CONTROLLING CONTAMINATION AND WASTE: A SUCCESS STORY

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ABSTRACT

The Containment Fabrication Facility (CFF) at Westinghouse Savannah River Company (WSRC) manufactures job specific/custom designed, commercial grade high quality radiological containment devices for use in complex radiological work environments at the Savannah River Site (SRS). The application of containments at the source controls contamination stringently thereby lowering risks to the worker while minimizing the spread of contamination which inherently reduces radiological waste. The CFF Project was placed in operation in October 1999 and was funded by the Department of Energy (DOE) as a Waste Minimization/ Pollution Prevention Project at a cost of less than $300K. The acquisition of containment fabrication techniques and knowledge was obtained through technical visits to various government and commercial locations. The establishment of a containment manufacturing facility required the acquisition of new fabrication equipment and material, the selection and training of people, and the development of procedures. WSRC/SRS is reaping the benefits of the CFF through increased radiological safety and cost savings. The waste reductions are documented through pollution prevention on DOE approved Pollution Prevention Activity Forms. WSRC's CFF Project investment has resulted in the design and practical application of safe, cost effective, efficient, ergonomically correct and user friendly containments which have become the flagship models of the DOE complex.

INTRODUCTION

The Containment Fabrication Facility (CFF) manufactures job specific/custom designed, commercial grade high quality radiological containment devices for use in complex radiological work environments at the Savannah River Site (SRS). The application of containments at the source controls contamination stringently thereby lowering risks to the worker while minimizing the spread of contamination which inherently reduces radiological waste. The waste reductions are documented through pollution prevention on DOE approved Pollution Prevention Activity Forms. This paper describes the sequence of project history events which resulted in the establishment of a containment manufacturing facility, and the results after two years of successful operations.

Westinghouse Savannah River Company (WSRC) placed the CFF in operation in October 1999. The CFF Project was funded by the Department of Energy (DOE) as a Waste Minimization/ Pollution Prevention Project at a cost of less than $300K. The project was completed under budget and ahead of schedule in October 1999.

Selection Criteria

The first step in establishing a CFF was the identifying of a suitable building which could be refurbished to adequately house the necessary equipment, have ample electrical power, supply adequate heating and air conditioning, meet current engineering and OSHA requirements, and have sufficient floor space. Even though numerous buildings were available as a result of current DOE downsizing, most buildings older than twenty years do not meet current standards. This was graphically demonstrated when two buildings originally thought to be suitable proved to be cost prohibitive, i.e. remain within budget if engineering upgrades were considered into the project cost. After two false starts, a suitable building was located. However, an abundance of excess equipment had to be removed and relocated. Two full size flat bed trailers of equipment and parts were returned for excess disposition or warehouse restocking. The money saved by recycling the parts and equipment, although not calculated in the budget numbers, did result in a cost savings for the DOE. The removal of this equipment was an incentive to gain access to floor space.

Retrofitting the Building

The selected building was walked down to identify interferences which had to be removed to ensure unobstructed floor space and eliminate potential safety hazards. Numerous installed/abandoned-in-place electrical panels and equipment were disassembled and removed to support the project. The work space lighting was upgraded from 'warehouse' to 'shop' requirements by adding twenty-four additional fluorescent light fixtures. This also required the installation of four twenty foot tall vertical I-beams and eleven horizontal supporting beams. There was ample electrical power from the abandoned equipment to supply the lighting and equipment needs from existing spare MCC breakers. One of the major hurdles was the lack of adequate as-built documentation when the abandoned in place equipment was removed and the new hook ups were made to the existing MCCs. Worker safety was a prime consideration, and the walk down process took more time than anticipated due to the lack of engineering documentation.

Industrial Safety and Hygiene Buy-In

During the entire project, from design through construction and initial operation, industrial safety and industrial hygiene were included and continuously consulted so their input could be incorporated as the project progressed. This eliminated any 'surprises' at project conclusion which is the bane of most projects and results in a flurry of unanticipated, unbeknownst problems which usually delay the project schedule and add to the budget.

Learning the Technique

The acquisition of containment fabrication techniques was obtained through technical visits to a DOE site, Department of Defense (DOD) base, containment fabrication equipment manufacturer, local awning/boat cover manufacturing companies; and discussions with personnel with previous containment manufacturing experience. Idaho National Engineering Laboratory was visited as they have a successful containment hut manufacturing facility which has been in operation for

over five years. Although their method of assembly consisted only of sewing and gluing, their experience in the measuring, design, fabrication and installation techniques proved invaluable to the CFF team during initial start up operations. A visit was made to the Naval Submarine Base King's Bay, Georgia. This DOD facility had experience in huts and glove bags and they used sewing, gluing and radio frequency heat sealing machines (RF/HSM) in their manufacturing process. This visit also added to our body of knowledge. Several visits were made to local awning/boat cover shops to learn their heat sealing and sewing techniques, types of materials, and supplier sources of bulk containment material. These local visits provided common sense, practical, and cost efficient methods which could be applied during our manufacturing process. In addition to searching the internet for information on radio frequency heat sealing machines, several visits were made to Hall Dielectric Company in Rock Hill, SC. This provided hands on practical knowledge on the potential application of RF/HSMs from a reputable, proven source.

