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# THE OAK RIDGE GASEOUS DIFFUSION PLANT ANNIVERSARY

"40 years . . . An Enriching Experience"



### APPROVAL FOR RELEASE

Document # Unnumbered; Date \_\_\_\_\_

Title/Subject THE ORGDP ANNIVERSARY, 40 years . . .

An Enriching Experience & misc. documents

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Oak Ridge Gaseous Diffusion Plant  
P. O. Box P  
Oak Ridge, Tennessee 37831

Operated for the U. S. Department of Energy  
by Martin Marietta Energy Systems, Inc.

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**40th Anniversary Commemorative Publication**

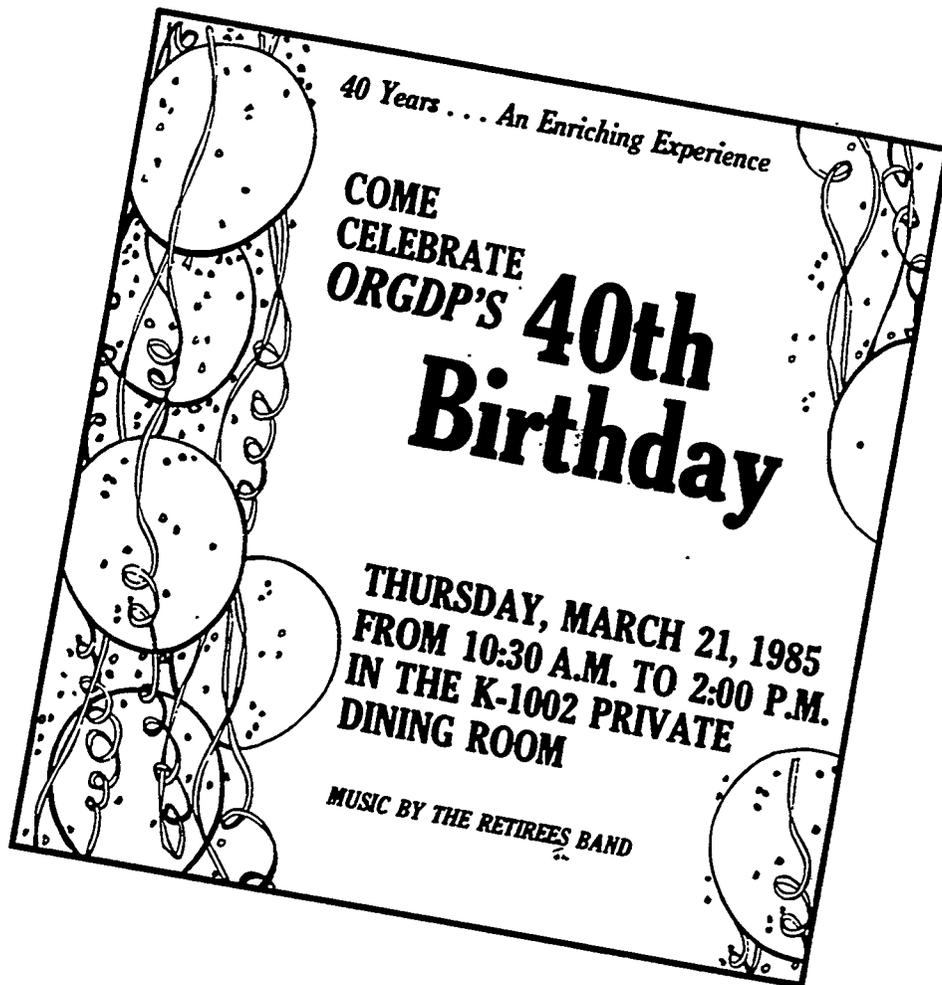
**THE OAK RIDGE GASEOUS DIFFUSION PLANT**

**“40 years . . .  
An enriching experience”**

The Souvenir/Memento Subcommittee of ORGDP's 40th Anniversary Celebration Steering Committee gratefully acknowledges contributions by the numerous employees and retirees which made this publication possible. Special thanks go to Vickie Conner for sharing her talents in putting this publication together and Barbara Lee for designing the anniversary celebration logo.

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### PROLOGUE . . .

Forty years ago our government brought forth at Oak Ridge, Tennessee, a new city, conceived in secrecy and dedicated to the proposition of ending the great war. Today, the city still stands as a beacon of hope for all mankind.

- At ORNL through research and development for a better world
- At ORGDP through the separation of U-235 for a cleaner world
- At Y-12 through the nuclear weapons production for a safer world

May today's secrets be tomorrow's prosperity and may Oak Ridge remain the energy capital of the world.

—Albert Lively, ORGDP  
Security Inspector  
April 1985

# **The ORGDP 40th Anniversary Committee first met on December 14, 1984, to begin planning for a celebration.**

"In February 1985, ORGDP will reach its 40th year of operation. This represents a milestone in our history that should be commemorated in some way. . . ."

W. F. Thomas,  
Plant Manager

**T**he 22-member steering committee was composed of representatives from each division as well as the ORGDP Retirees' organization and chaired by Ruby Miller, manager of ORGDP's Public Relations Office. One of the Committee's first tasks was to initiate a contest whereby employees could "suggest a theme/slogan in ten words or less" for the celebration. Out of the 134 entries submitted, the committee chose the slogan, "Forty Years — An Enriching Experience," written by Floyd Hipshire of the Engineering organization. For submitting the winning entry, Hipshire was given a camera.

Steering Committee members were divided into the following subcommittees to coordinate celebration plans:



ORGDP 40th Anniversary Celebration Steering Committee

Recognition/Awards - - Gladys Manis, Ted Wagner, Joe Jennings

Video Programs/Film - - Sandy Davis, Ruth Cary, Bobbye Curtis, Tony Heitzman, Rick Forbes, Esther Case

Exhibits - - Brenda Norvell, David Rupert, Ann Trotter, Doug Stephens, Beverly Anderson, Dick Moss

Souvenir/Memento - - Lola Byrd, Warren Bass, Ruth Cary, Frank Strang, Jimmy Qualls, Kathy Moore

Publicity - - Ruby Miller, Brenda Norvell, Ann Trotter

Audio Tape - - Ted Wagner, Frank Strang, Doug Stephens, Ruth Cary

Refreshments/Decorations - - Lola Byrd, Lula Bartholomew, Kathy Moore, Gladys Manis

Although February 21, 1945, was the date ORGDP first produced enriched uranium by gaseous diffusion, the committee set March 21 as the date for the fortieth anniversary celebration in order to have adequate time to plan and prepare for such a gigantic task.

Exhibits were displayed at the ORGDP Cafeteria and at the American Museum of Science and Energy covering the forty-year period.

## A commemorative video program was prepared covering forty years of uranium enrichment at the ORGDP.

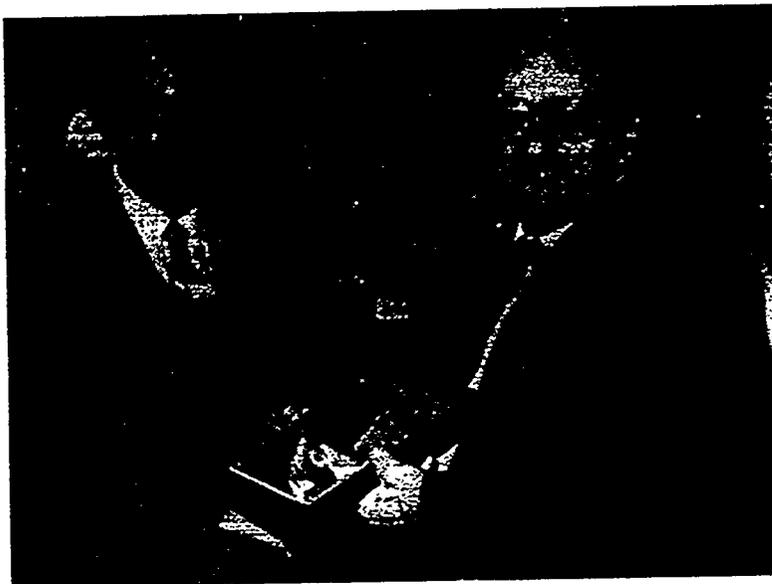
The program was humorous as well as serious.

The committee decided to prepare a commemorative book to be filled with photos as a souvenir for each employee and each retiree. Input was solicited from each division in the plant.

The celebration was publicized in several local newspapers as well as the Energy Systems News and on local television stations. Tape recorders were placed in various plant areas to enable employees to record stores and share reminiscences; our retirees were also afforded this opportunity.



The Exhibits – "That's me!" Emil Fortunato says to Ray Greene



Plant Manager, W. F. Thomas, recognizes Murray Hanig.

The committee decided that since we were celebrating ORGDP's birthday, we should serve birthday cake. Cafeteria Manager, Reva Day, and her staff worked closely with the Refreshment Committee in coordinating this effort.

The Fortieth Birthday Celebration program participants included W. F. Thomas, ORGDP Plant Manager; Ken Jarmolow, Martin Marietta Energy Systems President; Joe LaGrone, DOE/ORO Manager; and Roy Pruett, Mayor of the City of Oak Ridge. Plaques were presented to the oldest living retirees, W. A. Ashbrook and J. T. Veasey. Both were born in August 1892 and both retired in September 1957. Murray Hanig was recognized as the employee with the longest company service. Hanig's company service date is August 29, 1942.



Vocal Trio of Lost Chords Band

## Forty-eight employees were recognized for having 40 or more years of company service.

L. L. Anthony, Jr.  
E. F. Babelay  
E. J. Barber  
R. E. Barringer  
C. R. Calloway  
V. H. Carpenter  
E. B. Carter, Jr.  
E. R. Cary  
N. C. Crutcher  
H. J. Culbert  
C. H. Dowdy  
J. Dykstra  
I. C. Flanders  
J. Foster  
V. P. George  
M. S. Ginsberg

S. B. Harris  
B. E. Heidle  
B. P. Holbrook  
P. W. Honneycutt  
T. Hope  
D. B. Janney  
T. E. Koprowski  
W. S. Lenihan  
S. A. Levin  
J. K. Lowery  
M. I. Lundin  
G. J. Marrow  
T. L. McCreary  
G. H. Miller  
B. E. Mitchell  
K. N. Moore

W. T. Northcutt, Jr.  
J. A. Parsons  
R. L. Payne  
R. L. Poteet  
L. G. Rowland  
J. Sawicki  
K. A. Sells  
J. C. Shinpaugh  
J. A. Smith  
M. R. Stokes  
L. R. Thackston  
R. J. Thomas  
T. C. Trusley  
G. Turner  
J. R. Waddle  
J. M. Young

**T**he celebration, held in the Auditorium and Cafeteria of Building K-1002, was a happy reunion for more than 500 retirees who "returned home" one more time. The party mood was accented by the music of the Lost Chords Band which is made up of retirees. Band Member Joe Kelly, an ORGDP retiree, composed a special song in honor of the occasion:

"Thanks For The Memories"  
(by Joe Kelley)

Thanks for the memory,  
Of riding cattle cars to work  
Being trampled by some jerk.  
We pushed and cussed  
And fumed and fussed,  
And sometimes lost our shirt,  
But we thank you so much.



The Lost Chords feature the harmonica

Thanks for the memory,  
Of rationed tires and gas  
And mud up to our - - ankles.  
We stood in lines for hours at times  
Not one we dared to pass,  
And we thank you so much.

Thanks for the memory,  
Of work inside a cell  
It sure was hot as hell.  
Sometimes we'd almost choke  
On leak detector smoke  
But we thank you so much.

K-25, you've stood tall and proud  
for forty years;  
You and your people helping to  
keep our country strong.  
We built you with blood, sweat and tears--  
yes and most of all patriotism.  
And without an Environmental Impact Document!!!!

We could hardly spell environment and  
the only impact we were concerned with  
was the impact of our bombs and  
torpedos on the Nazis and Japs.



A little soft shoe routine

Most of us had brothers and sisters and  
friends in those "far away places with  
strange sounding names"  
Like Guadacanal, Saipan, Guam, Anzio--  
And we had a gut feeling that  
whatever we were doing here at K-25  
would hasten their return. It did!!

Thanks for the memory,  
Of a thousand pretty girls  
In ponytails and curls.  
In coveralls and tight fitting jeans.  
They all looked like movie queens  
And they did their part.

Thanks for the memory,  
And in the end if DOE  
Decrees that you must go.  
It won't be very smart but you'll live  
within our hearts  
And we thank you so much.

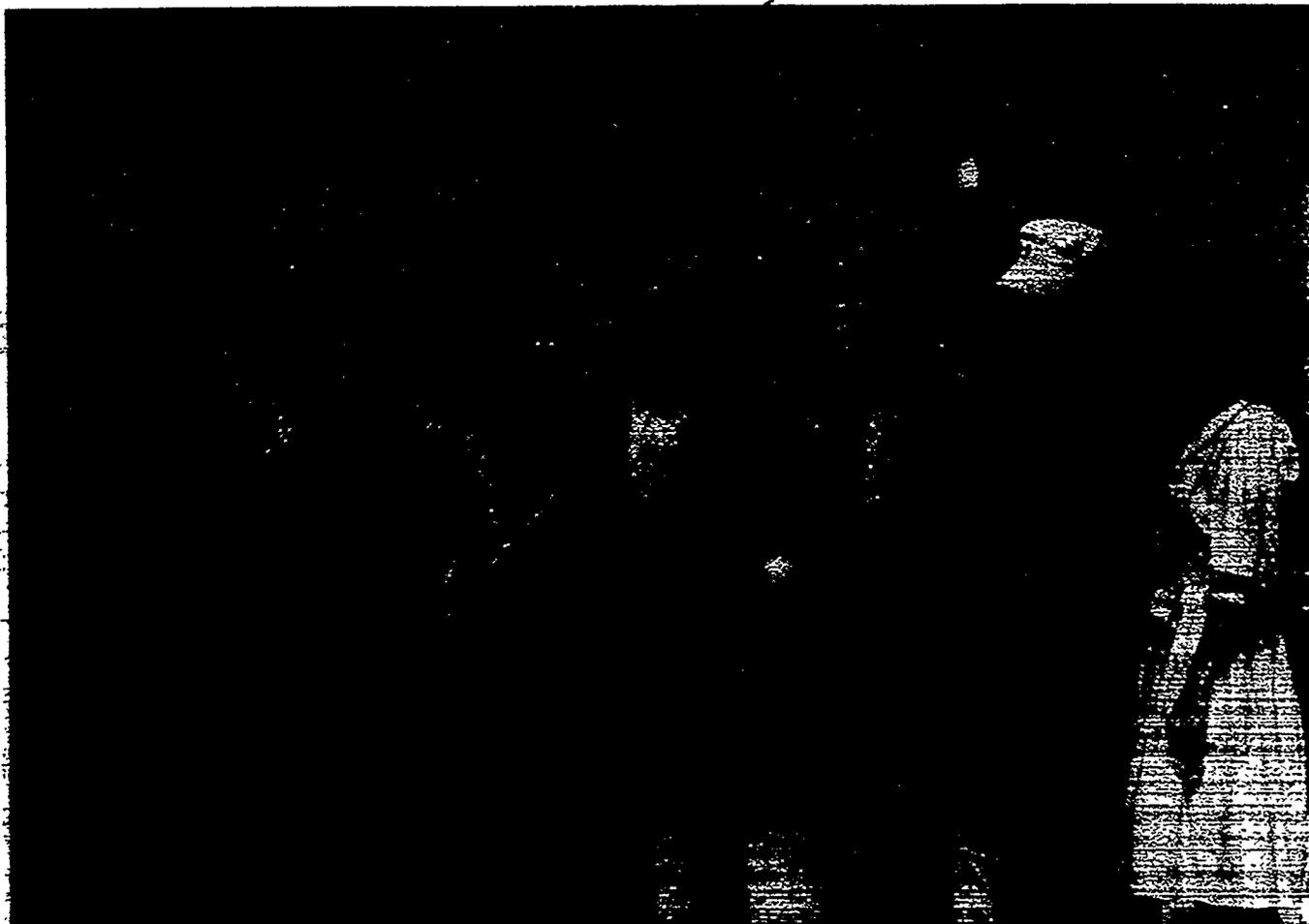


Enjoying the festivities - -  
Martin Marietta Energy Systems President  
Ken Jarmolow with Ruby Miller, who  
chaired the Steering Committee

**C**ongratulatory greetings were received from

- Ralph Donnelly, Manager of the Paducah Gaseous Diffusion Plant and a former ORGDP employee
- Lamar Alexander, Governor of Tennessee
- Marilyn Lloyd, Member of Congress from Tennessee

**Proclamations were presented by  
Roy Pruett, Mayor of  
the City of Oak Ridge,  
and Ken Yager,  
Roane County Executive.**



Roane County Executive, Ken Yager, presents proclamation to ORGDP plant manager, Bill Thomas, as several Roane County residents look on.

# Telegram . . .

"Congratulations on the 40th anniversary of the Oak Ridge Gaseous Diffusion Plant. I join all of you, both employees and retirees, in celebrating the four decades of excellent service that the ORGDP has provided to improving the quality of life. The enriched uranium from Oak Ridge has allowed utilities all around the world to supply electricity at reasonable cost and in an environmentally safe manner. Let us face the future of this enrichment enterprise with the determination that, regardless of what tomorrow's technology brings, you, the good and talented people of East Tennessee will play a major role."

Marilyn Lloyd, Member of Congress

## PROCLAMATION

WHEREAS, on February 21, 1985, the Oak Ridge Gaseous Diffusion Plant marked its 40th Anniversary as an efficient, continuous supplier of enriched uranium for power reactors in this country and abroad; and

WHEREAS, to commemorate this historic event, Martin Marietta Energy Systems is planning a birthday celebration to be attended by ORGDP employees and retirees on March 21, 1985; and

WHEREAS, the Oak Ridge Gaseous Diffusion Plant was built during World War II as part of the U. S. Government's "secret" Manhattan Project and had as its original mission the production of enriched uranium for use in the nation's nuclear weapons program; and

WHEREAS, through the years a transition of great significance has taken place; ORGDP's production emphasis has gradually changed from defense program usage to peaceful applications - primarily by the nuclear power industry; and

WHEREAS, through its role as a center for uranium enrichment, the ORGDP is contributing to the nation's efforts to conserve its nonrenewable resources, such as natural gas and oil, and to decrease its dependence on foreign imports; and

WHEREAS, the City of Oak Ridge is proud of the contributions made by the Oak Ridge Gaseous Diffusion Plant, both to the cause of world peace and to conservation of the nation's renewable resources, and considers the facility a vital and enduring part of this City's history.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND MEMBERS OF THE OAK RIDGE CITY COUNCIL that the week of March 18-22, 1985 be proclaimed

### OAK RIDGE GASEOUS DIFFUSION PLANT WEEK

in the City of Oak Ridge, Tennessee, and that all citizens be called on to join in the observance of this special time for paying tribute to the Oak Ridge Gaseous Diffusion Plant and its dedicated employees.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the City of Oak Ridge to be affixed, this the 18th day of March, nineteen hundred and eighty-five.



State of Tennessee

LAMAR ALEXANDER GOVERNOR

March 6, 1985

Mr. W. F. Thomas  
Manager  
Oak Ridge Gaseous Diffusion Plant  
Martin Marietta Energy Systems, Inc.  
Post Office Box P  
Oak Ridge, TN 37831

Dear Friends,

I am pleased to have this opportunity to join you as you celebrate the fortieth anniversary of the Oak Ridge Gaseous Diffusion Plant. I know that this is a special time for each of you as you reflect back over the forty years of the plant's operation and your association with it.

Technological progress and the high cost of electricity may soon impact and even close the plant here. It is hard to believe that this important supplier of enriched uranium may soon be obsolete. There are no words that I can say to ease your frustration.

