon Facility came about as a solution to a problem: Because there was no organized, central decontamination effort at the site back in 1993, large volumes of material and equipment were being thrown away as expensive low-level waste. The specific idea for the Decon Facility grew out of a Total Quality workshop addressing this problem. The Reactor Division recognized the advantage of centralizing decontamination activities and designated two excess facilities which could be modified into a decon center. As part of the remodeling, three decon stations were installed in the 105-C reactor facility (at a cost of \$1.4 million), and a portable CO₂ Facility was installed outdoors in the 105-C "Handball Court" (for another \$400,000). To make sure the electrical loads required by portable decon equipment could be handled, another \$100,000 was spent to clean up and electrically upgrade the 728-N facility. These facilities jointly became the Decon Facility.

In 1996, the Reactor Division split into two separate divisions and the Decon Facility came under direction of the newly formed Facilities Decommissioning Division (FDD). FDD has expanded Decon Facility staff and infrastructure to its current operational status. Today, the Decon Facility plays an important role in the site's waste management activities and saves the site millions of dollars every year.

INFRASTRUCTURE

The 105-C reactor which became the Decon Facility had been shutdown and considered excess since 1986, when it was determined that a crack in the reactor tank could not be repaired. The facility had been virtually uninhabited since 1989; the only upkeep had been minimal, to allow safe entrance into the facility for necessary surveillances. Once the 0' level of the facility was designated for the Decon Facility, significant upgrades and modifications were required before radiological decontamination work could be performed.

Four new utility stations were installed throughout the 0' level to support the decon stations. These utility stations provide breathing air, water, and various electrical services including 480V, 300A receptacles. Also installed were new air sampling monitors and ventilation ducting into which the decon stations' airflow would feed.

The first decon station installed was a HEPA ventilated 15' W x 15' L x 10'H stainless steel hut. This hut was designed for dry decon techniques such as grit blasting, strippable coatings, and general rub & scrub techniques. This station is referred to as the "dry hut."

The second decon station installed was a 15' W x 15' L x 10'H stainless steel hut with a stainless steel lined floor and elevated grating, making the hut "drainable." This hut was designed with a pumping system, demister/HEPA ventilation system, and a liquid high level alarm system for wet decon techniques such as superheated water blasting. This station is referred to as the "wet hut."

The third decon station installed was a 22' W x 40' L x 18'H stainless steel hut that has roll doors and ceiling accesses to accommodate off loading and deconning large equipment. General decon techniques with chemicals, strippable coatings, grit blasting, and shrouded tools are used in this containment. This station is referred to as the "LSME," an acronym for Large Span Modular Enclosure.

The fourth decon station installed was a portable facility consisting of two connecting SeaLand containers specially designed to support CO₂ blasting. The facility contains a room that houses a large CO₂ pelletizer, a glovebox room, a monitor room, two fan rooms, and a 16' x 16' blast room. A large liquid CO₂ storage tank which feeds the pelletizer is located nearby. To avoid recontamination, it is critical for the ventilation system to sweep contamination removed by the CO₂ to the HEPA filters; therefore, the blast room ventilation system is designed to allow 300 air changes per hour.

In 1997, another decon station was added to the 105-C 0' level. This station is a stainless steel glovebox specially designed for plastic blasting. This station allows the worker to remain outside of the radiological environment while deconning with the plastic blaster nozzle.

All of the above listed decon stations are portable and can, if needed, be moved to another location or facility. The utility stations, etc., are not portable.

In the 728-N facility, electrical upgrades were completed to allow the grit blaster and shrouded tools to be used in this facility. A 25' x 50' pre-fabricated hut of Pacifitex was installed for containing contamination. When this hut becomes too contaminated, it can be incinerated and replaced with an identical hut.

