Y-12 leads the way in specialized machining

The original nine major buildings at Y-12, five “Alpha” buildings and four “Beta” buildings were originally built to house calutrons to separate uranium 235 for an atomic bomb. The specific Building numbers are 9201-1, 9201-2, 9201-3, 9201-4, 9201-5, 9204-1, 9204-2, 9204-3 and 9204-4. Almost all of these building have seen radical changes, many times, over the years.

The single exception is Beta 3, or Building 9204-3. This building still contains its original calutrons used to separate the uranium 235 for Little Boy. These historic calutrons were operated until 1998, providing stable isotopes that were contributors to the medical isotope program and other valuable uses in both industry and research.

Within the other eight large buildings many modifications have been made to install specialized facilities to meet the various and seemingly ever changing mission needs of Y-12. Additionally, the buildings that were added after the war to expand the capabilities of the uranium processing facilities and to support special activities associated with new missions have also seen many changes over the years.

Some of the most challenging and impressive machining improvements have been produced in a dedicated area of Building 9998 by the Development Division over the years. This building was likely chosen because of its immediate proximity to the production facilities and the ability to move quickly between many production areas to the development area.

The specialized machining capabilities developed there over the years have included air-bearing spindle technology, contact ball tool setter, single point diamond turning, computer numerical controls and various dimensional inspection technologies requiring even closer tolerances. From the Development area these technologies were taken to the production floor in the various machining and inspection shops tucked within the World War II buildings and some buildings that had been added in the 1950’s and 1960’s.

The June 16, 1958 criticality accident that occurred in Building 9212’s C-1 Wing also brought about significant changes in facilities and the criticality safety requirements. While the eight individuals who were exposed to the criticality produced radiation all recovered, the situation that led to the concentrated uranium solution inadvertently being placed in a container large enough to hold sufficient material for a criticality resulted in major changes in the way materials were handled and very specific limits being placed on container size allowed inside uranium chemical processing areas.

The first dry room facilities where the environment was controlled to within very exacting levels of moisture content and other quality related parameters were added as early as December 1958. Assembly areas were being designated in various buildings and each one was controlled to assure quality standards of cleanliness and proper equipment was maintained. A second dry room was added in 1961.

Highly specialized equipment such as skull casters and other uniquely designed equipment items were routinely being requested of manufacturers and often extensively modified upon arrival at Y-12. Most everything being procured required some form of specialized, “Y-12 requirement” either added to it or some part of the machine’s ability enhanced through techniques developed at Y-12.

New missions, some short lived such as the PLUTO rocket (a nuclear-powered, air-breathing device) that lasted less than a year, often brought discoveries in machining exotic materials and utilizing process technology that contributed to the advancing requirements of the nuclear weapons component manufacturing that was Y-12's main mission.

1960 brought other firsts to Y-12 such as the first numerically controlled machine tool, an Excello template grinder using a Bendix vacuum tube punched tape system. An example of the special preparations being made comes from Bill Wilcox's Chronology of Y-12 events where he states that this first "NC" machine was installed in "an especially built room with laminar airflow and special cork floor to minimize vibration." Bill further states that "Numerical control was soon after applied to turning machines and milling machines and moved Y-12 into the forefront of state-of-the-art machining.

Y-12 adopted the Automatically Programmed Tools system from the aerospace industry. This system served well to support the many NC machines used in Y-12. The ever increasing and exacting requirements of the more sophisticated designs for such nuclear weapons as those designed for the Polaris and Minuteman missiles required even more specialized machine tools. A Pratt and Whitney jig boring machine was reconfigured into a precise measuring machine to verify templates.

Near the end of 1960 yet another new opportunity was presented to Y-12. The ROVER program needed fuel elements fabricated. ROVER was to be a nuclear powered rocket intended for outer space exploration by the National Aeronautics and Space Administration.

While this work was requested from Los Alamos, it may have been the first connection with NASA that resulted in Y-12 being asked later in the decade to fabricate the Blood in Gemini experiment and the Moon Box or Apollo Lunar Sample Return Container. This relationship between Y-12 and NASA continued for years with several requests for special items and the connection remains today.