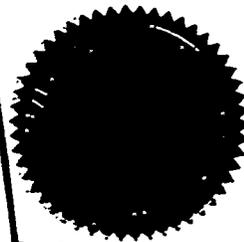
I can only commend you for your dedication to safety and quality, so that the Oak Ridge Gaseous Diffusion Plant well serves the industry. The ability to change and progress is a vital part of the strength of Tennessee and the United States. However difficult, it will make our country stronger for the future. I congratulate you on forty years of operation. On behalf of all Tennesseans, I wish you the very best for success and happiness in the future.

Sincerely,

*Lamar Alexander*

Lamar Alexander

LA/hp



*Don J. Purcell*  
Mayor



Roane County, Tennessee

## PROCLAMATION

By The County Executive

WHEREAS, the Oak Ridge Gaseous Diffusion Plant, or the K-25 Plant, began operating in 1945 as the world's first facility for separating uranium by the gaseous diffusion process, and

WHEREAS, the K-25 Plant has since that time been a continuous supplier of enriched uranium for power reactors in this country and abroad, and

WHEREAS, the national interest has been well served by the present employees and retirees of the K-25 Plant, and

WHEREAS, Roane County particularly appreciates the service of the many Roane Countians who have worked at the K-25 Plant, and

WHEREAS, the K-25 Plant recently observed its fortieth year of operation, and

WHEREAS, it is altogether appropriate to honor the K-25 Plant, its employees and retirees for their service to the community, state, and nation.

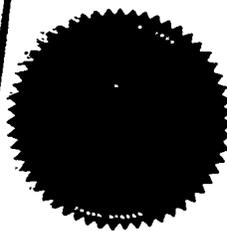
NOW, THEREFORE, I, Kenneth E. Yager, as County Executive of Roane County, Tennessee, do hereby proclaim the week of April 8, 1985 through April 14, 1985, as

"K-25 EMPLOYEE AND RETIREE WEEK"

in Roane County, Tennessee, and do urge all our citizens to join me in this observance.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the County of Roane, State of Tennessee, to be affixed at Kingston, this \_\_\_\_\_ day of \_\_\_\_\_, 1985.

Kenneth E. Yager  
Roane County Executive



## Electronic mail message . . .

"On behalf of all the employees at your sister plant in Paducah, and especially those of us who are ORGDP alumni, congratulations on your plant's 40th anniversary. I wish I could be there to share in the festivities and the telling of old "war stories" that this occasion is sure to bring out!!"

"Have a piece of cake for me (preferably chocolate!) and save me a showing of the "ORGDP - 40 Years - An Enriching Experience" videotape for my next visit to Oak Ridge.

"Again, congratulations!!"

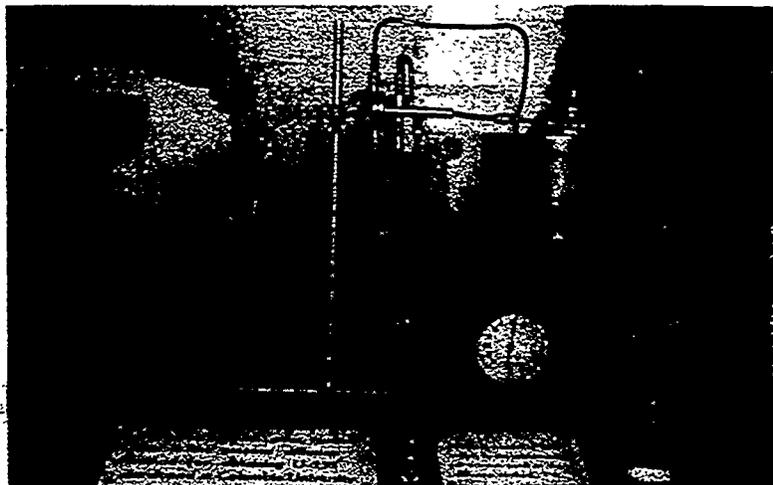
Ralph Donnelly

**“In the beginning . . . .  
from swords  
to plowshares”**

**( . . . and they shall beat their swords  
into plowshares . . . . (Isaiah 2:4)**

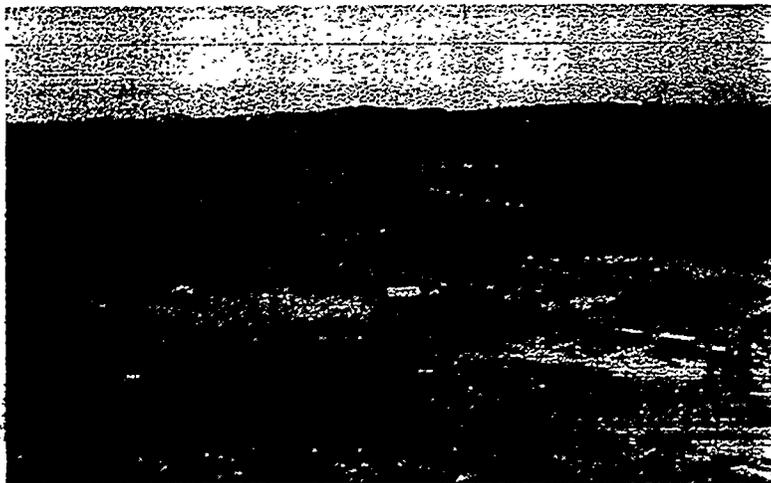
**I**n January 1942, soon after the beginning of World War II, Columbia University scientists made the first small-scale separation of uranium isotopes by the gaseous diffusion process with the apparatus shown.

Analyses, showing the separation had been accomplished, were performed at the University of Minnesota. This long-distance collaboration proved that uranium isotopes could be separated by diffusion.



**W**ithin a year, under the stimulus of an all-out war, scientists at Columbia and other universities had enough information on gaseous diffusion to show that production of large quantities of uranium-235 was possible. At that time, the Carbide and Carbon Chemical Company, later Union Carbide Corporation, was called

in. On January 18, 1943, a contract to operate a gaseous diffusion plant and to provide engineering and research help was signed by James A. Rafferty for Carbide and Lt. Col. K. D. Nichols for the Manhattan Engineering District. The scope of this contract was expanded many times by the U. S. Atomic Energy Commission (now the Department of Energy) and Union Carbide Corporation.



**U**nion Carbide was brought into the atomic energy program because of its experience and expertise in the chemical and metallurgical fields, and because of its important contributions to the atomic energy program prior to the Government contract. The Corporation served as operating contractor for the Oak Ridge Gaseous Diffusion Plant from its startup in 1945 until April 1, 1984, when Martin Marietta Energy Systems, Inc., became operating contractor.



# The Army Special Engineer Detachment

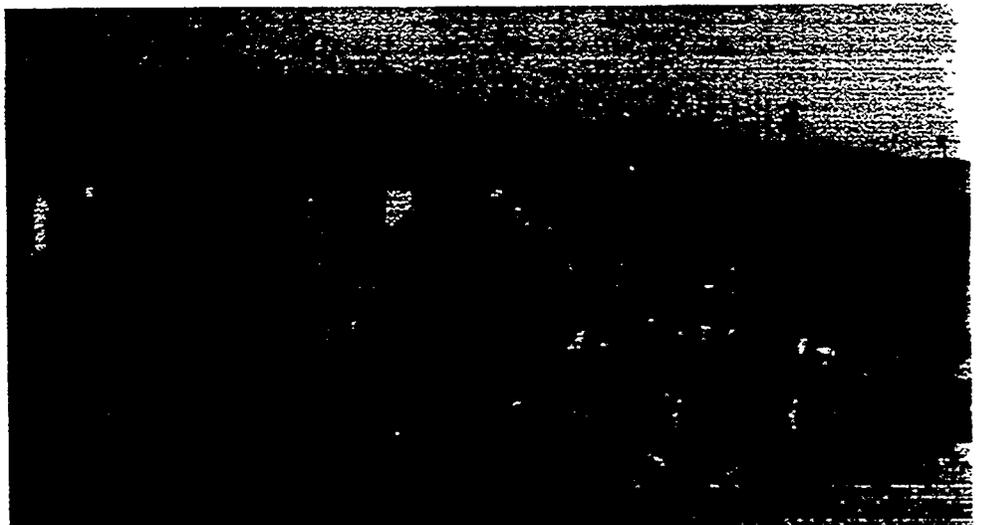


Party time for the SED boys

In May, 1943, a Special Engineer Detachment (SED) was formed by the Commanding General of the Army Service Forces to help provide essential technical personnel for the Manhattan District. The first roster consisted of 334 enlisted men. By September 1945 the roster had increased to 1,257 enlisted men.

In the fall of 1943 a recruitment program was begun at colleges and universities to line up draftable men for assignment to the SED. The men in the SED came from every state of the union and represented approximately 300 colleges and universities.

On their release from the Army, many SED men elected to return home; however, many remained as civilian employees at K-25. Among those who remained at K-25 after discharge from the Army were: Larry Allen, Mike Bartkus, Sy Bernstein, Bruce Bogardus, Buford Carter, Don Burton, Raimon Eby, Bob Dyer, Ernie Evans, John Farquharson, Jay Foster, M. Herskowitz, Bob Higgins, George Jamieson, George Job, V. H. Kiplinger, Ted Kwasnowski, Gordon Lindner, Ralph Morang, Larry O'Rourke, John Pashley, Ed Powell, Ted Rassler, Howard Preuss, Gene Roy, Harold Shnider, Gordon Smith, Herm Snyder, Stan Stief, Ed Sternberg, Bill Tewes, Dick Thomas, Al Tuholsky, Nelson Van Wie, Walt Wendolkowski, and Bob Winsbro.



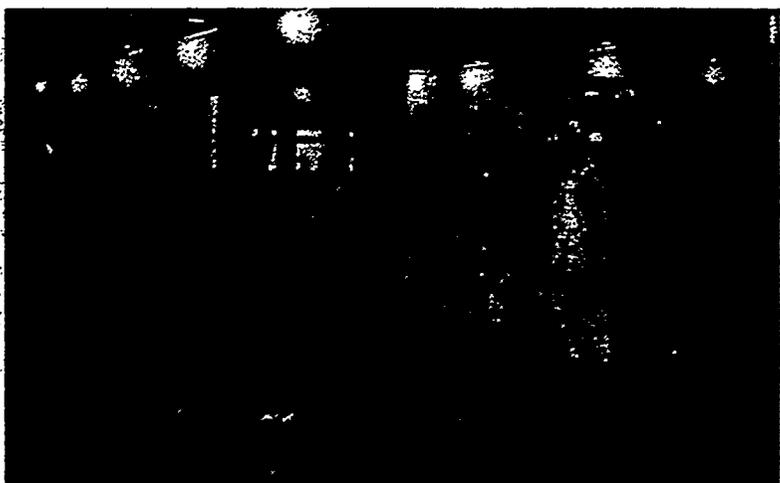
Sunday afternoon at the barracks



# **The “K-25 Plant” . . .**



Wheat Church



Masons pouring slabs for K-25 U

The ORGDP is located on a 1,500-acre tract of land bordered on the west by Poplar Creek. The eastern edge of the Plant once encompassed a portion of the Wheat community. ORGDP is often referred to as "K-25," which was the Plant's wartime code name and the name of its first gaseous diffusion process building. Ground was broken for the K-25 Building in September 1943. Less than 17 months later the first enriched uranium was produced by the gaseous diffusion process. In August 1945, the K-25 cascade was in full operation.

**At that time, about 10 percent of all the electric power generated**

**in the United States was required to operate the K-25 cascade.**

When Carbide accepted the contract to operate a gaseous diffusion plant, it also agreed to perform certain research, development and consulting services. This included management of the gaseous diffusion barrier development and production program under the direction of Dr. George T. Felbeck. In December 1947, the barrier plant and uranium hexafluoride feed plant began operation.

ORGDP's process buildings--K-25, K-27, K-29, K-31, and K-33--and the auxiliary and support buildings cover about 640 acres. The ORGDP represents a capital investment of about \$1.3 billion; however, the current replacement cost would exceed \$6 billion.



**B**uilt during World War II as part of the United States Government's "secret" Manhattan Project, the plant's original mission was to produce enriched

uranium for use in the nation's nuclear weapons program. The future of atomic

energy became a legislative concern with the war's end. Thus, on January 1, 1947, the newly created Atomic Energy Commission (AEC) assumed the responsibilities and obligations held by the Manhattan Engineering District at the Clinton Engineering Works (CEW). The Oak Ridge area then came under civilian authority, and the peaceful applications of nuclear energy became the primary concern at the ORGDP.

**C**onstruction of

the Paducah Gaseous Diffusion Plant was

begun in December 1950 and the Portsmouth Gaseous Diffusion Plant in September 1952. Many key personnel for both plants were trained at the ORGDP.

**T**he first shipment of enriched uranium under the Atomic Energy Commission's Civilian Applications Program (CAP) was made in September 1956. By early 1962, the gaseous diffusion plants had shipped approximately one million pounds of uranium for CAP use.



*Handwritten:* Vacuum Dept

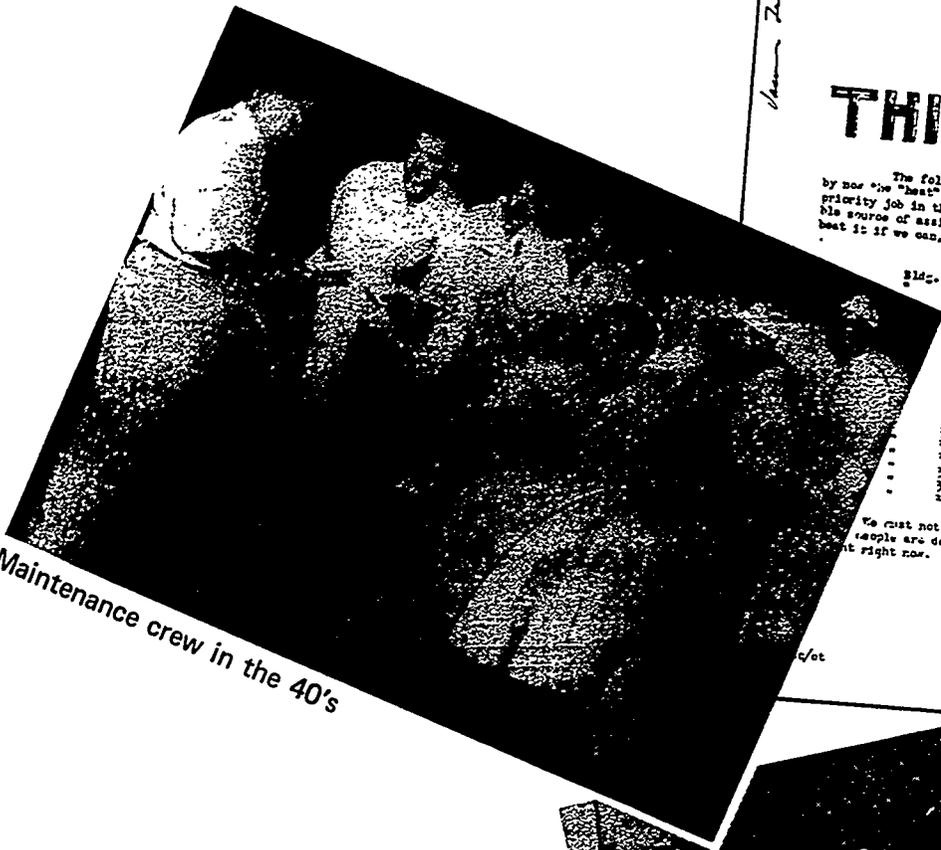
# THIS MUST BE IT

The following schedule must be met. As you all probably know by now the "heat" is on Vacuum Testing. It is probably the highest priority job in the United States today. The Army is makin' every possible source of assistance available to us to meet this schedule. We must beat it if we can, but by all means WE MUST MEET THIS SCHEDULE.

Bldg.	Vacuum Testing	Complete	Days
301-4	.	7-7	7-9
301-5	.	7-7	7-10
305-2	.	7-7	7-3
305-5	.	7-7	7-16
305-6	.	7-16	7-13
305-7	.	7-13	7-13
305-10	.	7-11	7-18
305-11	.	7-8	7-7
305-12	.	7-27	7-20
306-1	.	7-23	7-21
306-2	.	7-15	7-14
306-3	.	7-20	7-27
306-4	.	7-20	7-27
306-5	.	7-21	7-2
306-6	.	8-1	7-2
306-7	.	7-1	7-22
		7-16	7-26

We must not let anything stand in our way. A lot of things and people are dependin' on us to do our part. Our part is the most important right now. We must not fail.

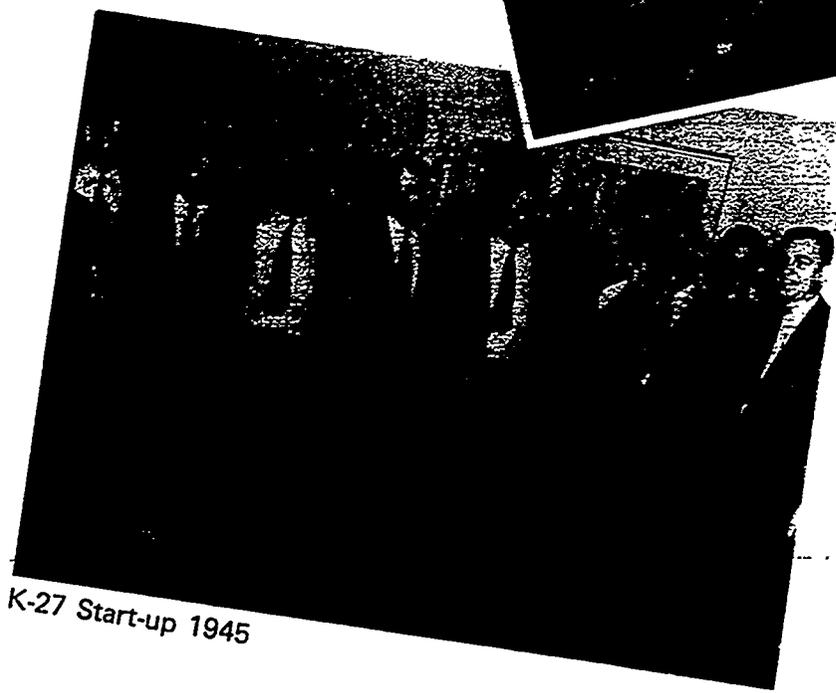
*Signature:* R. L. ...  
 V.T.D. Administrative Eng.



Maintenance crew in the 40's



Seal Service Mechanics Process Building



K-27 Start-up 1945

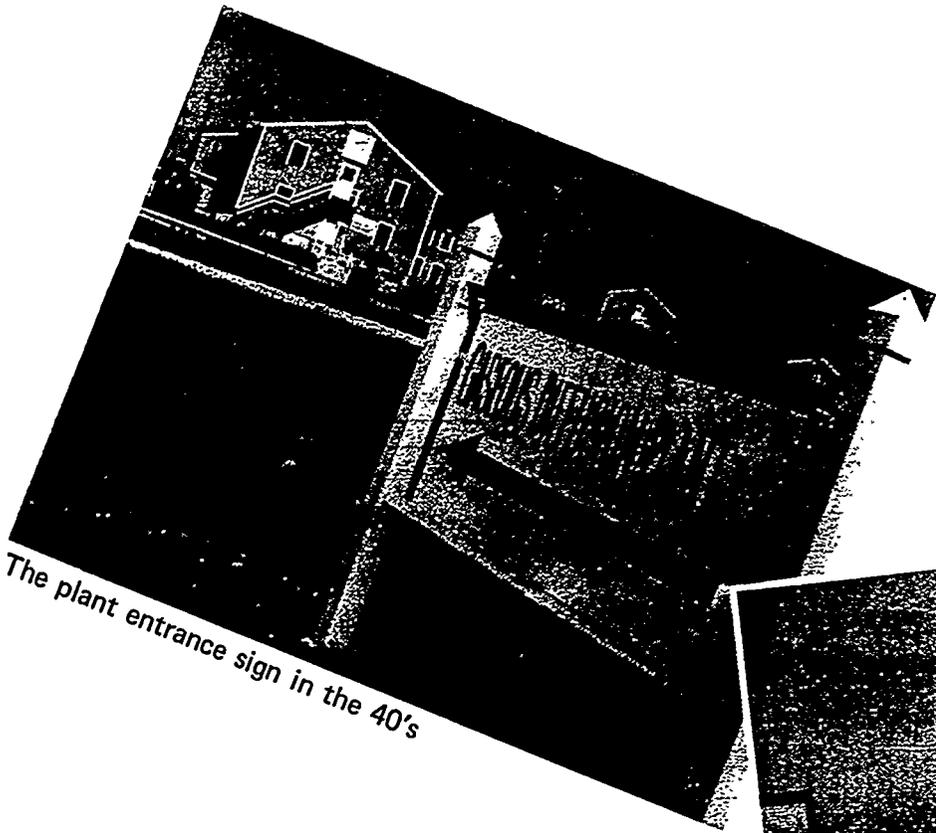
# Remember the portal lines?