LOW, MEDIUM, AND HIGH ABRASIVE DECON TECHNOLOGIES

The Savannah River Site offers a wide variety of decontamination needs and no single technology can address them all. For that reason, several different decontamination technologies are available at our Decon Facility. These technologies can be used for many deconning needs, but even they are not all-inclusive for every decon job at SRS. Several factors were considered in deciding which technologies to make available to site customers. Considerations included the type of waste stream generated, amount of waste generated, costs to implement, costs to operate, substrates to be deconned, past commercial successes, decon factors, portability, and support services required (air, electrical, etc.). For the sake of discussion, I have grouped these technologies into low, medium and high abrasive technologies.

Low Abrasive Decon Technologies

For low abrasive decontamination needs, the Decon Facility uses super-heated water blasting and/or strippable coatings. Low abrasive decontamination should allow removal of transferable contamination, but will have little effect on fixed contamination. The main advantage of low abrasive decontamination is that the surface of the material being deconned will not be physically altered.

A Kelly Vacuum System that uses super-heated water technology is currently in use at the Decon Facility. This system can be used two ways: with a shrouded head or with a spray wand. The shrouded head allows all the water to be recollected and HEPA filtered without creating an airborne hazard. The shrouded head has tremendous suction and can be used to remove transferable contamination from floors, walls, and most flat surfaces. The super-heated water flashes to steam when it hits the contaminated surface and lifts the contamination from the substrate to the vacuum system. This method is especially effective on concrete and porous surfaces and, in the process of removing most/all transferable contamination, it will remove some fixed contamination as well. This equipment is easily portable and has been used at several SRS facilities to decon floor and wall surfaces.

The Kelly Vacuum spray wand does create an airborne hazard, so it is used in conjunction with the wet hut. It is very effective for spraying down equipment and materials, whose shapes are not conducive to the shrouded head, to remove transferable contamination. This method is expected to be very effective at cleaning hangers previously used in the reactor basins to store irradiated components.

Two low-cost strippable coatings are currently in use: TLC Stripcoat and ALARA 1146. TLC Stripcoat can be removed in 4 to 8 hours but is not UV light resistant; therefore, outdoor use is limited. ALARA 1146 is more expensive and cannot be removed for 24 hours, but it is UV light resistant (can be used outdoors) and is easier to peel up.

Both strippable coatings will go into cracks and crevices and will remove contamination from these areas when peeled up. Depending on the porosity of the concrete to which the coating is applied, some fixed contamination will be removed when the coating is peeled up. Both coatings are easy to apply with rollers or commercial paint sprayers.

A third strippable coating used by the Decon Facility is a polyurea coating known as Insta-Cote⁹. This coating is very expensive, but very quick drying (about 2 seconds), impervious to water, unaffected by most chemicals, long-wearing (>10 years) and very weather resistant. A permanent variety of this coating (for use when removal of the coating is not anticipated) is also available.

As mentioned earlier, the polyurea coating material is expensive, and costs extend to the application process also. Application of this material requires extensive training, a Gusmer 3000 psi sprayer, and special air monitoring and protective equipment to guard against the hazardous constituent, Isocyanate. Despite these costs, for many applications at SRS the benefits of using this coating outweigh the costs.

The Insta-Cote⁹ coating is especially useful in protecting rooms and outdoor areas from contamination when high hazard radiological work will be taking place over an extended period of time and a very durable coating is needed. It is also useful in ensuring fixed contamination that cannot be removed by reasonable decon techniques be coated for long-term protection against traffic and weather degradation. In 1998, fixed contamination areas totaling 33,254 square feet were coated with Insta-Cote⁹ to ensure they would remain environmentally stable.

Medium Abrasive Decon Technologies

For medium abrasive decontamination needs, the Decon Facility utilizes CO₂ blasting, plastic blasting and/or chemicals. Medium abrasive decontamination allows removal of transferable contamination and contamination fixed in an oxide substrate or painted surface with little effect to the material substrate.

