

Union Carbide's 20 years in nuclear energy, part 1

Researching Y-12's history is not always easily accomplished. While stories abound and historically significant accomplishments are seemingly limitless, finding the exact details is often a most difficult task. Adding to that frustrating search for details is the fact that much of what has been done at Y-12 is classified and remains protected to this day.

Additionally, not much time was spent over the years documenting what was being done for historical purposes. Technical papers and prescriptive procedures were often created, but capturing historical facts were not as important to the accomplishment of the project and thus were not as thoroughly completed. Often, Y-12 just did it and moved on.

However, some excellent products were produced periodically. One such document came to me from Tim Gawne of the Oak Ridge National Laboratory's Technical Library. Tim sent it along with a note that he thought I might be interested in this "old 'glossy' on Union Carbide." He was right and I certainly appreciated him thinking of me. I found some really useful information within the booklet.

The publication was prepared in 1962 and the section highlighting Y-12 starts with a familiar image of the Beta 3 Calutrons with the following caption: "*The Plant investment today is \$442,000,000. When the electromagnetic process was discontinued, most of the uranium isotope separation equipment was stripped from Y-12 and the plant assumed a new role with many widely diversified programs. Today's activities include the reduction of uranium hexafluoride – enriched in U-235 – to metal, followed by casting, rolling, machining, and fabricating the enriched metal into various forms, including nuclear weapon components.*"

The text of the document continues to highlight Y-12's history and missions through 1962. I have reproduced the Y-12 portion of publication here in full. The title of the document is ***Union Carbide's 20 years in nuclear energy.***

"The Y-12 Plant was built on a "crash" basis during World War II to produce enriched uranium by the electromagnetic process. The first production building went into operation January 27, 1944. By 1945, Y-12 employed 22,000 operating personnel. It was the first plant to produce large quantities of enriched U-235.

"The electromagnetic process involved ionizing uranium tetrachloride, accelerating a continuous stream of uranium ions to a very high speed, then bending the stream into semi-circular paths in a powerful magnetic field. The lighter U-235 traveled an arc of shorter radius than that of the heavier U-238, and the two isotopes were caught in separate containers at the end of a 180-degree arc.

"After the war, the electromagnetic process for U-235 separation was discontinued and only gaseous diffusion was used on a production basis. A few of the electromagnetic units are still used at Y-12 for separation of stable isotopes of other elements.

"Carbide has been the operating contractor since May 4, 1947, when Tennessee Eastman Corporation withdrew from the operation.

A photo caption read: "*In addition to developing and operating complex chemical process, Y-12 makes significant contribution in the field of advanced metallurgy and special fabrication. A high-temperature furnace with hydrogen atmosphere used in developing tungsten rolling techniques is shown above.*"

"Because of Y-12's vast reservoir of industrial skills, many problems in areas such as metallurgy, special fabrications, chemistry, chemical engineering and health physics are brought for solution to its development engineers.

"Y-12 has assisted in developing reactor fuels, particularly those employing uranium oxide. The plant perfected a procedure for producing hafnium-free zirconium, a material used extensively in Naval

reactors. The first large-scale precision machining of beryllium, which is used in some reactors as a neutron reflector, was performed at Y-12. In addition, development activities in the pressing and machining of tungsten have made valuable contributions to the missile program. Y-12 also has developed, and operates, a plant for large-scale separation of lithium isotopes.

“About 5,500 are employed at the plant which is engaged in many exacting and complex processing activities. Its personnel have made Y-12 one of the nation’s safest plants. In late 1960 more than 10 million man-hours were worked without a lost-time accident, setting a new record for Carbide’s nuclear energy plants and the Corporation.

“Y-12 is engaged in continued development and pre-production work on fuel elements for the nuclear rocket program, and on shields for nuclear power sources used in space satellites. Considerable development work for the weapons program is also undertaken at Y-12 at the request of weapons design laboratories. Components for nuclear devices being developed for the Commission’s Plowshare program, directed towards demonstrating the peaceful uses of nuclear explosives, are fabricated at Y-12.

“In conjunction with its various engineering, development, fabrication and production activities, Y-12 has developed ultra-precision analytical and inspection capabilities.

“The Atomic Energy Commission has said, about the Y-12 Plant: “The capability and versatility of Y-12 are now proven assets to the United States nuclear energy effort. As the highly-skilled personnel of Y-12 continue to perform difficult production and engineering development jobs, frequently on lightning schedules, they add immeasurably to the nation’s defense posture while at the same time advancing the peaceful application of the atom.”

A photo caption reads: “A 100-inch turning, facing and boring mill used for fabricating large parts, such as are used on reactors. A tape-controlled, three-axis grinding, turning and milling machine used for specialized short-run items.”

These are but two examples of state of the art machines in Y-12 in 1962 – already exceeding the capacity and accuracy of anything else in existence at the time. Y-12 remains at the forefront of the world’s machining abilities and accuracies even today. As has been said, when we at Y-12 say “a tenth” we mean one ten thousandth of an inch!

Next we will look at a list of Y-12 Historical Milestones that was published in the same early historical document as the above text.