Welder - 1945



Portal 4 - 1945



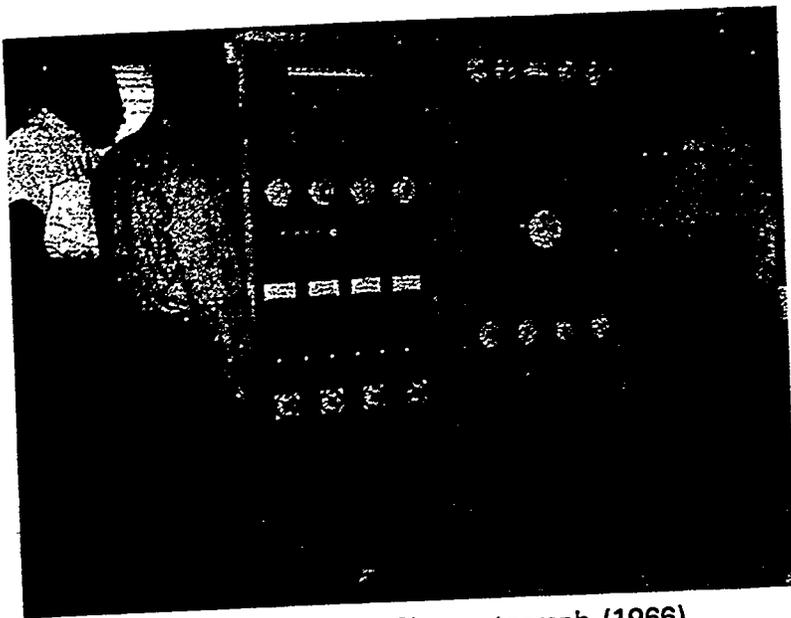
The plant entrance sign in the 40's

## Employees entering Portal 4



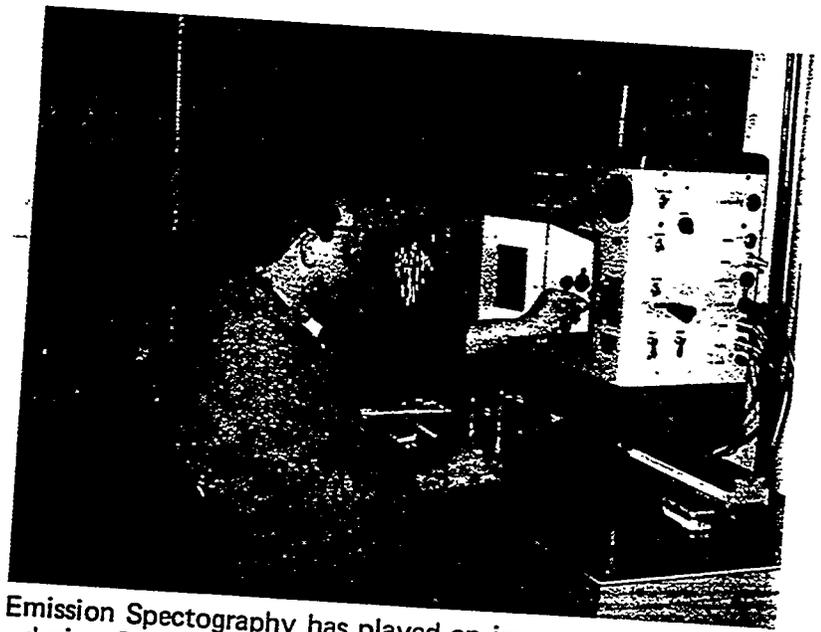
Remember when we had a helicopter pad  
near Portal 4?



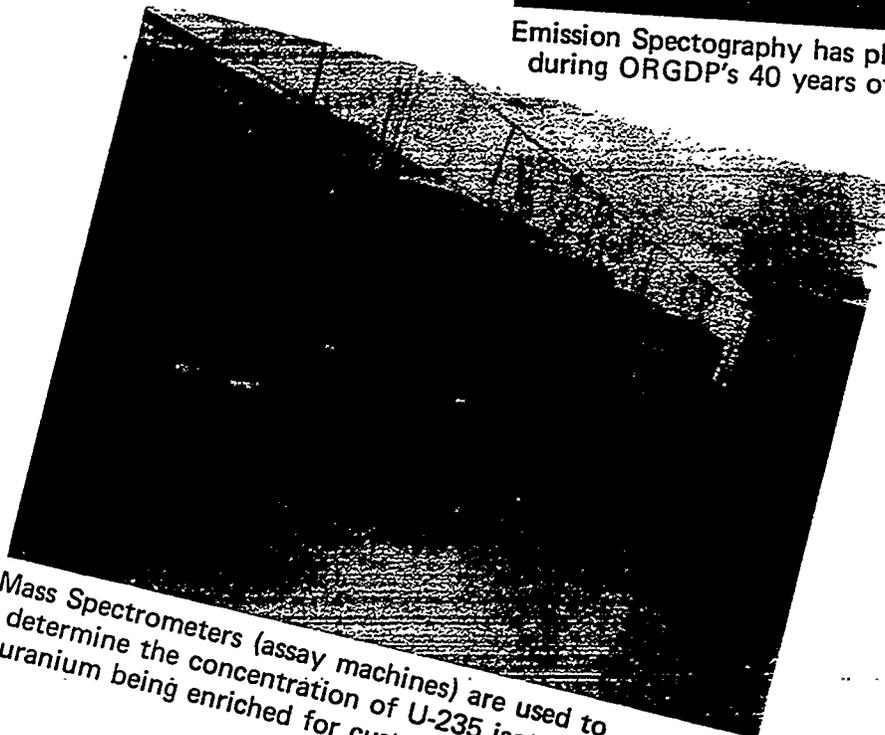


ORGDP's first corrosive gas Chromotograph (1966)

## Memories . . .



Emission Spectography has played an important role during ORGDP's 40 years of operation



Mass Spectrometers (assay machines) are used to determine the concentration of U-235 isotope in uranium being enriched for customers

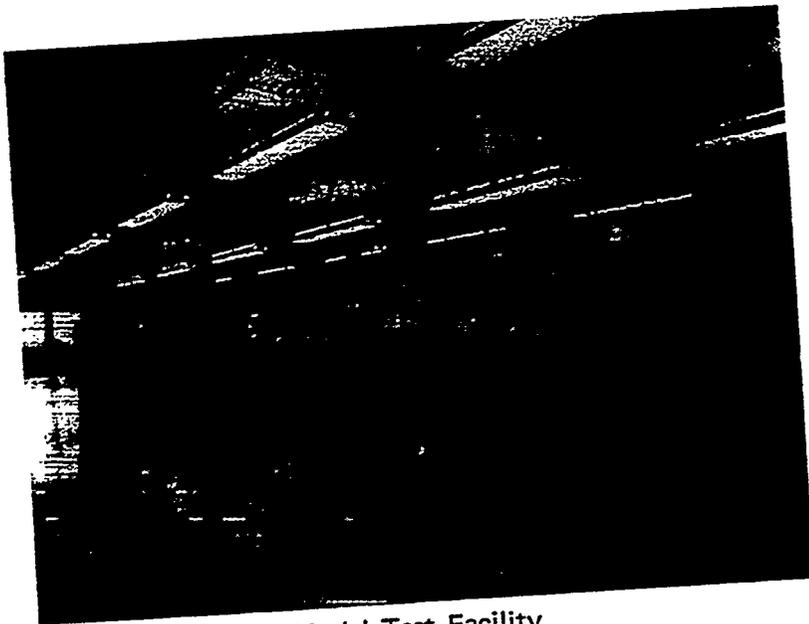
# Memories . . .



Some will remember the K-633 Test Loop



Doug Fain is shown with the Portable Certification Unit used for calibrating pressure and gas flow rate



Vertical text on the right edge of the page, likely a page number or reference code.

**Enrichment technology  
and other advances . . . .**

# Gas Centrifuge . . .

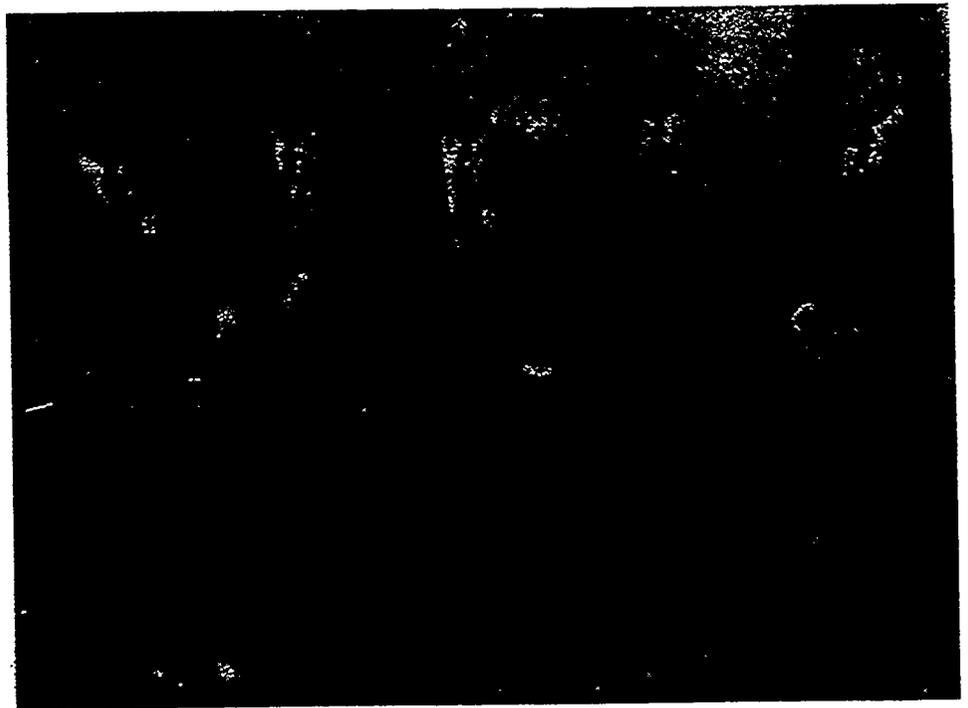
In the early 1960's, ORGDP began experimental work on gas centrifuge as an alternative uranium enrichment process. (The first gas centrifuge machine had been operated in 1934 by Jesse W. Beams at the University of Virginia.) After several years of successful research, development and demonstration of the centrifuge technology at ORGDP, in 1977, President Jimmy Carter announced plans to build a full-scale production plant near Portsmouth.

ORGDP continued to have a key management role related to construction of the Gas Centrifuge Enrichment Plant and training of Goodyear employees to operate the facility once it was completed. Staff also continued their research and development of advanced, even more efficient, centrifuge machines.

## Toll Enrichment . . .

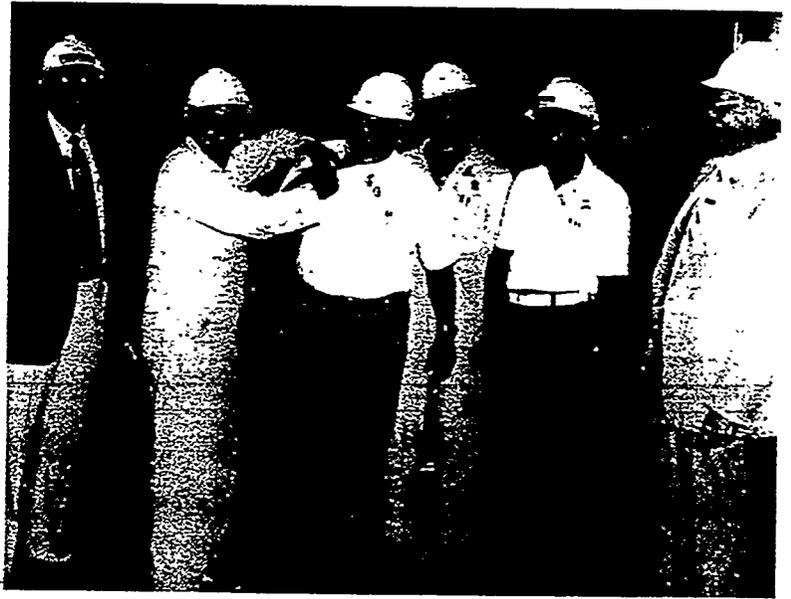
In 1969, DOE's Toll Enrichment Program was begun to provide uranium enrichment services to customers in the United States and in several foreign countries. To obtain the enrichment service, a customer — usually a utility company — negotiates a contract with the DOE.

The customer purchases natural uranium in the form of uranium hexafluoride and ships it to the gaseous diffusion plant. After it has been enriched in the U-235 isotope to the desired level (about 3 percent), the uranium is shipped to the customer or to a designated fuel fabrication facility.



(l to r) Ernie Evans, Ed Babelay, Jesse Beams, Paul Vanstrum, Bill Wilcox

The customer pays a pre-set fee or "toll" to cover the cost of the enrichment service. This activity had generated more than \$13 billion in revenues for the United States Treasury by 1985.



## CIP/CUP . . .

Placement of the last CIP/CUP converter in the K-33 process building was a reason to celebrate in 1981. Through the cascade improvement and uprating programs, new equipment and barrier were installed at all three diffusion plants, improving their operating efficiency and increasing the U. S. uranium enrichment capacity by 60 percent.

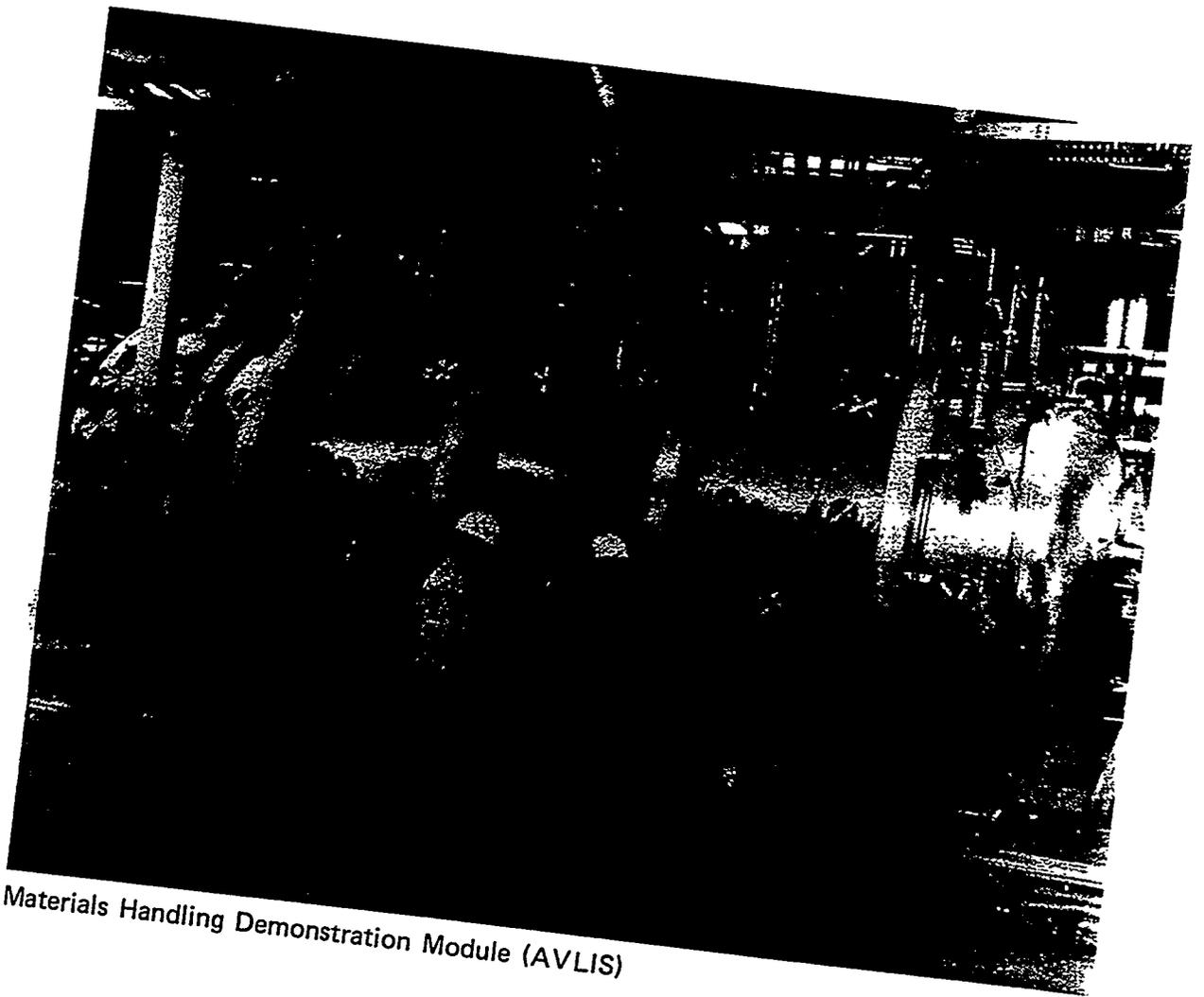


## **AVLIS is victorious . . .**

In its continued quest for more economical energy efficient uranium enrichment methods, DOE authorized an extensive research and development program on advanced isotope separation technologies in the 1970's. ORGDP staff were involved in R&D work on the Plasma Separation Process, the Molecular Laser Isotope Separation process and the Atomic Vapor Laser Isotope Separation (AVLIS) process. In 1982, AVLIS was selected over the other two processes for further development and demonstration. At the same time ORGDP staff were continuing their lead role in the gas centrifuge area through development of advanced gas centrifuge (AGC) technology.

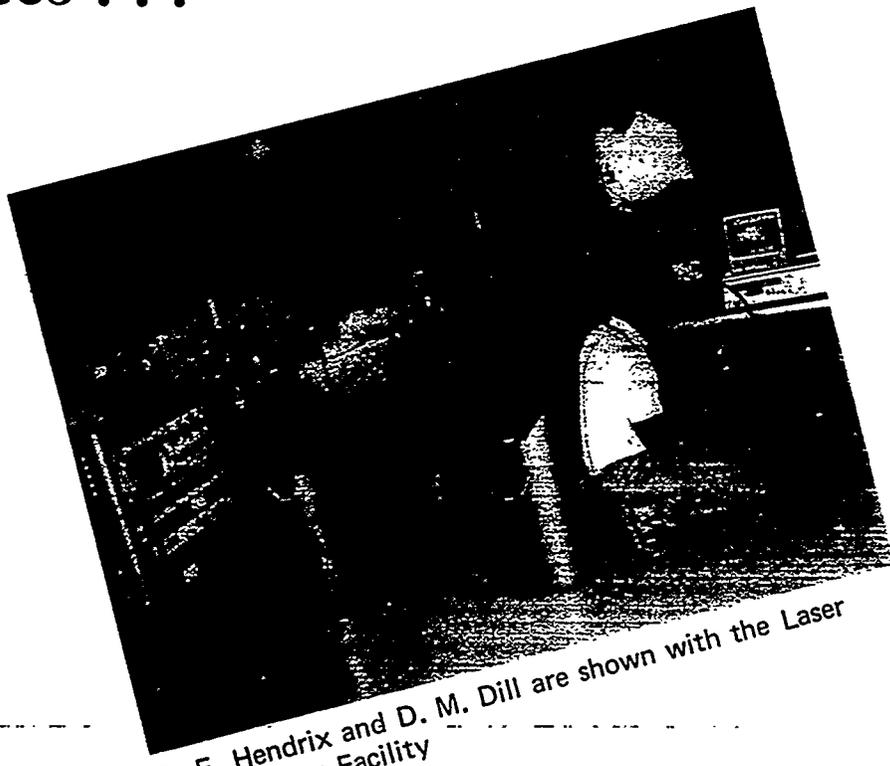
Due to changes in the world market situation which reduced its enrichment revenues, DOE announced in 1984 it could no longer continue to support both AVLIS and AGC. The two advanced processes were put into competition with each other to determine which would be "the process of the future."