The CO₂ blaster works by propelling carbon dioxide pellets against the material surface. This action causes sublimation and creates a localized pressure change that lifts the contamination into a high flow air stream and eventually to a HEPA filter. CO₂ blasting is very effective on removing transferable contamination from surfaces and fixed contamination in an oxide substrate, especially on softer surfaces such as lead (if blasted correctly) or computer keyboards.

CO₂ blasting is a very expensive decon technology. Extensive training is required, special blasting equipment and pelletizers are needed, and special air monitoring and response plans are required to ensure the CO₂ does not create an Immediately Dangerous to Life and Health (IDLH) atmosphere. Despite these constraints, we felt it was a good technology for our Decon Facility, because it does not create any side waste streams except for the HEPA filters. It is excellent for deconning the current stock of >100 tons of lead that would be very expensive to disposition as a mixed waste (\$1,741/cu-ft).

Though CO₂ blasting is effective at deconning hand tools, it is not cost effective. Plastic Blasting gloveboxes (frequently used at commercial utilities) are a faster and more cost-effective

means of deconning tools. One factor contributing to the lower cost of the Plastic Blaster is that only one operator is required to do the blasting within a glovebox, which minimizes protective equipment use.

There are limitations to Plastic Blasting, however. The glovebox only allows materials up to 2' x 3' to be deconned, and the process creates a side waste stream (though the waste stream is incinerable). The Plastic Blaster used at the SRS Decon Facility recycles reusable media, thus enhancing the cost savings while minimizing waste generation. We've had good results with this technology. Over the last three months, we've been able to release approximately 10,000 tools for clean reuse.

The final medium abrasive technology used at the Decon Facility which I'll discuss is chemicals, such as Easy Off Oven Cleaner, Blue Whiz, manganese phospholene, Naval Jelly, Deconahol, and Peel Away 7, to name a few. These chemicals are cheap but can produce waste issues if a careful evaluation is not completed to ensure waste compatibility for the disposal option being utilized. If the laundry system allows the chemicals, it is advisable to use these chemicals with launderable wipes and rags to minimize waste generation and increase cost effectiveness.

High Abrasive Decon Technologies

For high abrasive decontamination needs, the Decon Facility uses shrouded grit blasting and/or shrouded tools. High abrasive decontamination allows removal of transferable and fixed contamination by removing the outer material substrate.

The LTC Americas' 1060-PN Plus Vacuum Grit Blaster is used in our Decon Facility. This blaster uses aluminum oxide or stainless steel grit and a contained vacuum system to blast contamination from metals and concrete. The reusable grit is recycled automatically and reduces the waste stream normally associated with blasting technologies. This equipment also employs various shrouded heads to minimize airborne hazards. This technology is excellent at removing fixed contamination, but should not be used on materials where the substrate needs to be intact. This technology has been successfully used to decon stainless steel fuel basin storage buckets, flatbed trailers, and two vans. The grit blaster is easily portable and can be moved to the material to be deconned if necessary.

Some drawbacks to the grit blaster include the need for extensive training, high cost of the equipment (\$60,000), a requirement for 750 cfm dry air, and production of a side waste stream that is not incinerable.

For small areas that need aggressive decon, shrouded tools are used. The SRS Decon Facility uses shrouded tools from Desco Manufacturing Company, including a mini-flushplate system, needle gun, triple head scaler, and a 3" grinder. These tools minimize airborne hazards and require a much smaller compressor to operate. They are easily carried to any location for immediate, aggressive decon. For large areas requiring decon, the shrouded tools would be too labor intensive and the grit blaster should be used instead. Shrouded tools have been a successful option for small contaminated concrete surfaces on trailers, vehicles and on location.

SAVINGS METHODOLOGY

To maximize the savings for SRS, the Decon Facility is managed like a small business. From the beginning, a written business plan specified goals and outlined the methodologies that would be employed to meet and track progress toward these goals. We treat all the organizations that we do work for as "customers," which means we are committed to meeting their expectations for cost and efficiency.

