## Electromagnetic separation of isotopes at Oak Ridge – L.O. Love (part 2)

As a part of the “informal history” Leon Love wrote about the Stable Isotope separation done in Buildings 9731 and 9204-3 (Beta 3), he also noted some information under a heading of “Those Silver Coils.” Let me include some of that information as it gives some details I had not seen elsewhere.

Leon said, “Originally all of the alpha coils (about 800 of them) and about half of the beta coils (about 150) were wound with silver, a total of about 15,000 tons of silver being used in the electromagnetic plant. When the U. S. Treasury Department was approached about borrowing hundreds of tons of silver for the magnet windings, the spokesman made an interesting observation: ‘Sir, we measure our silver in ounces, not tons.’ In keeping with this philosophy, when the bus bar connections were being made, a guard was always present to pick up the filings.

“After the war, the heavier silver bus bars and most of the silver in the coils were returned to the Treasury Department with the dismantling of the plant. Some of the silver coils, however, were retained for several years. Each year, the Treasury Department politely requested its silver back, the local AEC operations office conferred with the Laboratory, and the request was politely declined on the grounds that (1) the Laboratory saw a finite chance that the coils might be economically re-used, unique as they were; (2) the silver was safe, being massively enclosed in welded oil-cooling jacket and kept in a guarded area; and (3) it would cost a lot to ship it back. This routine went on until 1968.

“By that time the Laboratory’s Thermonuclear division had emerged as the sole conceivable future user of the coils (for plasma work in controlled fusion), and as that work developed in other directions, A. H. Snell (then Director of the Thermonuclear Division) made the determination that the silver should be released. The coils were then cut up and returned to the Treasury, with no publicity until the operation was complete.

“Fortunately, most of the beta coils had been made of copper, and replacing the three beta coils in the pilot plant was only a matter of changing them out. However, we had almost 37 tons of silver in the three alpha coils, and since there were no alpha coils with copper windings, we had to fabricate them. The existing coils were dismantled and rewound using copper conductor taken from beta coils that had been saved when the pan was dismantled. A full coil alpha winding contains over a mile of copper conductor and weights over 16 tons.“

In his “informal history,” Leon went on to describe many of the advances and innovations introduced in the isotope separation process using calutrons. The dedication of Leon and his co-workers is reflected in the following statement, “One of the shift supervisors expressed it best when he said, ‘For most of us, separating isotopes is not a job but a way of life.’”

Over the years, there were many experiments conducted and much new technical knowledge gained as a direct result of the stable isotope program. The demand for isotopes continued to increase. A survey of the research papers in the journal *Nuclear Physics* in 1956 showed 386 papers documenting experiments, and 39% of them depended on the use of enriched isotopes, while in 1971 the numbers were 574 papers and 62%.

Shipments of isotopes made per year saw an exponential increase from 100 per year in 1946 to over 3,500 per year in 1966. In 1969 there were 3,947 shipments.

Love concluded by saying, “In 1960 I attended a European conference on isotope separation and in a subsequent visit to the Niels Bohr Institute in Copenhagen. A staff member there ventured the opinion that in the year 2000, when the Atomic Energy Commission writes its memoirs, the separation of isotopes will be first on the list of important contribution to the peaceful uses of the atom.”

He also said, “In 1968 the USAEC Division of Research contracted with the National Academy of Sciences, National Research Council to conduct a review of the AEC program for the separation of stable isotopes by electromagnetic and thermal diffusion methods. This ad hoc panel comprised seven scientists from the fields of chemistry, classical physics, geochemistry, geophysics, medicine and physics. In their final report, *National Uses and Needs for Separated Stable Isotopes,* they referred to the store of separated isotopes as a 'real national asset that attains increasing value as science and technology develops' and recommended 'continuation of the program as a national resource of great value to the United States.

"Later, in a discussion of this report with Dr. A. M. Weinberg, J. Koch, himself a pioneer in electromagnetic isotope separation and member of the Danish Atomic Energy Program, mentioned that he would like to correct the statement that the ORNL electromagnetic facility is a 'national asset.' 'It is an INTERNATIONAL asset,' he said, 'without which many research programs could not exist.'"

Scott Aaron, present Isotope Development Group Leader in the Fuel Cycle and Isotopes Division at ORNL, sent me a link to a new web site, the National Isotope Development Center at www.isotopes.gov. What I found there indicated that J. Koch was right and even more so today. Scientific research using isotopes continues to abound and has recently come more into play with the shortage of certain isotopes. ORNL continues to function in a key role, with most of the other DOE laboratories involved as well.

I dare say the folks who pioneered electromagnetic separation of isotopes in Building 9731 and Building 9204-3 (Beta 3) would be impressed with where their groundbreaking operations have gone today. Much of nuclear medicine depends on a continual supply of radioactive isotopes. Scott Aaron continues as a leader in the development of isotopes today and looks forward to the possibility of even more demand for his products.

Remember, the exact same science and exact same equipment that separated the uranium for Little Boy, the world's first atomic bomb ever used in warfare, also separated the isotopes that were used to create the world's first stable isotopes that were then made into radioactive isotopes at the Graphite Reactor for nuclear medicine and other research activities. As early as 1946, in less than a year after the end of World War II, the newly discovered atomic energy was being put to peaceful use.