In June 1985, AVLIS was announced as the winner of the competition. The process is being developed jointly by staff at ORGDP and Lawrence Livermore National Laboratory in California.



Materials Handling Demonstration Module (AVLIS)

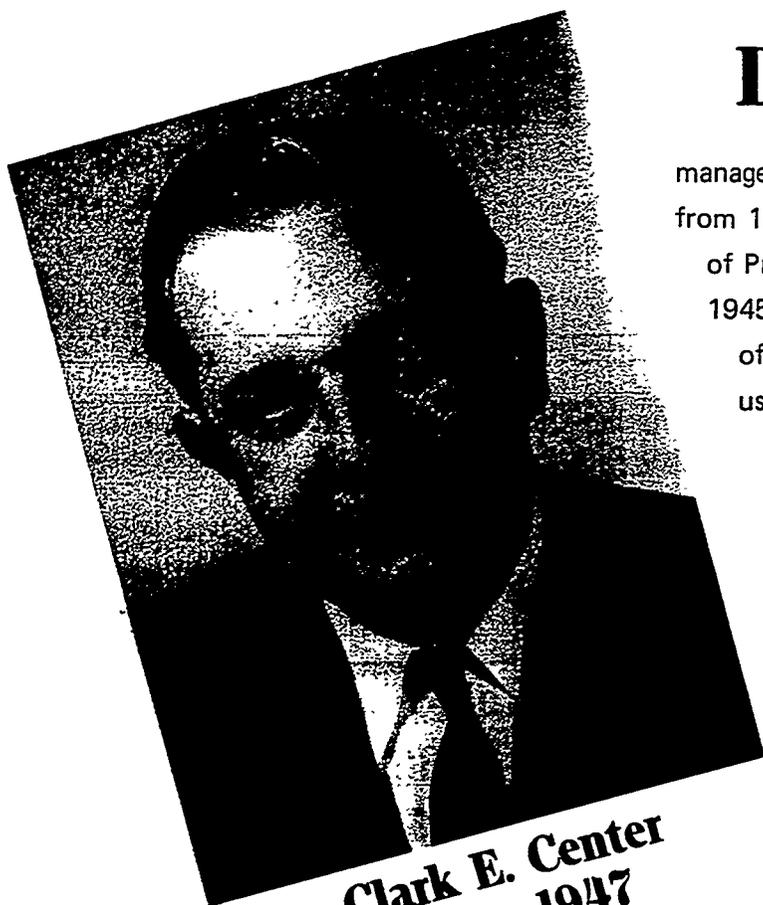
## Advances . . .



D. E. Hendrix and D. M. Dill are shown with the Laser Holography Facility

**ORGDP Leaders . . .  
Past and Present**

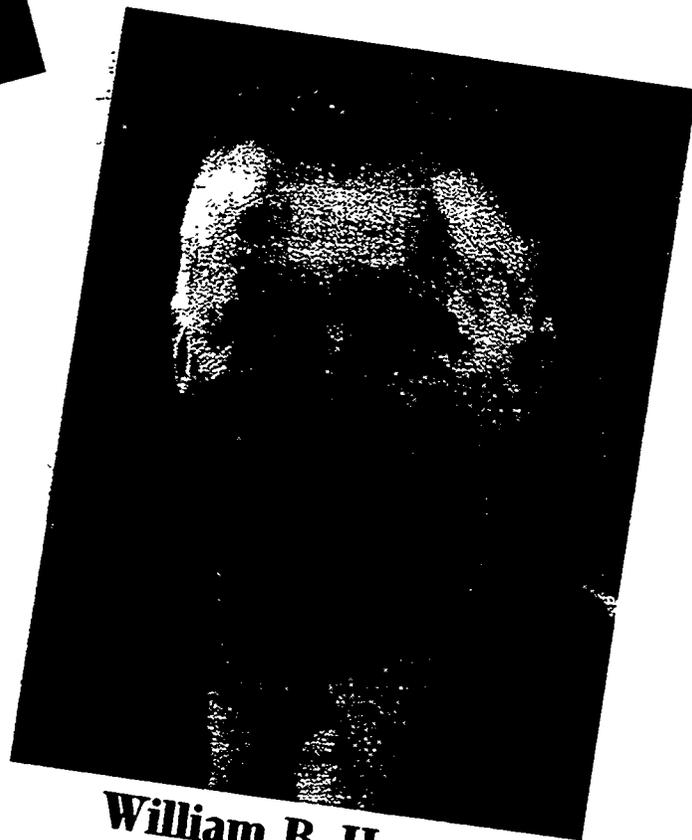
# ORGDP's Plant Managers



**Clark E. Center**  
1944 - 1947

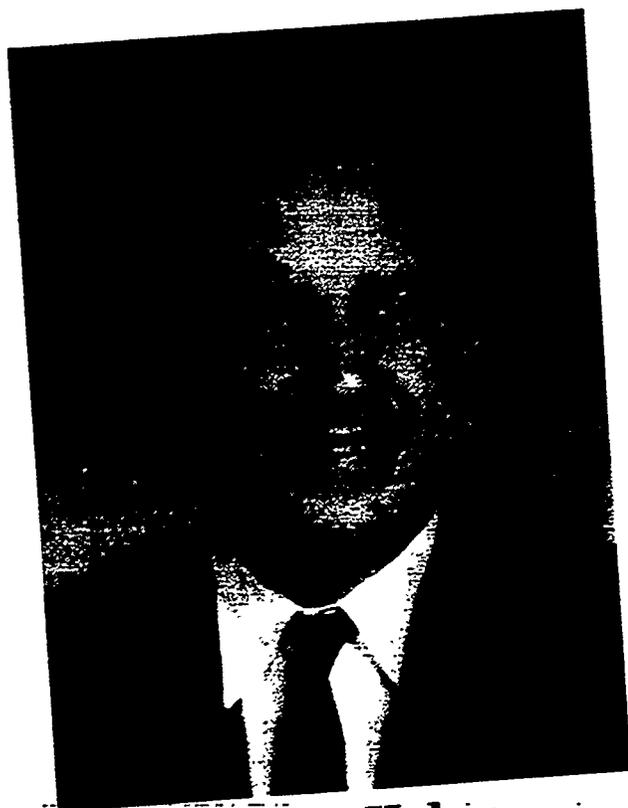
**D**uring its 40 years of operation, the ORGDP has had seven plant managers. The first ORGDP plant manager was Clark E. Center\* who served in this capacity from 1944 to 1947. Center was plant manager at the time of President Franklin D. Roosevelt's death on April 12, 1945, when Harry Truman suddenly became President of the United States. President Truman approved use of the atomic bomb on Japan during World War II. Following the bombing of Hiroshima on August 5, 1945, and Nagasaki three days later, the Japanese surrendered.

\*Center died May 31, 1985.



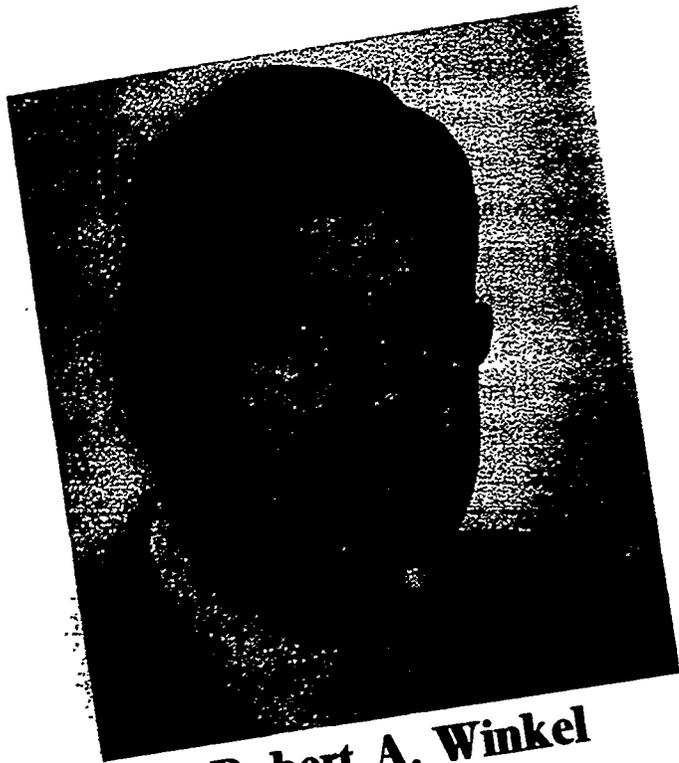
**William B. Humes**  
1948 - 1950

**W**illiam B. Humes became plant manager in early 1948 serving in that capacity for the next two years. He was followed by A. Paul Huber who served as the plant manager for the next ten years (1951-61).



**A. Paul Huber**  
1951 - 1961

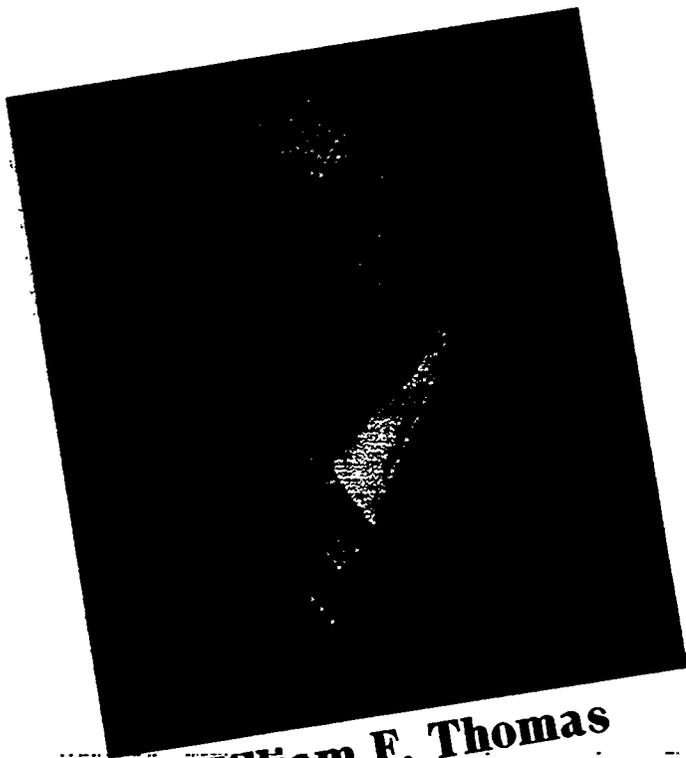
**I**n early 1962, Robert G. Jordan became plant manager, serving ten years in that capacity. In 1972 Robert A. Winkel transferred from the Paducah plant to serve seven years as ORGDP's plant manager. In early 1980 Kenneth W. Sommerfeld was promoted to the level of plant



**Robert A. Winkel**  
1972 - 1979



**Robert G. Jordan**  
1962 - 1972



**William F. Thomas**  
1981 -

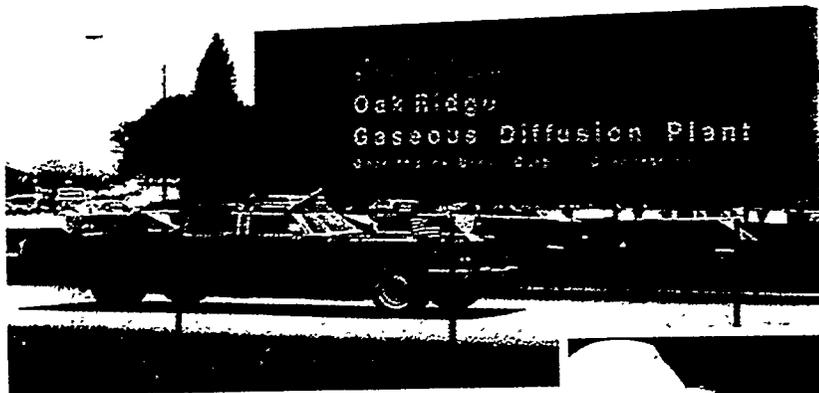


**Kenneth W. Sommerfeld**  
- 1980 - 1981

manager. About two years later the current plant manager, William F. Thomas, transferred from the Paducah Plant to become ORGDP's seventh plant manager when Sommerfeld became a vice-president of Union Carbide's Nuclear Division.

# VIPs visit . . .

# ORGDP visited by Presidents, Senators, Congressmen and top Company, Atomic Energy and Department of Energy officials . . . . .



President Carter visits ORGDP in 1978



President Carter and Senator Gore are shown with company officials



. . . More employees line up to see President Carter



ORGDP employees waiting for a look at President Carter



Tennessee legislators visit ORGDP . . .  
 Congressional Representatives Lloyd and Sasser and Senator Baker are shown with  
 Union Carbide Nuclear Division President Roger Hibbs



Union Carbide Chairman of the Board  
 visited ORGDP



## Atomic Energy Commissioner Dixy Lee Ray visits ORGDP

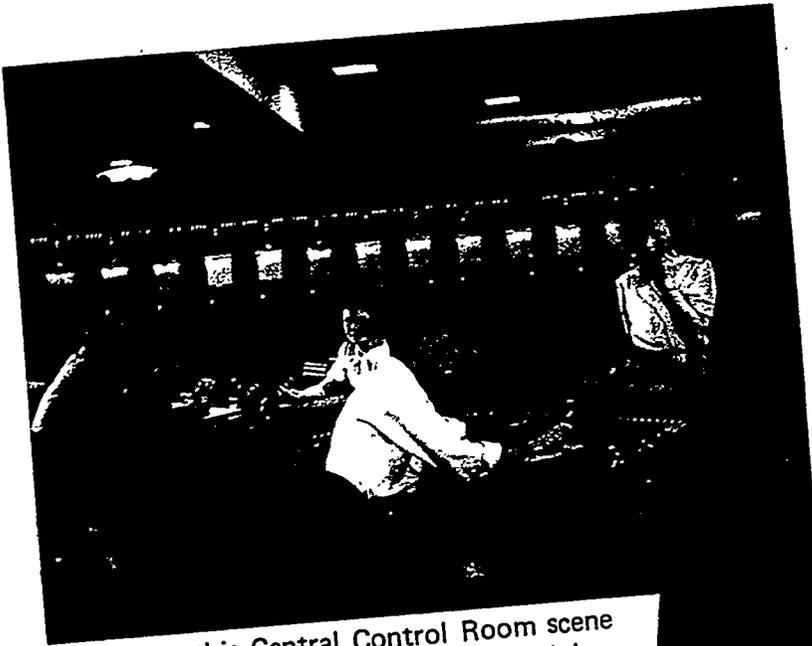


The "Baron" visits ORGDP



**DOE Secretary Donald Hodel, third from left,** inspects first cylinder of enriched  $UF_6$  produced in the Centrifuge Plant Demonstration Facility in 1983. With him are Nuclear Division President Roger Hibbs; Robert Hart, manager of DOE-ORO; and J. Robert Merriman, then Enrichment Technology Manager.

# **ORGDP . . . The Town**



Remember this Central Control Room scene in the 1940's? Shown from left are John Clark, Mary Lou Rader, Bob Newton, and Toni Carpenter



Remember our Company Store?



Remember when K-25 medical facilities looked like this?

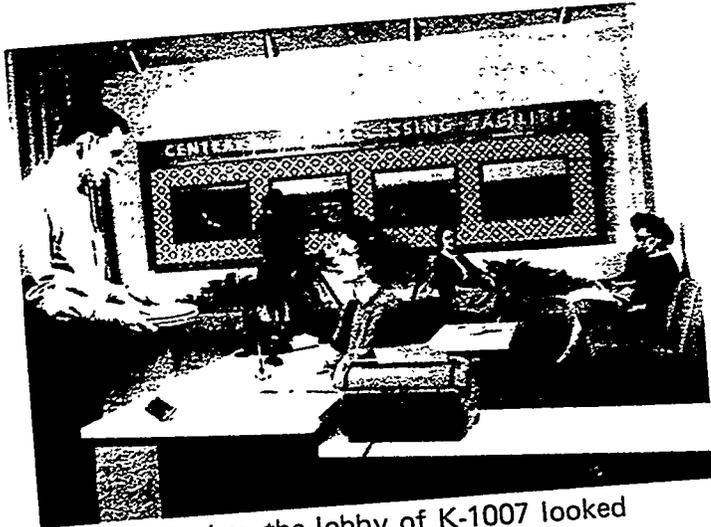
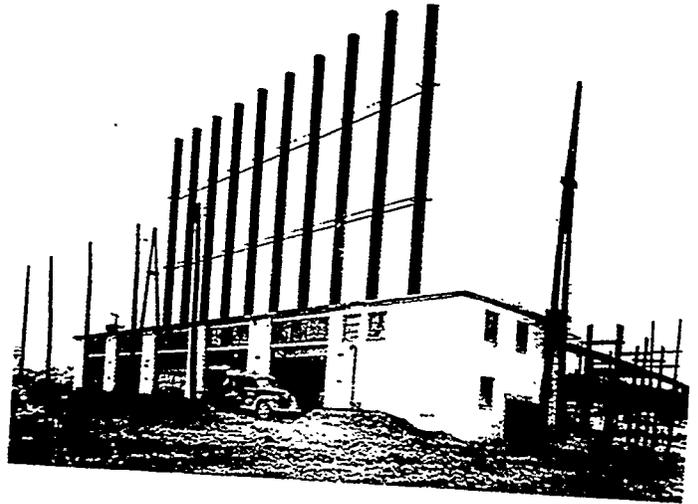


... and our first K-25 ambulance looked like this ...

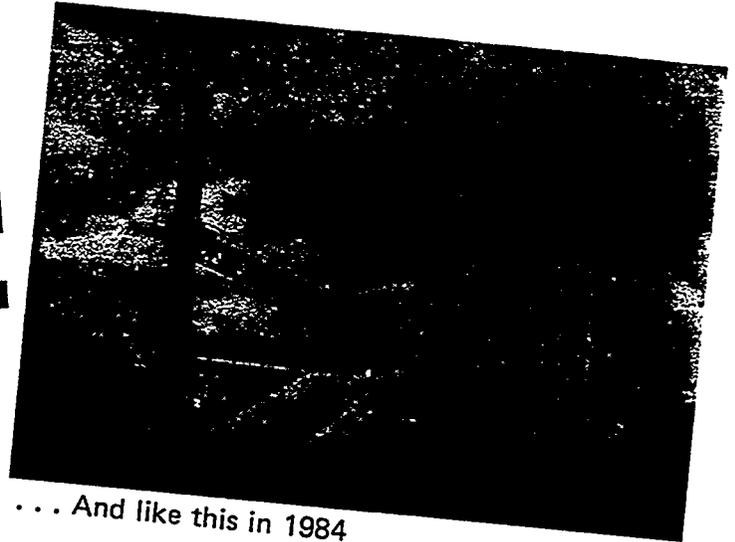
# The K-1501 Steam Plant looked like this in 1945



The K-25 Garage employed such a large crew



Remember when the lobby of K-1007 looked like this?