In FY98, we completed cost estimates for all proposed decon work as a funding benchmark against which facilities could compare disposal costs. If the decon project was funded, we tracked the decon costs and produced reports that reflected the Actual Decon Costs vs. Waste Disposal and Actual Decon Costs vs. Estimated Decon Costs. Out of 58 completed projects, only three projects resulted in higher dollars spent on decon than would have been spent on waste disposal.

Though these numbers are impressive, we determined that >50% of the Actual Decon Costs vs. Estimated Decon Cost reports had a positive delta >20%. The main contributing factor was determined to be Decon Facility personnel's failure to estimate all costs associated with identified hazards. A new estimating process has been completed for FY99 that should result in these reports having a delta of 10% or less (excluding customer changes that result in additional costs).

We are also developing detailed flowcharts for each decon process that will ensure all decon jobs are planned consistently and will not be dependent on which supervisor plans the work. The flowcharts also reflect Integrated Safety Management System (ISMS) nomenclature and can be used to emphasize our high safety standards. We expect these flowcharts to greatly improve our work planning efficiency for decon work at other facilities.

These efficiency changes, combined with the knowledge we have gained on past decon projects, should allow us to increase our average return on investment of three to one. We will review our status periodically to determine other improvement mechanisms to put in place to enable our return on investment to be five to one by FY01.

Decon Facility technologies and staff saved over \$8 million in FY98. The savings can be broken down into three major categories: waste minimization programs, decon, and contamination area rollbacks.

The waste minimization programs saved \$290 thousand. These consisted primarily of releasing waste from Radiological Buffer Areas (RBAs) and redirecting it from low level waste disposal to sanitary waste disposal.

The decon savings came as a result of utilizing the Decon Facility's decon stations. For the work performed at these stations, savings totaled \$607 thousand.

The highest savings -- over \$7.1 million -- were attributed to contamination area rollbacks. In this effort, Decon Facility staff mobilized decon technologies to numerous facilities for decon

work. The savings associated with this type of work are high, since savings are realized over several years (due to reduced laundry and waste) instead of the one-time savings associated with equipment decon for reuse.

FUTURE ENDEAVORS

SRS Decon Facility personnel work closely with all SRS divisions to keep a pulse on their deconning needs. As opportunities arise that warrant new equipment, technology, or skills, the Decon Facility will evaluate incorporating new programs to meet customer needs. The following are future growth areas for FY99-FY02:

- Identified the need for a new radiological survey/assay system to allow materials with irregular geometries to be released for unrestricted use. This new system will allow our facility to take on technically challenging decon projects which will result in more resources being recovered at a net savings. A system has been ordered and should be operational by September of this year.
- Rolling back most of the contamination areas in FDD's excess facilities to reduce long-term surveillances and ensure environmental stabilization. If funding is provided, this work would extend through FY00 and possibly beyond when additional radiological facilities come under FDD's management.
- Finding improved alternative strippable coatings to current in-stock coatings.
- Finding/designing improved engineering controls/containments for radiological work.

Our overall objective for the future is to become the DOE Complex's decon experts. We hope to accomplish this by testing cutting edge technologies at our facility and deploying/demonstrating these technologies across SRS. This will ensure that our personnel have a pulse on the latest commercial technologies as we move towards our future responsibility for large scale deactivation of excess facilities.

CONCLUSION

By investing in the necessary infrastructure modifications and carefully choosing several proven decon technologies, the Savannah River Site was able to save over \$8 million in FY98 by utilizing the Decon Facility's deconning and waste minimization services. Savings of this magnitude are expected to continue over the next several years, especially as more facilities are considered "excess" and must have their radiological hazards minimized for long-term stabilization and eventual decommissioning.

REFERENCES

H. H. Dukes, "Decontamination Facility Business Plan", WSRC-TR-98-00400, Savannah River Site, October 1998