The Restoration of an Argonne National Laboratory Foundry

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The Environmental Management Operations’ Waste Management Department (WMD) at Argonne National Laboratory-East (ANL-E) undertook the restoration of an unused foundry with the goal of restoring the area for general use. The foundry was used in the fabrication of reactor components for ANL’s research and development programs; many of the items fabricated in the facility were radioactive, thereby contaminating the foundry equipment. The major challenges associated with the safe removal of the foundry equipment included the sheer size of the equipment, a limited overhead crane capability (4.5 tonne), the minimization of radioactive and hazardous wastes, and the cost-effective completion of the project, the hazardous and radioactive wastes present, and limited process knowledge (the facility was unused for many years).

The large pieces of equipment included a 1134-tonne horizontal hydraulic extrusion press, a 272-tonne vertical extrusion press, multiple furnaces, a large punch press, and a glovebox with associated equipment (Figure 1). Furthermore, after multiple years of unuse, significant amounts of clutter had been introduced into the area. A quick radiological characterization revealed contamination on most pieces of equipment and approximately 5700 L of waste water (some of which was still contained in piping pressurized to 21 MPa). A quick hazardous/chemical waste characterization revealed asbestos in numerous areas,
570 L of PCB transformer oil, and hydraulic fluid. WM estimated it would remove 91 tonnes of metal from the facility.

WM personnel planned to dismantle the large pieces of equipment, decontaminate individual parts, and survey every item for unrestricted release. The decontaminated material was to be recycled as scrap metal, while the material with fixed contamination would be managed as radioactive waste. WM estimated 90% of the metal could be reclaimed and recycled as clean scrap metal.

WM used innovative yet simple decontamination techniques and engineering controls to minimize the radiation hazard to the workers. For example, a large vacuum furnace with a traceable history of radioactive materials being melted in this furnace would have normally required a portable plastic tent be erected around the entire furnace for contamination control during dismantlement. Workers inside the tent would wear a single layer of anti-contamination clothing and respirators while completing the work. However, because only the interior of the furnace was contaminated and the openings of the furnace were relatively small (circular and approximately 0.6 m in diameter), personnel used glovebags (normally reserved for asbestos abatement) around the openings to gain access to the interior for decontamination purposes. Not only were the techniques used by WM personnel in keeping with the spirit of ALARA, but these techniques considerably reduced the cost of the entire project.
WM completed the restoration project in nine months, with a total of 84 tonnes of metal removed (Figure 2). WM successfully decontaminated and recycled 90 tons of scrap metal. This scrap metal recycling translated to a project direct cost recovery of $15,000. Additionally, two large pieces of the horizontal extrusion press (~5 tonnes each) were initially found to have fixed contamination inside of hollowed out portions of the piece. An investigation into the origin of the contamination revealed that the contamination was actually residual sand (which contains naturally occurring thorium) remaining from the manufacturer's casting process for the piece; therefore, this item was releasable as scrap metal because there was no Department of Energy added radioactivity. This investigation saved the project $15,000 in radioactive waste disposal costs. WM reconditioned the glovebox and installed it in its facility for reuse. The total project cost savings to the Laboratory, when compared to the estimates received by outside contractors, was $400,000.