... And like this in 1984



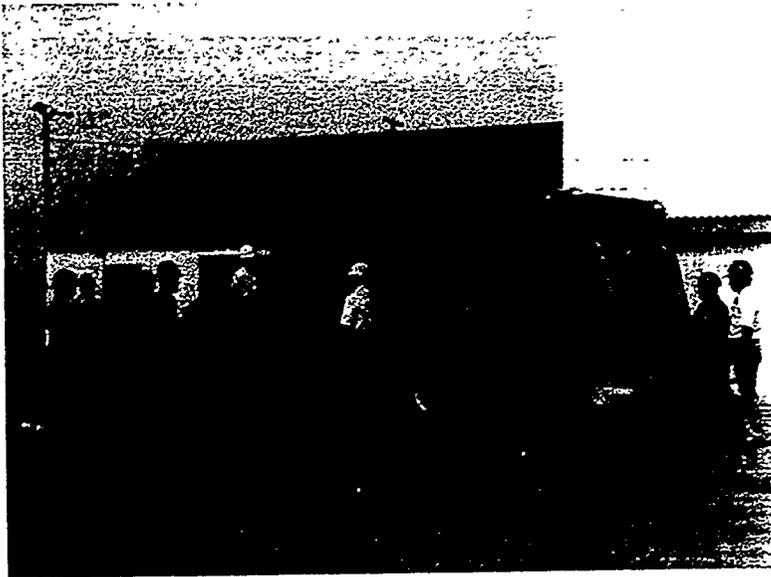
..Remember when dresses were short?



K-1024 Instrument Shop looked like this

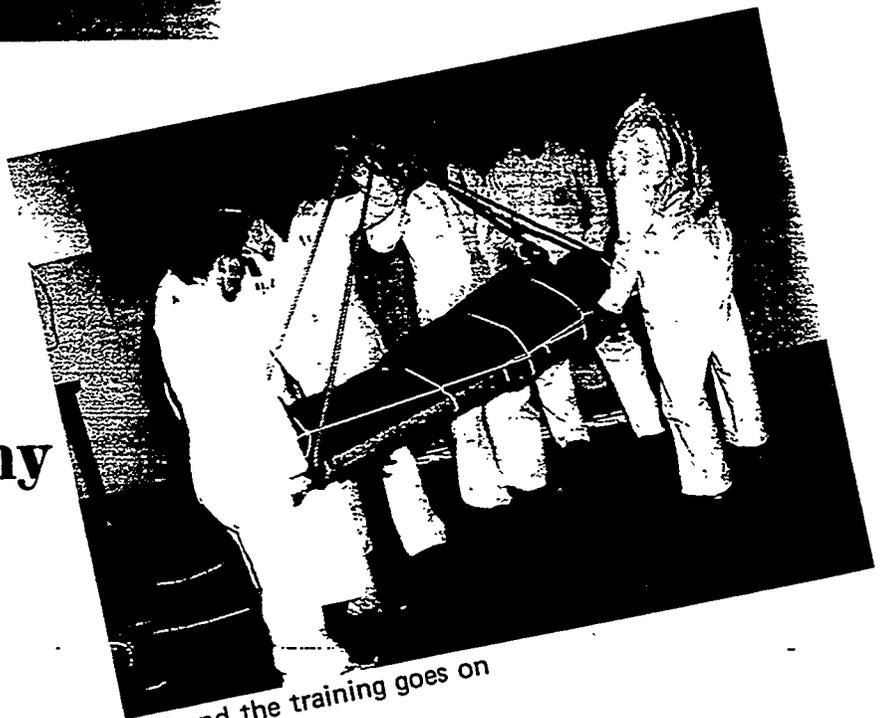


Remember these Emergency Squad members serving in 1949?



Emergency Squad

**Emergency Squad  
members train  
to handle any  
emergency.**



... and the training goes on



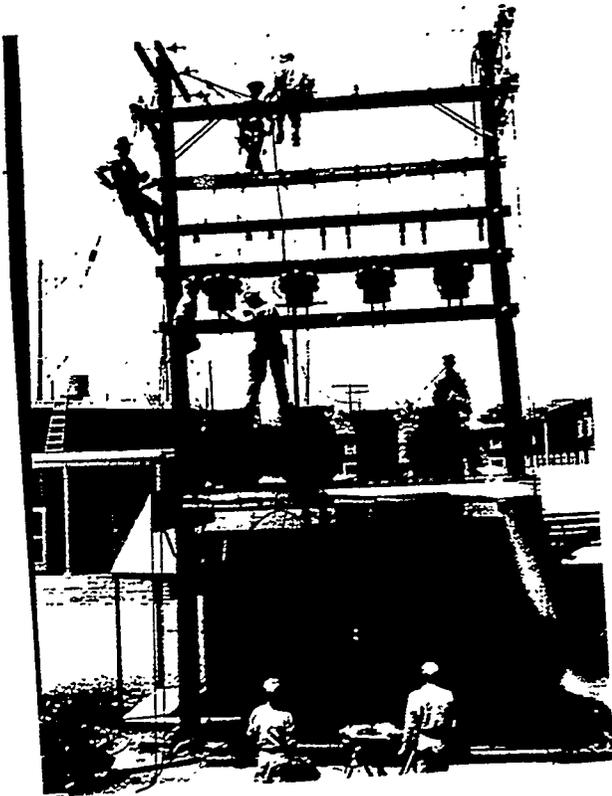
Health Physics employees responding to a radiation alarm drill



ORGDP employs mail carriers to distribute in-plant mail



ORGDP Fire Department employs the latest in equipment for fighting fires



**Our electrical  
linemen at work  
in 1945.**



At the time of its completion in early 1959, the ORGDP's water tower was the highest in the world at 367 feet, 5½ inches.

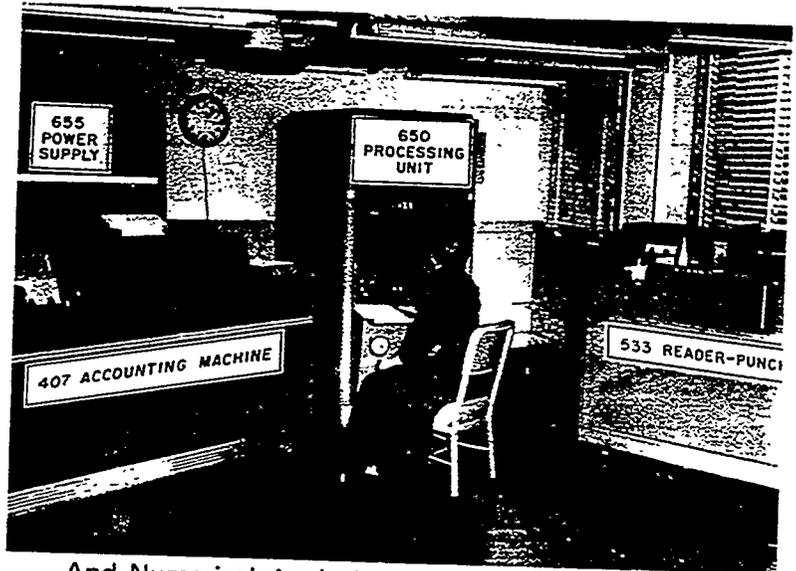
**It is 46 feet in diameter and holds 400,000 gallons of water.**



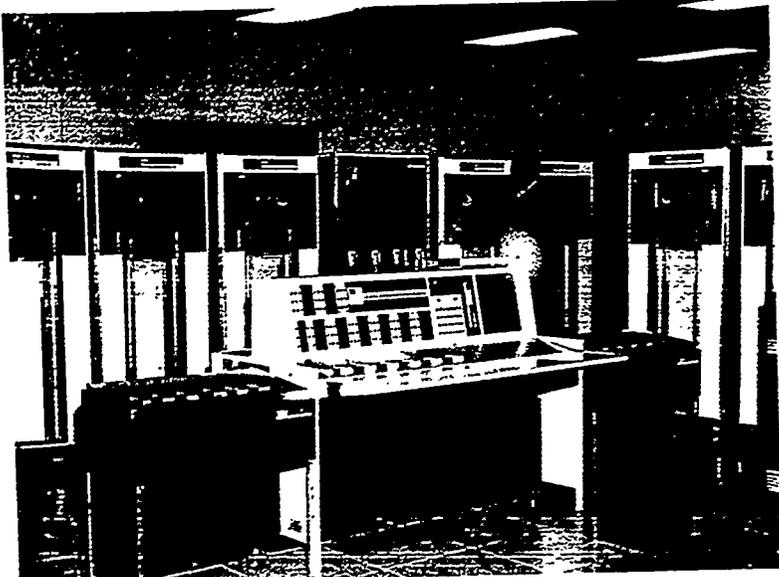
Anyone remember seeing these three-wheel scooters about the plant?



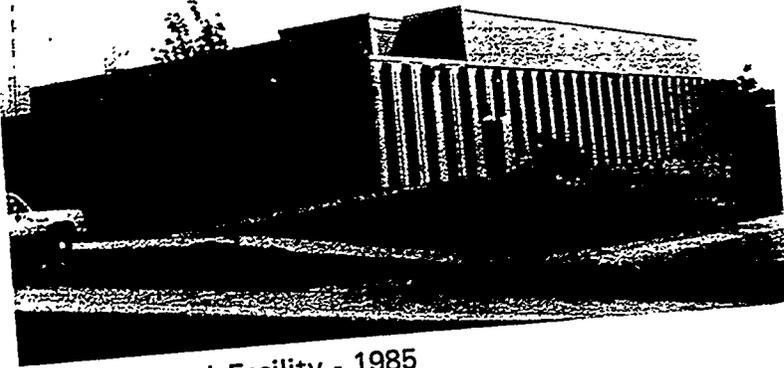
The ORGDP computing facility has come a long way in 40 years. Our computing power has increased by a factor of about 2 trillion over the manually operated desk calculators



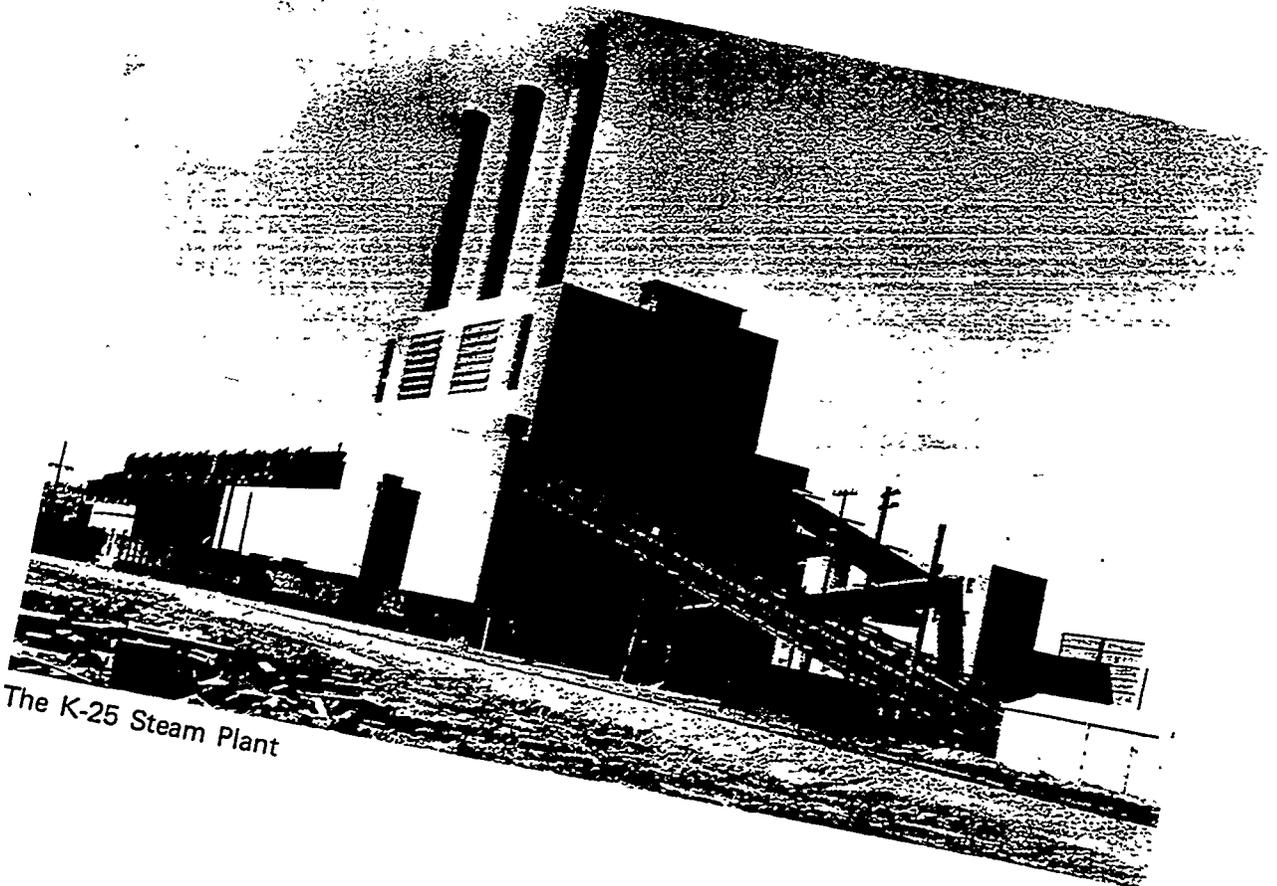
... And Numerical Analysis had the latest in electronic computing equipment



**A view of  
Central Data  
Processing in  
1965**



Central Control Facility - 1985  
The latest in computer technology used to  
monitor all aspects of plant operation



The K-25 Steam Plant

# **Just Reminiscing . . .**

How many of you remember when the process area was composed of 90 percent women workers? There were women sitting in front of every panel board all the way around the U. In all of the line recorder stations there were women. Boy, those were great days!

Do you remember when the Cafeteria stayed open 24 hours a day and the rolling canteens came through the U? Do you remember when the process area was fenced off and there was a guard at either end, one on the north end and one on the south end?

Do you remember Willy the bug man, the plant exterminator? Now, the bug man was kinda short, rotund and had a toothless grin. He knew everybody in the plant and everybody knew him as the "bug man." He never met a stranger. It was a hot summer day and a guard had been standing at one of the portals out in the sun all day, sweating up a storm. He got on the bus to inspect the badges and came upon Willy. The guard said, "Bug man, wouldn't you like to be a guard?" The bug man looked up at the guard and said, "No sir, mister guard. It's bad enough just being colored." The perfect squelch. The guard continued to inspect the badges and left the bus without uttering another word.



I was an Army engineer at K-25 in 1945 and 1946; following that I became a civilian employee of K-25 until 1961 when I was assigned to Y-12. I lived around the clock with the Production Division in the early days. I remember the K-25 startup period as a gigantic accomplishment including rapid technology growth, amazing engineering, construction, and procurement activities which progressed at a pace that could not possibly be matched in today's society of regulation, budget debates, and much reduced industrial resources at our disposal.

As a GI, I can recall endless hours of vacuum testing, charging cooling systems, preconditioning, and testing and testing, and finally production operation. For the most part, everybody worked hard. Later we got involved with development, and then the operations of new facilities such as K-29, K-31, and K-33. During all of this, we worked hard for competitive operation of the Power House, along with the Oak Ridge electrical distribution system.

Those were exciting times racing around the operating floor on bicycles. There were fun times, too – softball games, picnics, Christmas dances, fish fries. K-25 is a source of many cherished memories and friendships for me and my family. Forty years, no it can't be that long.

— H. G. P. Snyder



Remember when MAN Laboratory was operating in the old powerhouse building?



Remember the women's rifle team in the late forties?

## Remember the Carbide Girl's Club?



Remember when Electrical Maintenance had their own basketball team?



Bowling has always been a popular sport with K-25 employees

# Remember when the K-25 site looked like this?



One of the weirdest things that ever happened to me was back during the days of the great big station wagons with lots of chrome and big, expensive wire wheels. I parked in the parking lot out in front of the plant one day, went in my office to work, and came out, running late as usual, to go home; I got a few feet from my car and noticed the thing was setting on its axle. There wasn't any back wheel. The people behind me thought it was the funniest thing they had ever heard of. I was not too amused, especially when I discovered that all the lugs on the left wheel were loose. I drove home that afternoon on the spare with just a very few lugs holding it on. Some asked, "Well, how in the world did you get home?" "Very carefully," said I.

— Bobby W. Curtis

A story about Ed Pluhar that comes to mind was when his office was located upstairs above Clarence Larson's office when Larson was Y-12 Plant Manager. A very good cook, Pluhar invited me over for lunch one day. He cooked cabbage with ham hock in his office, and it smelled the place up a bit, but we had a very good lunch. About a week later I learned that Dr. Larson had a problem in his office. His secretary said that the rug had mildewed, creating a terrible stench in his office; therefore, he was planning to have a new rug installed. It was finally determined that cabbage odor had saturated the carpet when no mildew was found. After the true story was revealed, Ed's office was moved rather quickly to the Y-12 Warehouse.

During the time Bill Humes was K-25 Plant Manager, I was working in Process Maintenance. We were helping get cells onstream and Humes called me up to the office. Bolinger, my boss, was on vacation, and it was just before Christmas. Humes said, "Winkel, I want no Christmas parties." We were pretty busy at that time and Christmas parties were not even on our minds. He had his back to the door leading into the hallway and did not see someone dressed in a Santa Claus suit walking down the hall. I said, "Bill, does this rule go for the Ad Building, too?" He said, "You better believe it." I said, "Well, Santa Claus just went by your door." He jumped up, went out into the hall and Santa Claus, better known as Ed Pluhar, was instructed, in no uncertain terms, to get out of that red suit.

— R. A. Winkel



... and this?

I came to K-25 in 1972 from the Paducah Plant. I was Operations Division Manager until I retired in September 1984. Shortly after I came to K-25, one day an operator who was needing some cigarettes and didn't have correct change, climbed onto a straddle carrier used to move 30,000-pound cylinders, and drove up to the Ad Building. He parked the straddle carrier with its engine idling opposite the Plant Manager's office. Needless to say, the roar of the engine and clanking of the idle gear disrupted the proceedings in the Plant Manager's office as well as those in that vicinity.

Can you imagine receiving a telephone call from an irate boss and trying to visualize what he was saying? Needless to say, a similar incident never occurred again.

— A. J. Legeay



In the 1950's an employee in the Shift Operations Department bought a new Volkswagen; he came in bragging about his gas mileage. A group of his coworkers decided to play a little prank on him. Each week they added about a pint of gas to his tank; they did this for about two months. He raved about getting 40 or 50 miles per gallon of gas; however, at the end of two months, his coworkers decided they would begin taking a pint of gas out each week. Of course, his gas mileage began to go down, and he was upset about it. He subsequently took his car back to the Volkswagen dealer and had it checked over. They found nothing wrong with the car. Nevertheless, he became so frustrated and dissatisfied, that he traded in his Volkswagen and bought another car.



I spent 34 years at K-25, all of it in the Operations Division. Just prior to my being assigned as area supervisor at K-32, Bill Hartman, who was in charge of the Shift Superintendent's office told me he was going to give me a little advice. He said, "Now when you go over there, you're not going to know a damn thing. Tell your crew to get the place cleaned up and that will give you about two weeks to figure out what's going on."

— W. B. (Bill) McCluen



## Remember when K-33 was manned by 3 1/2 operators?

I hired in with Union Carbide on January 15, 1945, and retired after almost 38 years on November 1, 1982. I worked in several different places but most of the time was spent in the Operations Division in the old Coded Chemicals Department. My last ten years I worked in the Barrier Plant. I can say that all of the time I spent at K-25 was very enjoyable.

One of the funny things that happened to me was early in my employment. I was single and met a young girl on the operating floor with whom I made a date for a couple of nights later. That afternoon as I was leaving the plant, I saw a girl and thought it was the same girl that I had made a date with; I told her that I would see her tomorrow night at the dormitory. I later discovered I was talking to her twin sister. On arriving at the dormitory on the appointed night, there sat my date and her twin sister in the lobby; I was very surprised to be seeing double.

— J. E. (Jim) Rogers

## **K-25 employment was located south of K-1001-A wing where the Portal 2 building now stands**

Doris Shell, who had been at Central Employment since about 1949 or 1950, relates that when Central Employment was located in Clayton Hall, they frequently received mail addressed to Mr. Clayton Hall; after moving to Charlotte Hall, mail began to arrive addressed to Mrs. Charlotte Hall. In completing an applicant blank, some applicants would respond to the blank labeled sex, — sometimes; once in a while; or frequently. If marital status was not in their vocabulary, they would write down "don't know." For extracurricular activities, one person responded: "I am married and enjoying every minute of it."