Sealing Equipment Selection

As a result of these visits, RF/HSMs were selected as the primary method for sealing containment devices due to the superior quality of the "plastic welded" seal as compared to alternative, existing methods such as: taping, gluing, sewing, or thermal sealing. The RF seal is similar to a microwave for plastic. The radio frequency energy excites the molecules which heats them up. Simultaneous to the RF application, the plastic is pressed together by pneumatic pressure dies which form the seal. The Hall Dielectric RF/HSMs were selected due their historical superior industrial and quality performance record, and their relatively close proximity to SRS for potential technical assist visits. RF seals are used primarily on the entire glove bag seams, and glove, window and service ports

Sewing Equipment Selection

Pfaff industrial sewing machines were initially selected based on the knowledge that INEL gained from their containment building experiences. Although the Pfaff sewing machine is a heavy duty, reliable machine, CFF has included a Juki deep throat single and double stitch sewing machine to sew the wall seams on larger (greater than 8 feet X 10 feet) huts due to the bulk of material that must pass under the sewing arm. Sewing is used primarily where greater strength or complexity precludes RF application such as: grommet strips (which suspend the hut walls and roof), wall and ceiling floor joints, zipper and velcro applications (doors, air locks and curtains).

Fastener Selection

The use of grommet strips sewn to the wall joints and ceiling to suspend and support the hut from the external frame/scaffolding is in an integral part of the containment construction. A grommet strip is a six inch wide piece of containment material which is folded in half by a sewing stitch. Grommets are then installed every 10-12 inches apart on inch from the edge of the strip. The strips are then sewn to the containment. Thus the selection of the right grommet for our CFF application was critical. A trip to Scovill Fastener Manufacturing Plant in Clarkesville,

GA was made and samples of our plastic material were taken. Based on our material and application, a #4, half inch rolled rim and spur grommet was selected . It is interesting to note that the Scovill Fastener is a world class fastener manufacturing company whose product has been used in Apollo and current US astronaut space suits, and the National Football League helmets. The company has a long history going back to the Civil War when the company produced fasteners/buttons for both the North and South. Scovill also recommended the use of a foot operated grommet installation machine which would make consistent quality grommet compressions. However, due to the CFF's high production volume, the two step operation of the foot operated press, (punching and installation) has proven to be inefficient. The foot-operated machine will be replaced by a one step, automatic feed machine which will significantly speed up grommet strip production.

Material Selection

In addition to the fabrication equipment, the selection, acquisition, testing and stocking of containment material required considerable effort. Many of the materials were not stocked on the shelf so they had to be identified, located, ordered and placed in the supply system. Since many of the materials were new, compatibility testing of all materials to exposure of facility chemicals had to be done and documented by our local laboratory. In addition, the National Fire Protection (NFPA) fire retardancy results had to be documented.

Staff Selection

The CFF was initially staffed with mechanics who were part of the original hut building team which used tape and internal frames/scaffolding. They had an elementary baseline of knowledge and quickly adapted to the new fabrication techniques. They were initially trained through a combination of visits to INEL, Naval Submarine Base Kings Bay, RF/HSM factory training, and practical on-the-job (OJT) training. They also participated in the development and approval of equipment and process Job Hazard Analysis (JHA) which emphasized safety along with proper equipment operation. In addition, two experienced radcon planners were selected to walkdown jobs and provide approved design drawings by which the CFF crew manufactured containments.

Procedure Issues

Because of the emphasis on containments across the Savannah River Site and the addition of more chemical compatibility testing due to more materials and chemicals, all containment procedures had to be revised. This led to an enhancement and improvement of the containment application process. The procedure revision process has fostered standardization on the use of containments which has resulted in fewer facility procedures and the reliance of division or site wide procedures.

Beneficial Aspects

WSRC/SRS is reaping the benefits of the CFF through increased radiological safety and cost savings. The increased radiological safety benefits are: Enhanced planning resulting in safer, more efficient work with better results; increased teamwork and participation among diverse

work groups; worker ownership through active participation of the containment design and job planning process; less worker exposure to radiological hazards and less potential threat to the environment through effective control of contamination at the source. In general, the increased planning has driven greater quality in all other aspects of radiological work. The resultant cost savings from 800 containments fabricated was over $800K. The savings are the result of waste avoidance, less waste generated. Even more savings will be realized as the experience level of the containment fabrication process improves and more uses of containment technology are applied. WSRC is moving forward with an additional grant of waste minimization funds this fiscal year to move the CFF to a larger, more efficient location. The new shop will be three times the floor space, four times the layout table space, and twice the number of RF/HSMs and sewing machines which will effectively increase production rate by 50% using the same number of people.

Summary

WSRC's initial CFF Project investment has resulted in the design and practical application of safe, cost effective, efficient, ergonomically correct and user friendly containments which have become the flagship models of the DOE complex. And the end is still not in sight...