Beta calutrons and Y-12 experiments

Among the most enjoyable parts of writing about Y-12's history is the feedback I get from those who actually lived the history I'm trying to capture in written form.

Ken Bernander continues to be one of my most ardent supporters and also one of my best critics. He is kind in his efforts to keep me on track, but he's quick to point out when I am overlooking important details.

Such is the case with Building 9204-3, commonly known as "Beta 3," and affectionately noted as being THE only building where the 1945 beta calutrons can still be seen in their original configuration. This building, along with Building 9731, the Calutron Pilot Facility and first building completed at the plant, are two of the most historic Y-12 structures; they are intended to be preserved for posterity, along with the historic artifacts within them.

The sole remaining alpha calutron magnets are in Building 9731, and these 20 foot-tall structures dwarf anything else in the building's high bay. They were the subject of Martin Miller's historic black-and-white images of the Manhattan Project and Cold War equipment. Those magnificent images can be seen at http://www.martin-miller.us/Gallery-Manhattan.htm -- along with images of the Graphite Reactor and K-25 made at the same time.

When I wrote recently that the Beta 3 building was turned over to the Oak Ridge National Laboratory's Stable Isotope Program, Ken pointed out I had skipped a good 10 years of exceptional experimentation done in Beta 3 BEFORE it was converted exclusively to the separation of stable isotopes. He also suggested Alex Zucker would be a good person to fill in those years for me, and Alex gladly did so.

He came to the Y-12 plant in August 1950, among a group of what Ken calls "several young Ph.D's" Y-12 hired about then. This was when management was rebuilding the technical staff lost after the shut down of the calutrons and the transition of many research and development personnel to the newly forming ORNL. Remember this was a time of transition as indicated by Alex's first statement setting the stage for what he was going to tell me about Beta 3; he said he was hired into the "Electromagnetic Research Division of Y-12, later renamed the Electronuclear Division of Oak Ridge National Laboratory."

See what I mean?

As the rest of Y-12 was being "repurposed," buildings were being stripped and new initiatives were being introduced in buildings where the original purpose was no longer needed, some exciting experiments were being developed ... and Alex was right in the middle of all that. When Alex hired in to Y-12, the 86-inch cyclotron was still under construction in Building 9201-2. Remember also that Building 9201-2 was used for the pilot plants for at least two of the experimental Lithium 6 separation processes, so that building must have been abuzz with activity as well.

Building 9201-2 is yet another of Y-12's historic calutron buildings that has a storied history. After the COLEX process was chosen as the Lithium 6 separation process to be used and the process installed in Buildings 9201-4 and 9201-5, Building 9201-2 continued to be used by ORNL for fusion energy research right up to just a few years ago when that organization was relocated to the Lab's main campus.

The 86-inch cyclotron took about two years to install and served as an exceptionally powerful proton accelerator reaching 22 million electron volts. Bernie Cohen used it to discover new energy levels in the nuclei using inelastic scattering. Interestingly, when I looked up this proton accelerated scattering online, the article proudly stated this type research was done in the late 1960s at the Stanford Linear Accelerator. Looks like it was being done in Oak Ridge nearly 20 years earlier.

Meanwhile, in Building 9204-3, there was a 22-inch cyclotron that had been installed in one of the magnetic gaps of the beta calutrons. This was a convenient method to quickly set up a cyclotron, as was done early in the history of calutrons by E.O. Lawrence at Berkley. The vacuum chamber between the magnets was just modified with a configuration that suited the experiment.

The 22-inch cyclotron was mainly built to study the central region of cyclotrons, but wasn't as successful as was hoped. However, this machine would soon serve as the forerunner of one of Alex's most significant experiments where he would design an even bigger cyclotron.

In the fall of 1950, Alex was asked to develop an ion source for "triply charged nitrogen." This was merely a nitrogen atom with three electrons removed. With the help of Royce Jones, Alex had a satisfactory source running by November 1950. Now, remember, he only came to Y-12 in August 1950, so here he is already developing a most important experiment.

Next week, we will see just what Alex was up to.