Once in the early days I was on the cell floor of the K-25 Building reading some numbers on a machine when a man in the pipe gallery above decided it was too far to go down to the bathroom, so he just proceeded to urinate into the insulation of the pipe gallery. As it trickled down to the cell floor below, it hit me on my shoulder and on the sleeve of my sport coat. That was the first time that I was literally peed on in my life.

— Bill Schimmel, Auditing



Have you ever seen Rod Shaffer at a loss for words? Shove a microphone in his face some time and see what happens. Rod did tell one funny story. He and the late Joe Marshall worked together in New York prior to coming to Oak Ridge. Joe was transferred to Oak Ridge before Rod was. Joe, who liked to drink rum, telephoned Rod and asked him to bring him some rum when he moved down to Oak Ridge. Rod said, "Sure, how about a couple of fifths." Joe said, "Hell, no, I mean 25 or 30 fifths." Well, Rod packed many bottles of rum in with his furniture. He said that when the moving men picked up dressers and chests, they gurgled.

I hired in with Union Carbide in 1951 in the Communications Division at K-25 and worked until June 1976. I worked in an old building up town which was replaced with the new Federal Building. We were subsequently relocated underground in the new building.

I was called in to work one Saturday; on that day we experienced one of the most frightening sky jackings in the history of American aviation, that of Southern flight No. 49. At one time the sky jackers threatened to crash into the building where I was working if their demands were not met. We could hear the plane as it flew over Oak Ridge. It was a scary time but, thankfully, God saw fit to spare Oak Ridge.

When the Government began selling the cemesto houses, ours was the first one financed through the K-25 Credit Union. I am enjoying my retirement; however, as I look back I am thankful for my time with Union Carbide.

— Gladys Rollins

I came to ORGDP in 1944. I wouldn't take anything for my 41 years here. Of course, the first days were sort of hectic; there was the mud, homesickness, and some bad times, but lots of wonderful times. I really would like to start at the beginning and do it all over again. Looking back, I see I had some of the best times I ever had in my life in those early days.

— Ruth Cary



## ... Safety awards were displayed at the cafeteria

I came to ORGDP in 1947, and feel these have been good years. I have enjoyed my association with my coworkers and have been quite happy during my years at K-25. When the public became aware of the true Oak Ridge story, my family in Memphis thought I should be frightened to work in such a place. I feel K-25 has an excellent safety record, and I have never been frightened. In fact, I am 59 years old, in excellent health and look forward to retirement soon.

I thoroughly enjoyed working on the 40th anniversary committee, renewing some acquaintances and uncovering lots of incidents I had almost forgotten about. I look forward to our 50-year celebration with optimism.

— Lōla Byrd

I worked at both K-25 and Y-12. I helped start up the first uranium separation plant in the world at Y-12. I was living in Opal, Virginia, and working on a secret mission for the U.S. Army Adjutant General when I was asked in early 1942 to go down to Tennessee to look over a site for the building of three plants. I looked the site over and returned to Virginia; my report to the Adjutant General was favorable. General Leslie Groves and his committee subsequently visited the Oak Ridge area and approved the site.

I was directed by the Adjutant General to return to East Tennessee and hire in with Tennessee Eastman. Thus, in May, 1943, I was hired by Tennessee Eastman to work at the Y-12 Plant. Soon after that I was sent on a business trip to the University of California at Berkeley to get acquainted with the electromagnetic separation process. When I returned to Oak Ridge, due to my power background, I was asked to help start up the first MG set in 9201-1 at Y-12. I was subsequently promoted to Electrical General Foreman of 9201-1. (I continued to report to the Adjutant General.)

On December 31, 1945, I finally got my discharge papers from the Army. I had been a Tech Sergeant; however, the papers show that I was a Private with no record. That ended my double agent work. In 1947 I transferred to the K-25 Engineering Division. I became second in command in the Electrical Engineering Department. When the construction of the Portsmouth and Paducah gaseous diffusion plants was announced, I was appointed to be the electrical liaison between the design departments and construction people. While on this job, I was asked by Paducah to become head of their Electrical Design Department; however, my K-25 supervision would not release me.

## **I'm proud to say that the secrecy of this project was handled very well;**

I think much of the credit belongs to the Adjutant General and the U.S. Army (I was in the middle of it).

I lived a lonely quiet life . . . being the kind of a person I was is why I was selected for the job (as a double agent); I have been that kind of a person all my life. Like, for instance, when it was decided to put aluminum cabling in instead of copper cabling, I was the foremost one arguing against putting aluminum cabling in. Yet when a cable blew up in K-1007 Building, as the chief Electrical Engineer, I was blamed for permitting such a thing to happen. I had on file a letter I had written to AEC prior to the installation outlining my opinion on aluminum cabling. (I wasn't high enough in the organization to force the issue.)

I was subsequently invited to go out to Texas to give a talk to all the AEC contractors because I was such a strong man against aluminum cabling. As I was talking, I noticed the head of the AEC Washington Safety Department sitting there sleeping. A few weeks after I returned to Oak Ridge, the man called me; he said, "I'm sorry that I slept and didn't listen to your talk. It wasn't of much interest to me. I didn't think you knew what you were talking about because everybody in the country was using aluminum cabling and you were against it." He continued, "I wish I had listened because a friend of mine who is President of the Underwriters Laboratories in Chicago called me; he was unhappy because his company wanted to fire him because he permitted the use of aluminum cabling in the country."

I received a bronze plaque from the Air Corps for having done an exceptional job in running the MG sets at Y-12 and aiding in producing the uranium material for the atomic bomb. I was for America first and then everybody else. I could go on for hours talking about this . . .

— Walter Bogdanowicz

I hired in with Carbide in 1944 as the first weekly employee in a group called the Manufacturing Division, which is now called Operations Division. Everybody working for Carbide at the time was located in the Ad Building; we had an office on the second floor. Al Reeder, B. H. Thompson, and George Stubbs were the three men in the office where I started working. This was the training school and the people who were going to operate the plant once it was built.

The office next door to us was occupied by Dr. Priest, who was the first head of the Laboratory Division. Because telephones were so scarce and limited at the time, when there was a call for Dr. Priest, it would ring on my phone. We had a code, I would bang three times on the wall so Dr. Priest would know the call was for him.

Also, in the early days, we had what was called the cattle cars. The cattle cars were well named because they were a great big rambling, rough kind of transportation, and looked to be more suitable for hauling cattle. Cattle car drivers would go all over Oak Ridge, Knoxville and surrounding areas to pick up the K-25 workers and deliver them to the only portal open at the time, the one we know now as Portal 4.

## **The Employment office and the Training School were located at Wheat School in the early days.**

Paul Vanstrum and Bob Jordan were in the group, and Jim Parsons was our timekeeper. Those were the very early days.

— Virginia Donahoe

The cattle cars (Virginia Donahoe spoke of) were long plywood, windowless trailers with a string of dimly lit bulbs running down the center. Two long wooden benches ran the entire length of the car on each side, and there was a small kerosene stove mounted in the center to supply heat in the winter months.

I hired in with Kellex and transferred to Carbide in July 1945. I retired in 1981. Except for the last 14 years, which I spent in the Barrier Manufacturing Division, I worked in the Production Division in many different capacities.

I remember when very few people in Oak Ridge owned cars and most people commuted to K-25 by bus. A fellow employee, one of the few lucky ones in those days, owned a black Kaiser sedan. One afternoon he came out of the plant as usual, got on the bus, and it wasn't until he arrived home and found his car missing that he realized that he had driven his car pool to work that day, and they were all sitting down at K-25 waiting for him to drive them home.

I also remember one night when B. W. Tomlinson and I were working at the 4-12 shift in the control room. Back in those days there were many preachers around; this preacher who came to see Tommy one night said, "Now Mr. Tommy, will you want to go to heaven, sir?" Tommy said, "Well yes, preacher, of course I do, and I want to take a bunch of pretty girls with me." The preacher was aghast. He stepped back and said, "Oh Lord, Mr. Tommy, you can't do that!" Tommy said, "I can't? The heck with it, then. I don't want to go." That was the biggest mistake Tommy ever made — the preacher spent the rest of the night trying to save him.

Not all of my memories are in the humorous light though. I remember the night one of our employees was caught in the coal hopper down at the K-25 power house. It was a very scary thing, and a few heroes emerged that night.

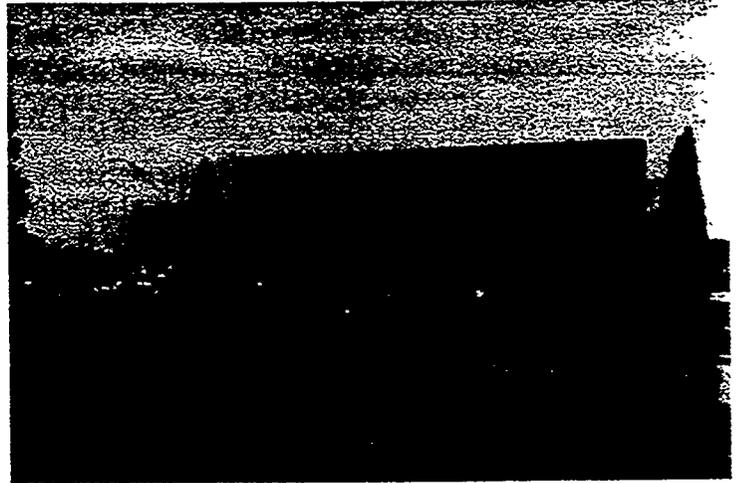
As I said, in all of the years I worked at K-25, I never received an assignment I didn't enjoy doing. Some I liked more than others, but I enjoyed them all.

— Frank Strang

I was employed at K-25 in 1951, transferred to Y-12, then to X-10, and now I'm at the Central Employment Office. The following story was told to me by an old-timer.

During the early days in 1943 and 1944 when World War II was going on, parts of the perimeter fence, which was not accessible by motor vehicle, was guarded by some of the U.S. Cavalry soldiers on horseback. One day one of the horsemen was riding his assigned post and came upon a rattlesnake. He stopped, pulled out his revolver, and in preparing to shoot the rattlesnake, his horse reared up, he missed the snake and shot his horse.

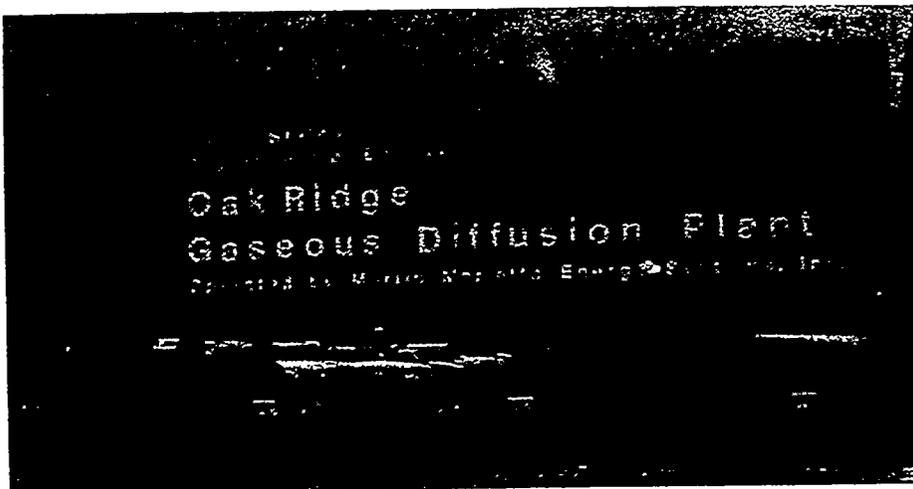
— Ted Wagner



## Our plant entrance sign looked like this

I came to work at K-25 in 1947 after working four years at Y-12, and stayed at K-25 until 1983 when I retired. A story which stands out in my mind occurred when we were having a simulated security breach. Some man broke in the plant, and in about three or four hours we were supposed to go around looking for him. I was out looking around with some other people and I saw Ray Hawkins of the Security Department coming up the stairs. We were up on the operating floor in K-303-7. I went over to him and asked if he had found the fellow yet; Ray handed me a piece of paper on which was written, "You have just been hit over the head and you will be out for about five minutes." So I realized it was Ray who was the security breach. That was some dirty pool, but it was funny, too.

— H. G. Stanley



... And changed to this

I hired in at K-25 in November 1944 and was assigned to the training school. A funny incident I recall was when a fellow employee made a remark about the furniture in our training class room at old Wheat School. The furniture was marked with the initials USED standing for United States Engineering Department. He said that it looked like a company as big as Carbide could buy new furniture instead of buying used.

— John Sharpe

I hired in at K-25 in May 1944. One of the most memorable situations I remember when I think of the old days really happened in 1951 when K-31 was being built. I was in the Shift Superintendent's office at the time, and we were having lots of drills to prepare ourselves to handle all kinds of emergencies. There was a lot of talk about UI. I think we called them 'unidentified intruders.' We had an unidentified person show up on the operating floor of the K-27 Building. All of the operators had been trained to look at badges, and if someone they didn't know was in their building, ask them what their business was. One of the operators saw someone down in the middle of his unit. He started walking toward the person who ran to the cooling pit and went down the pipe gallery and disappeared.

The operator telephoned his foreman and the foreman called me into the Shift Superintendent's office. He told me that we had an unidentified intruder in the middle of K-27 Building. I then called the guard captain who set up road blocks around K-27 and K-29 and called out the emergency squad and told them to report to the K-27 Building. The guard captain set up his road blocks and then realized this was not a drill. That caused me to crack up, but he certainly did put a seriousness to our business, and everybody was very serious about what he was doing. We looked and looked. The rescue squad paired up into teams, and we combed all areas of K-27 and K-29. Two things I was supposed to do in a situation like this was to call the Plant Superintendent and call the head of AEC Security, who promptly came out to the plant. We looked for several hours and hadn't found anybody; the construction crews for K-31 had completed their shift and were trying to get out of the plant to go home. However, the road was blocked to the only exit from the K-31 site, the bridge across Poplar Creek from K-31 to K-27. We looked and we looked and found nothing except a pair of coveralls that somebody had left in the basement. We finally lifted the road block, but our only conclusion was that our 'unidentified intruder' was probably one of our employees who wasn't particularly busy and wanted to look around but did not want to answer any questions about what he was doing there. It was a very amusing incident, and it certainly did help us all get serious about a situation for which we had trained.

— Lonnie Anthony

My first recollection of Oak Ridge was when I was notified that I was being transferred here in 1944 and I came down in January by train to find housing. I was met by Oral Rhinehart and his wife, and we had a long drive from Knoxville to Oak Ridge. I thought Oak Ridge was the crummiest looking place I had ever seen. I spent about a week at K-25 being indoctrinated by Sam Barnett on what my responsibilities would be. I was to set up a cost accounting system.

## **Getting a haircut in the early days was very rough.**

The barbers were usually bricklayers or carpenters. You went in and told the barber how you wanted your hair cut and when you came out, it was cut like everybody else's. It was practically shaved off your head. There wasn't any use in griping about it because everybody looked the same way, so you would say, "What the hell," and let it go at that.

In the fall of 1944, we went home to Charleston to visit our family. The day I arrived I got a phone call saying that the South Charleston plant superintendents were having a party up town, heard I was in town and wanted me to come. We had steak, and liquor was flowing freely. One of the guys was talking and said, "Hey, we got Marc here with us from down in the hills of Tennessee; maybe we could call on him and ask him to tell us a little bit about the place down there." Well, I wasn't prepared to make a speech. But, I got up and said, "Well, I can't tell you anything about what we are doing, but I can tell you something about the place and where it is and what we have run into." I started to tell them about a lot of the things. They started laughing and rolling in the floor and were having one hell of a big time; I thought, "Well, it ain't all that funny." Then one of the guys said, "You know, that Marc hasn't changed a damn bit. He can still tell the tallest tales."

— J. B. Marcum

I was employed at K-25 for over 18 years and transferred to Y-12 in early 1985. During my tenure at K-25, one of my assignments was that of Head of the Plant Protection Department. Shortly after going into that position in May 1978, a very unusual event occurred at K-25, and Security and Plant Protection people had a great deal to do with it. About thirty days before our President, Jimmy Carter, was to come to visit the plant, advance teams from the secret service arrived and began a very intensive planning and preparation process for the Presidential visit. We spent about thirty days, working into the night many evenings and weekends, developing detailed, comprehensive plans covering all aspects of the visit.

Very detailed plans were developed for each major division. The manager of the Security Division at that time, C. C. McSwain, did an excellent job of planning and preparation for the President's visit. He set up an operations center about three days prior to the visit. This makeshift arrangement was manned 24 hours a day during that period, with direct contact to the White House and the Secret Service. On the actual day of the visit, this command post was the central communications center; for those who served there, it was a very hectic and high-pressure assignment. My assignment for the day of the visit was to accompany the Presidential party and provide the liaison between our plant forces and the Secret Service. The presidential party included James Schlesinger, who was then Secretary of the Department of Energy, Frank Press, the White House Science Advisor, and John Deutch, director of DOE's office on Energy Research. The party also included two Tennessee senators, Howard Baker and Jim Sasser, congresswoman Marilyn Lloyd, and congressmen John Duncan, Albert Gore, Jr., Clifford Allen, Harold Ford, and Ed Jones.

I had an interesting experience a day or two before the visit. The Secret Service drove the Presidential limousine to the plant on a weekend; the Secret Service driver proceeded to very carefully drive over the designated route inside the plant so he would be totally familiar with it. The interesting part for me was to sit in the back of the limousine in the seat where the President would sit and enjoy the view from that perspective.

In the early morning on the day of the tour, I accompanied the Secret Service on a special tour in which we took dogs trained to search out explosives to assure that no devices were implanted along the tour route. Just outside of Portal 4 there are several storage lockers provided for employees to leave personal items not normally taken inside the plant. In searching that area, a very alert German Shepherd search dog came to a particular locker, sat down, and began to peer at the locker intently. The Secret Service agent who was handling him believed the dog had discovered something. When the locker door was opened, we discovered a package about the size of a shoe box wrapped in Christmas paper. Now keep in mind, this was in May. Some dust was on the package, indicating it might have been there awhile, thus after careful inspection, the package was removed, brought to a safe area, and the Secret Service personnel carefully opened it to reveal a fifth of bourbon whiskey. We were quite relieved to find that our search dog had discovered something other than explosives. Incidentally, I understand that the liquor was confiscated and disposed of.

## **Another incident of the day involved a woman who obviously was on the scene to demonstrate for her particular interests.**

She was carrying a sign that read, "Pluto, the God of War." We later found out that she was an active member of an organization called the Tennessee Alliance Against Nuclear Power. The Secret Service was, of course, advised of her presence; an agent very quietly made his way through the crowd and positioned himself immediately to the rear of the lady. She was standing near the plant sign at the front entrance (Portal 2) ready to step out in protest. Just as the Presidential vehicle began its turn, the agent standing near her reached out quickly, firmly grasped her by the hair at the base of the neck and stood in that position just long enough for the vehicle to pass through. He then released her hair, politely said, "Excuse me," and blended into the crowd. A very anxious Shift Superintendent was standing by to make an announcement over the PA system as the President entered Portal 2. Now this particular Shift Superintendent, who shall remain nameless, was a very articulate and particular type fellow. In order to assure no error in his announcement, he wrote down and rehearsed his intended words. As the President's limousine entered Portal 2, an announcement was made on the plant public address system: "Ladies and Gentlemen, the President of the United States is now entering the plant at Portal 4." You can imagine the shock of this Shift Superintendent who immediately realized his error; however, he realized that the people would figure out that the President had entered at Portal 2, not Portal 4.

An interesting sidelight occurred while the group was at the K-33 demonstration cell going through their briefing; of course, inside the building we had set up very elaborate security perimeters. Security personnel were stationed at frequent intervals all along the tour route. We assumed because of the magnitude of this event that everyone knew the President was visiting the ORGDP. One group, which apparently failed to get the word, was some construction people who happened to be in the K-33 Building at about the time the President entered the K-33 demonstration cell. Down on the first floor of the building, two contractor employees came jauntily walking along, headed for their coffee break. They were immediately stopped and searched by security personnel; the men had no idea that the President was in the building. After a thorough checking out, they were permitted to proceed up the parade route, and they did have an opportunity to see the President before he left the building.

It was an interesting day, and believe me, security people breathed a sign of relief when the day ended.

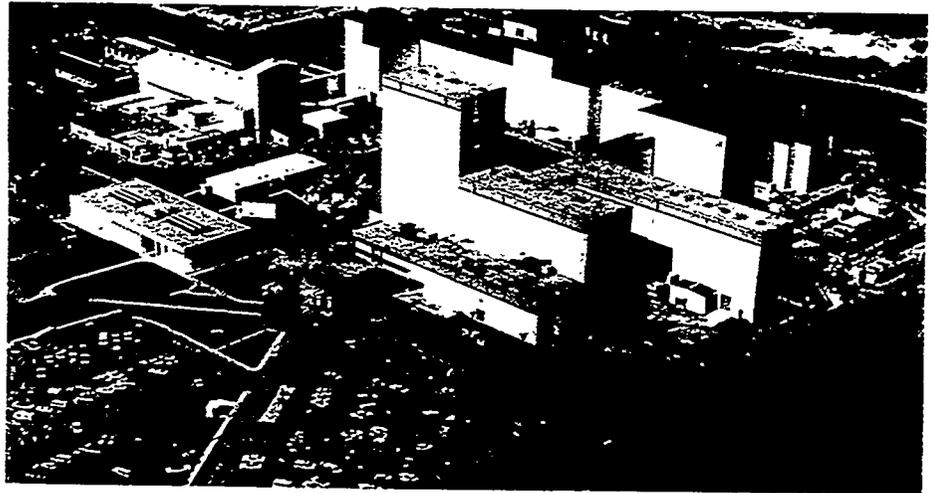
— Lynn Calvert



## K-27 construction was just getting started

Optical emission spectrography has played an important role at the ORGDP during its 40 years of operation. We are proud of the contributions we have made to the operation of the ORGDP during its 40-year history and will continue to meet the challenges as required for future operations.

— R. B. Farrar



The southeast corner of the plant looked like this

### THE ENVIRONMENT FIGHTS BACK. . . . . A WILD GOOSE CHASE

Process Support personnel went to the K-1407-B holding pond in April 1984 to obtain a solids sample from the pond bottom. Bob Gross had brought a bucket to drag up a sample, and Gordon Lindner, John Kennerly, and Luther Gibson were at the site to inspect a nearby construction area.

Swimming in the pond were a pair of Canadian geese that had made the pond their home and nesting ground. On approaching the pond, Bob was not aware that the nest was just about where he was standing. Responding to a threat to home and family, the gander went into a full power take-off, heading straight for Bob who by now had placed the bucket in the pond. Seeing the rapidly approaching bird, Bob began reeling in the bucket as fast as possible. It was too late, however, as Bob had to hit the dirt as the gander buzzed right over him. Meanwhile, the others were scattering in all directions, much to the amusement of the construction workers nearby.

No real harm was done except for the several bruised egos, and the distinct feeling that the environment was more out-of-control than originally thought.

**People: Awards,  
Committees, etc. . .**



Stores Department achieves 100% first in the plant for 1973 United Way campaign

## The People . . . Awards, inspections, and committees



1973 Savings Bond drive

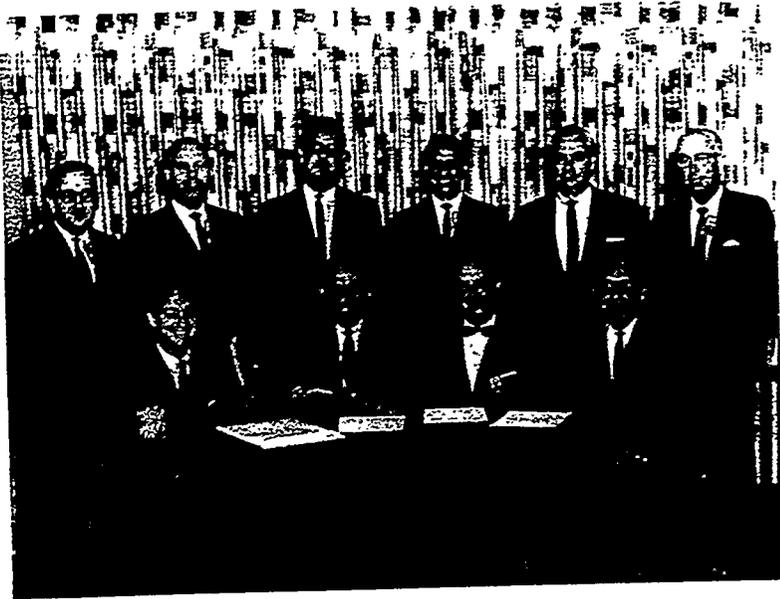


Achievement awards given in 1967



K-25 conducted fund raising campaign for Knoxville Children's Hospital in the 1960's





**United Way  
campaign gets  
under way  
in 1966.**



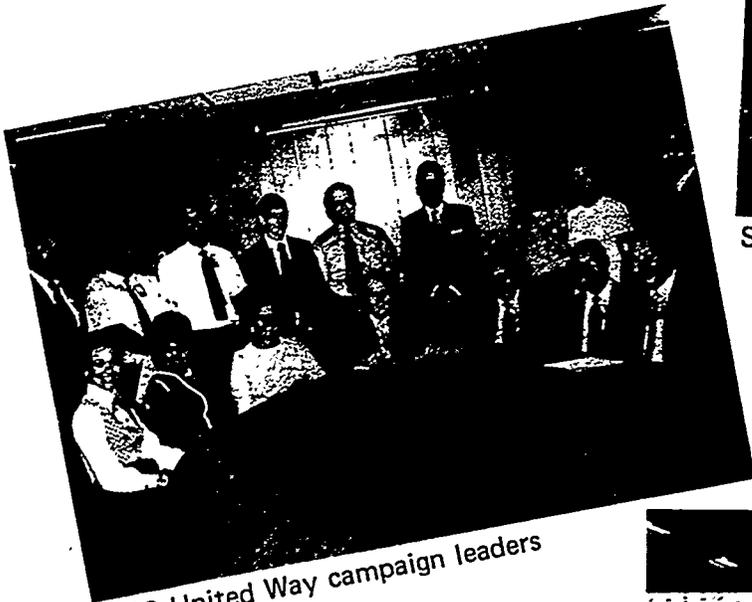
ORGDP managers prepare for plant appearance inspection (1982)



United Way predecessor, Community Chest --  
ORGDP receives award in 1958



Stores Department prepares for an inspection in early 1960's



1972 United Way campaign leaders



Stores Department reaches 100% first for 1973 United Way campaign



1967 United Way Campaign Staff

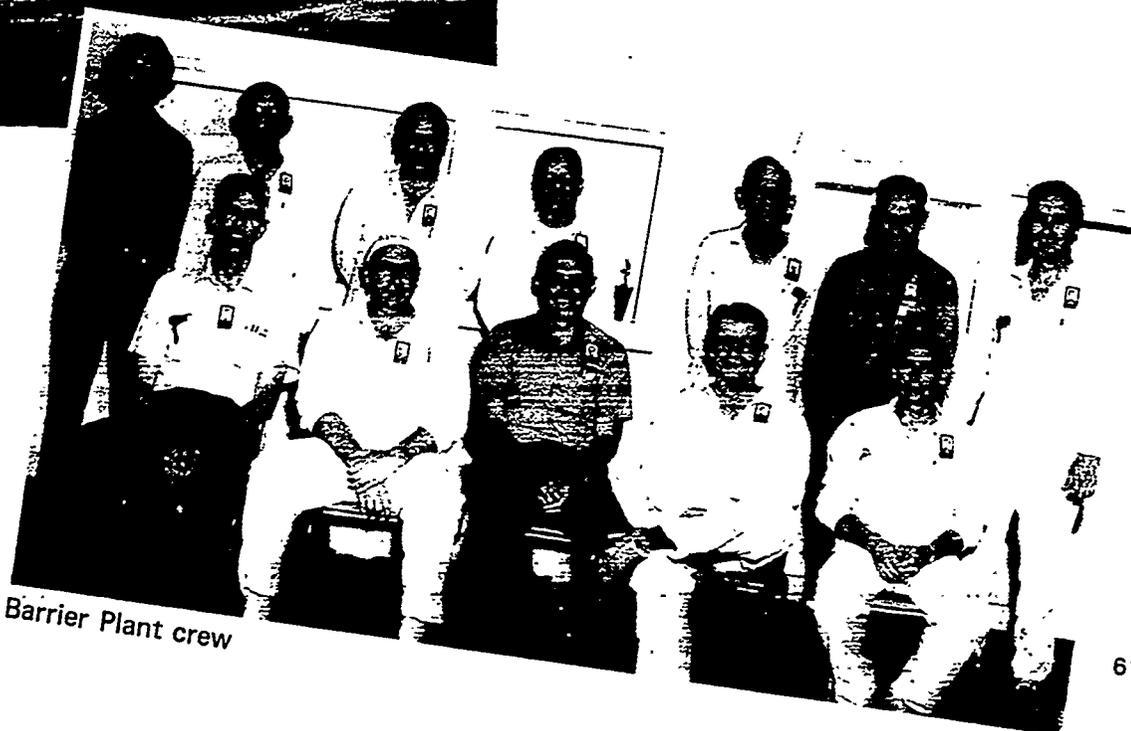
**Remember when  
weekly employees  
toured the plant  
once a year?**



*Another group of weekly employees on tour*



**Happy Valley**

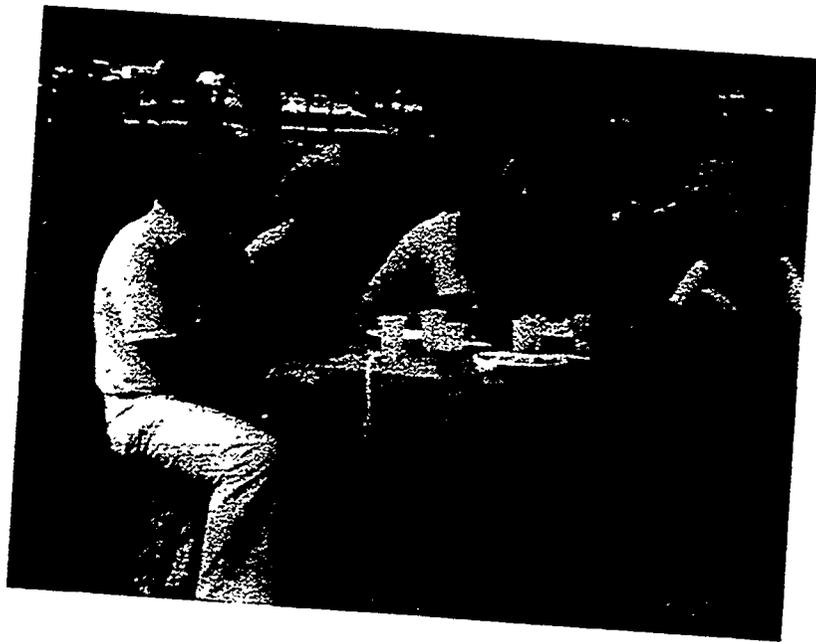


**Barrier Plant crew**



**Many have fond  
memories of  
the K-25  
Hootenanny's  
held each fall**





## **K-25's Hootenanny**



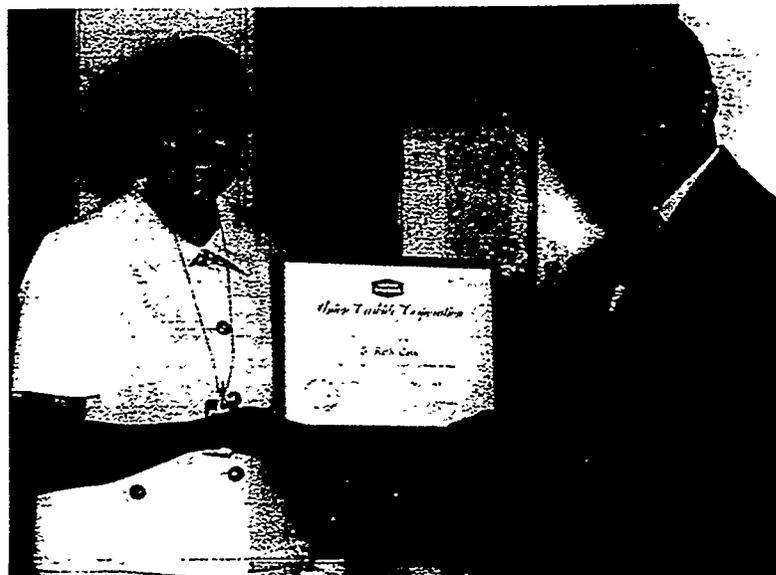


A 1959 retirement party honoring a maintenance employee

## Retirements and anniversaries



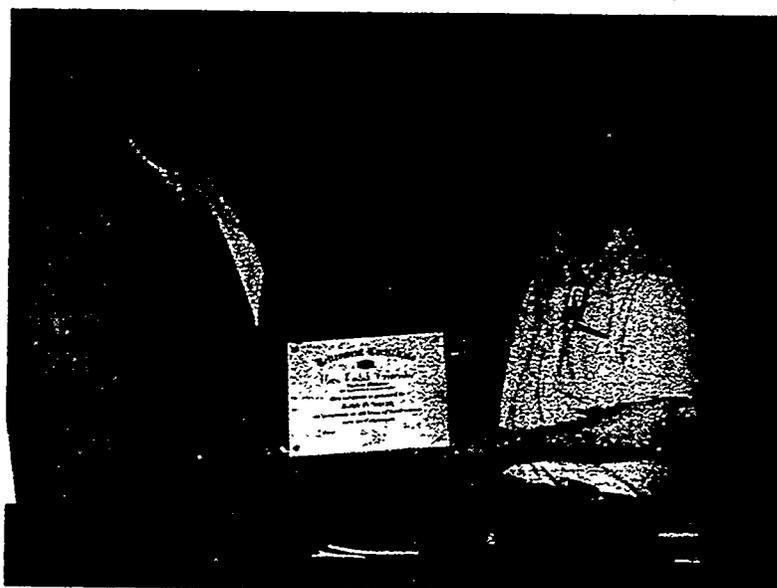
D. B. Luther retired in 1963



This is how Vice-President Ken Sommerfeld and Ruth Cary looked in 1969



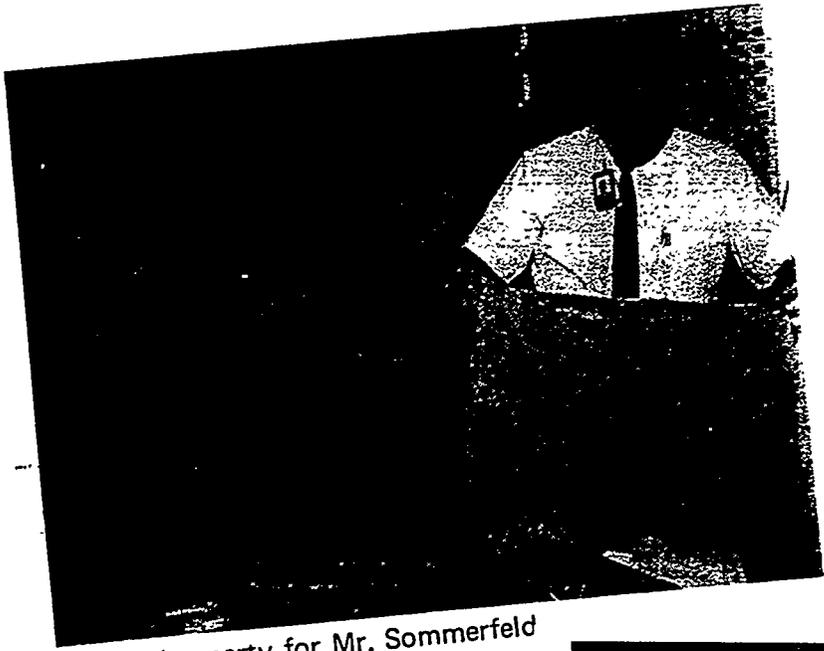
Several employees are honored for their endurance – 25 years of company service in 1971



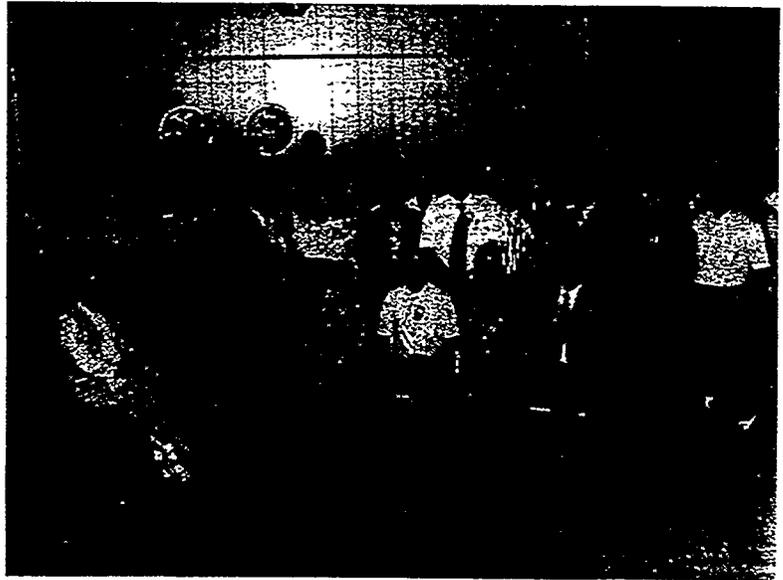
Plant Manager Bob Winkel presents a retirement certificate to long time Carbider, Doc Ingram, who retired in 1973 with 43 years of company service

**Remember when  
Wadie Spence  
retired in  
1978?**





A birthday party for Mr. Sommerfeld



25th anniversary celebration for Lola Byrd, 1975



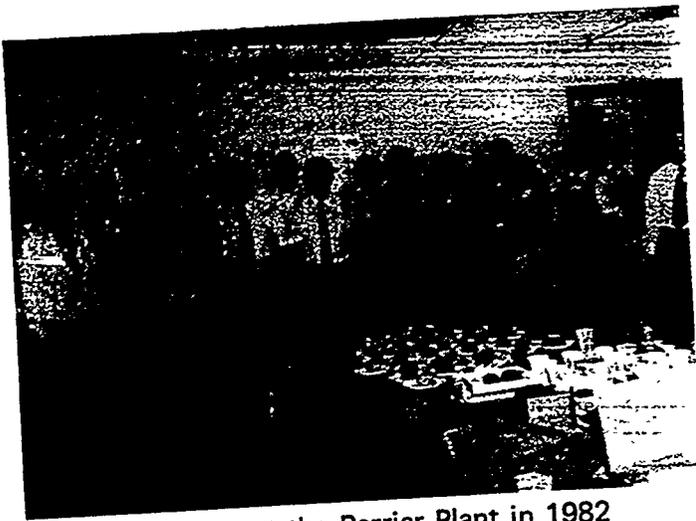
... another 25 year party



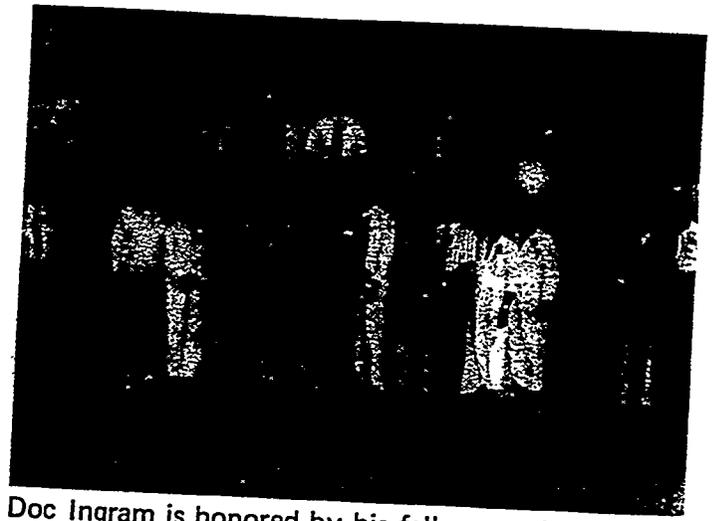
**Charlie Baldwin is honored  
for completing 35 years  
of company service (1980)**



Party time!  
Hank Culbert retired in 1985. He's shown with Sheila Renfro,  
Ruth Cary, and Beeb Benson



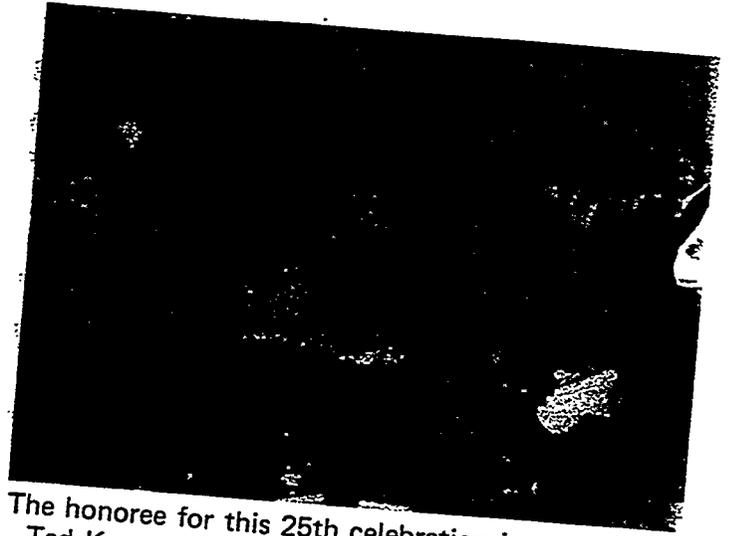
Retirement party at the Barrier Plant in 1982



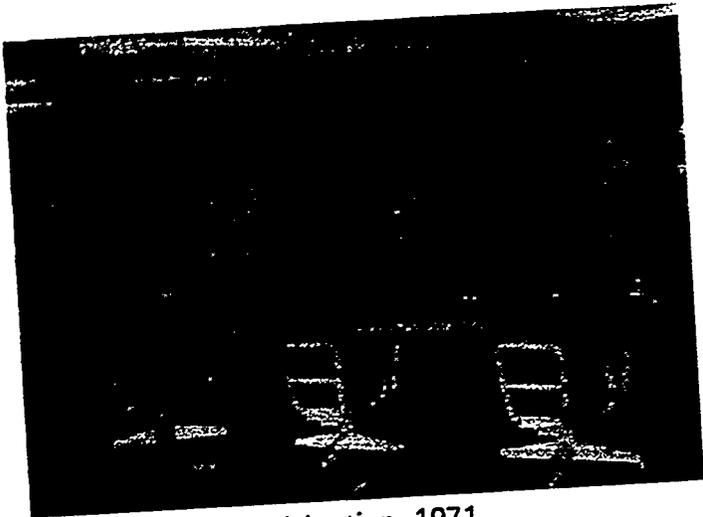
Doc Ingram is honored by his fellow employees



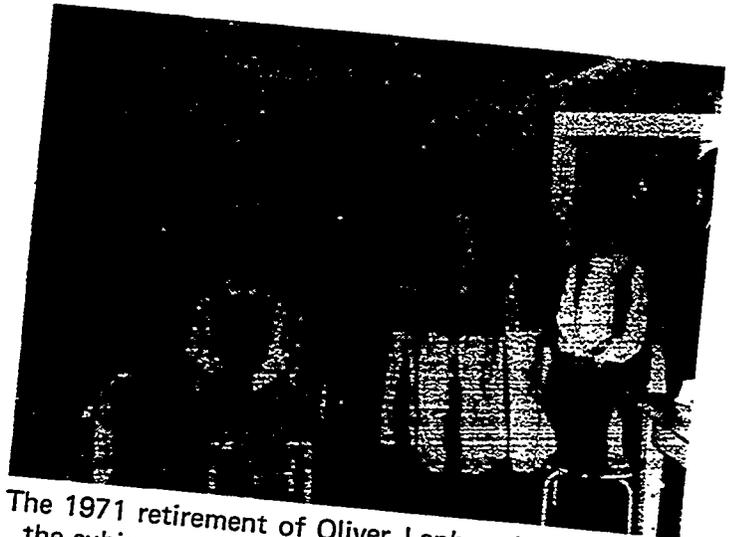
M. L. Holmes and friends of Electrical Test Department are shown following his retirement dinner in 1960



The honoree for this 25th celebration is Ted Koprowski, 1969



Another 25 year celebration, 1971



The 1971 retirement of Oliver Lanham is the subject of this gathering

## The beginning of the end . . .

On June 5, 1985, Department of Energy Secretary John Herrington announced that the ORGDP cascade would be shut down and placed in standby within three months. Thus, at midnight on July 31, 1985, feeding of normal uranium and withdrawal of product ceased and shutdown was begun.

V. H. Carpenter, far right, who assisted in placing the first cell on-stream in K-33 in 1954, supervised shutdown of the final K-33 cell in 1985.



# ORGDP Milestones . . .

July 1, 1941-The U. S. Office of Scientific Research and Development contracts with Columbia University for diffusion research.

December 14, 1942-The Manhattan Engineering District signs a contract with the Kellogg Corporation, to serve as architect-engineers for construction of a gaseous diffusion plant.

January 18, 1943-Union Carbide & Carbon Chemical Company, is awarded a contract to operate the gaseous diffusion plant.

May 18, 1943-J. A. Jones Construction Company signs contracts to build the K-25 powerhouse, cascade buildings, and administration area at Clinton Engineer Works.

June 1943-Ground is broken for the powerhouse at the gaseous diffusion plant.

September 1943-Ground is broken for the K-25 building.

April 1944-Union Carbide assumes overall management of the gaseous diffusion barrier development and production program.

January 1945-The first cascade equipment is operated with uranium hexafluoride.

February 21, 1945-First enriched uranium extracted from K-25 cascade.

March 19, 1945-The first enriched uranium is shipped from K-25 to Y-12.

August 15, 1945-The cascade reaches full operation, consuming about 10 percent of all the electric power in the United States.

## **December 1945 - The K-27 building begins full operation.**

December 1946-The electromagnetic separation facility at Y-12 is shut down making ORGDP sole U. S. supplier of enriched uranium.

December 1947-Start up of barrier plant and uranium hexafluoride feed plant.

August 1949-January 1951-Construction of K-29 plant.

November 1949-December 1951-Construction of K-31 plant.

December 1950-Construction starts on the Paducah Gaseous Diffusion Plant.

1952-ORGDP and Paducah personnel train Goodyear Atomic Corporation employees to operate Portsmouth Gaseous Diffusion Plant.

November 7, 1952-Interplant operations begin between Oak Ridge and Paducah diffusion plants.

# August 1952 - November 1954 - Construction of K-33 process building.

August 1955-An improvement program starts in Oak Ridge and Paducah.

September 17, 1956-First shipment of enriched uranium hexafluoride made under AEC's Civilian Applications Program.

1960-AEC accepts proposal for experimental work on the gas centrifuge at Oak Ridge.

November 1960-Electronic Data Processing building, housing the IBM 7090 computer, completed.

1961-First cascade of 35 centrifuges operates successfully, demonstrating technical feasibility of gas centrifuge.

February 1962-Gaseous diffusion plants ship one millionth pound of uranium hexafluoride for use in the Civilian Applications Program.

May-June, 1964-The K-27 and K-25 process buildings are shut down after supplying highly enriched uranium for nearly two decades to the U. S. weapons program, nuclear-powered naval vessels and research programs.

1967-ORGDP, in cooperation with ORNL staff, develops a new zonal centrifuge for producing ultra-pure vaccines. Patented by the government and transferred to industry, these centrifuges were used by Dr. Jonas Salk to obtain a quantity of polio virus for early batches of his vaccine and by Eli Lilly Company to produce the first large batches of purified influenza vaccine.

1969-Beginning of Toll Enrichment Program in which uranium is enriched for private nuclear power plants worldwide.

1972-1981-Cascade Improvement and Cascade Upgrading programs conducted, increasing efficiency and capacity of gaseous diffusion plants.

1974-Research and Development begins at Y-12 Plant on the Atomic Vapor Laser Isotope Separation (AVLIS) process for uranium enrichment.

1975-Centrifuge Test Facility begins operation.

1977-President Carter announces plans to use centrifuge for the next enrichment plant to be built in Ohio.

September 1981-Completion of the Cascade Improvement and Cascade Upgrading programs on schedule and within budget.

1982-Shutdown of Barrier Plant after successful production of high-quality material for all three gaseous diffusion plants.

April 1982-DOE selects AVLIS from among three advanced uranium enrichment technologies for large-scale engineering development and demonstration.

August 1982-September 1984-ORGDP's Centrifuge Plant Demonstration Facility successfully demonstrates the producibility, constructability and operability of equipment for Gas Centrifuge Enrichment Plant in Ohio.

January 1983-Materials Handling Demonstration Module, key component of the AVLIS process, installed at former ORGDP Barrier Plant, and AVLIS research and development staff move from Y-12 to ORGDP.

December 1983-Martin Marietta Corporation named new operating contractor for ORGDP.

April 1, 1984-Martin Marietta Energy Systems, Inc. assumes contractor responsibility for ORGDP from Union Carbide-Nuclear Division.

March 1985-ORGDP celebrates 40th anniversary as dependable, continuous producer of enriched uranium.

June 5, 1985-DOE announced gaseous diffusion cascade at K-25 would be shutdown and placed in standby and all research and development work on the advanced gas centrifuge program would be terminated. AVLIS was selected as the enrichment process of the future.

**August 7, 1985 - the last operating cell  
in the gaseous diffusion  
cascade was de-energized.**

# ORGDP



# ORGDP

## OAK RIDGE GASEOUS DIFFUSION PLANT

The Oak Ridge Gaseous Diffusion Plant (ORGDP) is one of five energy related installations operated by Martin Marietta Energy Systems, Inc., for the Department of Energy in Tennessee, Kentucky and Ohio.

The plant is located on a 1,500-acre tract of land west of the City of Oak Ridge and employs over 2,000 persons.

Operation of ORGDP began in 1945 as part of the U.S. Government's secret Manhattan Project. It was the world's first facility to separate uranium using the gaseous diffusion process, and its initial production was directed toward national defense programs. Over the years, ORGDP evolved into an internationally recognized center for enriched uranium production and technology development.

Its present missions include:

- maintaining the restart capability of the ORGDP cascade;
- providing high-quality business services and technical support to the U.S. enrichment enterprise
- supporting the development, demonstration and deployment of advanced enrichment technology;
- utilizing unique uranium enrichment technologies, expertise and facilities to support and strengthen other DOE programs and other programs of national importance;
- providing responsible stewardship of DOE's facilities by ensuring employee health and safety, protection of the environment and safeguarding of the national security.

### THE ORIGINAL "K-25"

"K-25" was the plant's war time code name and became the name of its first gaseous diffusion process building. The term is still used by many as a synonym for ORGDP.

As the first building to be constructed on the site, K-25 was considered an engineering marvel. It was built in the shape of a "U" approximately one mile in length and contained a multitude of unique uranium separation equipment.

The building was made fully operational less than two years after construction began. Equipment in the K-25 building operated successfully for over 20 years and was deactivated in the mid 1960's as newer, more efficient enrichment facilities came on line.

The newer facilities also operated successfully for 20 years until the decision was made by DOE in 1985 to suspend further gaseous diffusion production operations at the plant.

In the meantime, two other gaseous diffusion plants operated by Martin Marietta Energy Systems in Paducah, Kentucky and Portsmouth, Ohio are continuing to produce enriched uranium for nuclear reactors used in power generation, naval propulsion, radioisotope production and research.

### TOLL ENRICHMENT

Through DOE's Toll Enrichment Program, the diffusion plants provide uranium enrichment services to customers in the U.S. and in several foreign countries. To obtain the enrichment service, a customer such as a utility company, negotiates a contract with the Department of Energy.

The customer arranges for uranium, which has been converted to UF<sub>6</sub>, to be shipped as solid material to the diffusion plant. There, the uranium is enriched to the level specified in the contract, in most cases about three percent U-235. It is then loaded into special containers and shipped to the customer or to a designated fuel fabrication plant.

The customer pays the U.S. Government a preset fee or "toll" to cover the cost of the enrichment service. This activity, which began in 1969, results in revenues of about one billion dollars annually, which is used to cover costs of operating the enrichment plants, to conduct research on new enriching techniques and to build new plants if needed.

### URANIUM ENRICHMENT SYSTEMS

Since the end of World War Two, the gaseous diffusion process has been the principal method of uranium enrichment in the U.S.

In this process, uranium hexafluoride (UF<sub>6</sub>) gas flows through a barrier tube containing millions of holes, each smaller than two-millionths of an inch. Since the molecules of the UF<sub>6</sub> containing a U-235 atom are lighter than those with a U-238 atom, they bounce against the barrier more frequently.

Consequently, the U-235 molecules have a greater chance of passing through the barrier holes, and the gas diffused through the barrier is slightly richer in U-235 content. Natural uranium contains only one part of U-235 to 140 parts of the heavier U-238, therefore, the UF<sub>6</sub> must pass through several thousand such barriers before the required degree of enrichment is reached.

A gaseous diffusion process building consists of a series of "cells," which, in turn, are composed of a series of eight to ten stages. Each stage consists of a diffuser vessel, a gas compressor, a motor, a control valve and the associated piping.

ORGDP personnel have played a major role in the development of the gas centrifuge process for uranium enrichment, a system that requires only five percent as much electricity for its operation as the gaseous diffusion process.

In the gas centrifuge process, gaseous uranium hexafluoride is fed into a hollow vertical cylinder or rotor which spins at a very high speed inside an evacuated casing. The gas is accelerated, and centrifugal force causes the heavier U-238 atoms to move closer to the rotor wall, producing partial separation of the U-238 and U-235 isotopes.

Since the desired enrichment is not obtained in a single centrifuge, a number of machines must be connected in series. Each centrifuge is able to process only a small flow of UF<sub>6</sub>. Therefore, several units must be connected in parallel to achieve the desired quality of flow.

Additional production and development work on the gas centrifuge process to separate uranium isotopes was suspended in 1985. The suitability of the system for other isotopic separation tasks is currently being explored.

ORGDP personnel have also played an important role in the development and demonstration of the Atomic Vapor Laser Isotope Separation (AVLIS) system. A number of ORGDP personnel are presently assigned to the Lawrence Livermore National Laboratory in California, where the AVLIS research is centered.

In the AVLIS process, uranium metal feed material is melted and vaporized to form an atomic uranium vapor stream. When this stream is illuminated by a precisely tuned laser light, the U-235 atoms absorb the light and become ionized. They are then extracted from the vapor stream by an electromagnetic field which deflects the ions to a product collector. The U-238 atoms remain uncharged and pass on to the tails collector.

### ENRICHMENT TECHNOLOGY APPLICATIONS

The technology used in separation systems developed at ORGDP—including gaseous diffusion, gas centrifuge and liquid ultracentrifuges—and the accompanying support facilities are now being utilized to accomplish a variety of technical assignments for other government agencies.

The plant has unique capabilities in the development and application of high strength-to-weight ratio materials, and electro-optical instrumentation and has achieved state-of-the-art capabilities in machine dynamics, hydrodynamic, vacuum technology, advanced power electronics, microprocess or control applications and small, lightweight permanent magnet motors. Tools and methods also have been developed to remotely measure temperature, pressure, density, flow direction and other characteristics for very high speed motors, turbine engines, gas centrifuges and in other situations where the geometry or environment precludes use of conventional measurement techniques.

Analytical efforts span the ranges of compressible and incompressible flows, hypersonic flows and highly stratified flows. Multidimensional analytical models have been developed for predicting the dynamic behavior of gas and mechanical systems. Computer modeling and analytical capabilities are greatly enhanced by the on-site availability of two Cray computers.

One of the newer facilities is the Optical Component Characterization Facility, a totally filtered air laboratory which performs ultraprecision measurements on refractive and reflective optical components used in surveillance systems.

ORGDP is an international center for separation of isotopes, viruses, bacteria, dust particles and radionuclides. Centrifuge technology has been applied to separate isotopes of a wide variety of elements ranging from nitrogen to the transuranic elements. Enriching services are provided to customers through the Enrichment Technology Applications Center.

The plant's precision machining tools, originally established for the fabrication of large components used in gaseous diffusion operations, are now being applied to the manufacture of large specialty components.

### ENVIRONMENTAL MANAGEMENT

Environmental management activities at the ORGDP are aimed at ensuring that every activity conducted on the site is environmentally acceptable and in compliance with all company, DOE, federal, state and local regulations.

Air and water monitoring programs are maintained at the ORGDP to assess environmental quality on the plant site and to provide information regarding the environmental impacts of discharges and effluents from facilities. A groundwater monitoring well network has also been established to monitor groundwater movements and improve understanding of water quality beneath the plant site.

Projects associated with maintaining a clean environment are also underway at the ORGDP:

- The Sludge Treatment Facility encapsulates low-level radioactive waste-bearing materials in cement for safe, interim storage.
- An Interim Waste Storage Demonstration Project for low-level radioactive wastes and certain hazardous wastes is now located in the shutdown K-25 building. This project complements waste reduction efforts and demonstrates the feasibility of storing wastes from other DOE installations while additional storage capacity and new disposal techniques are developed.

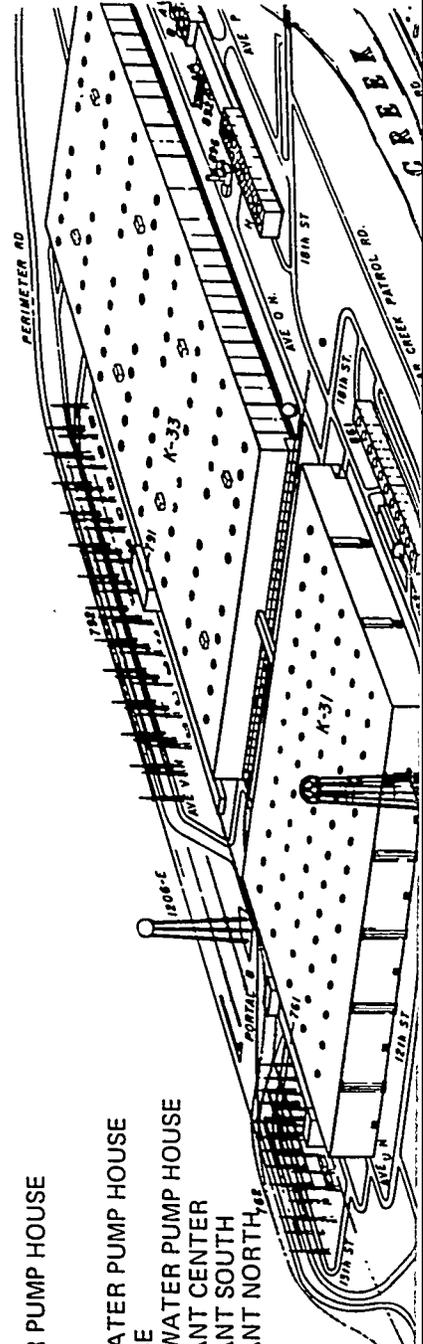
A new state-of-the-art incinerator can destroy antimony-contaminated PCB wastes and hazardous organic materials.

### SAFETY EMPHASIS

Throughout all work operations at the Plant, the health and safety of individuals are given primary emphasis. Plant health and safety groups continually work to ensure that the proper degree of protection is provided to every employee. As a result, the plant's safety record has been better than the national average for the entire chemical industry during more than 40 years of operation.

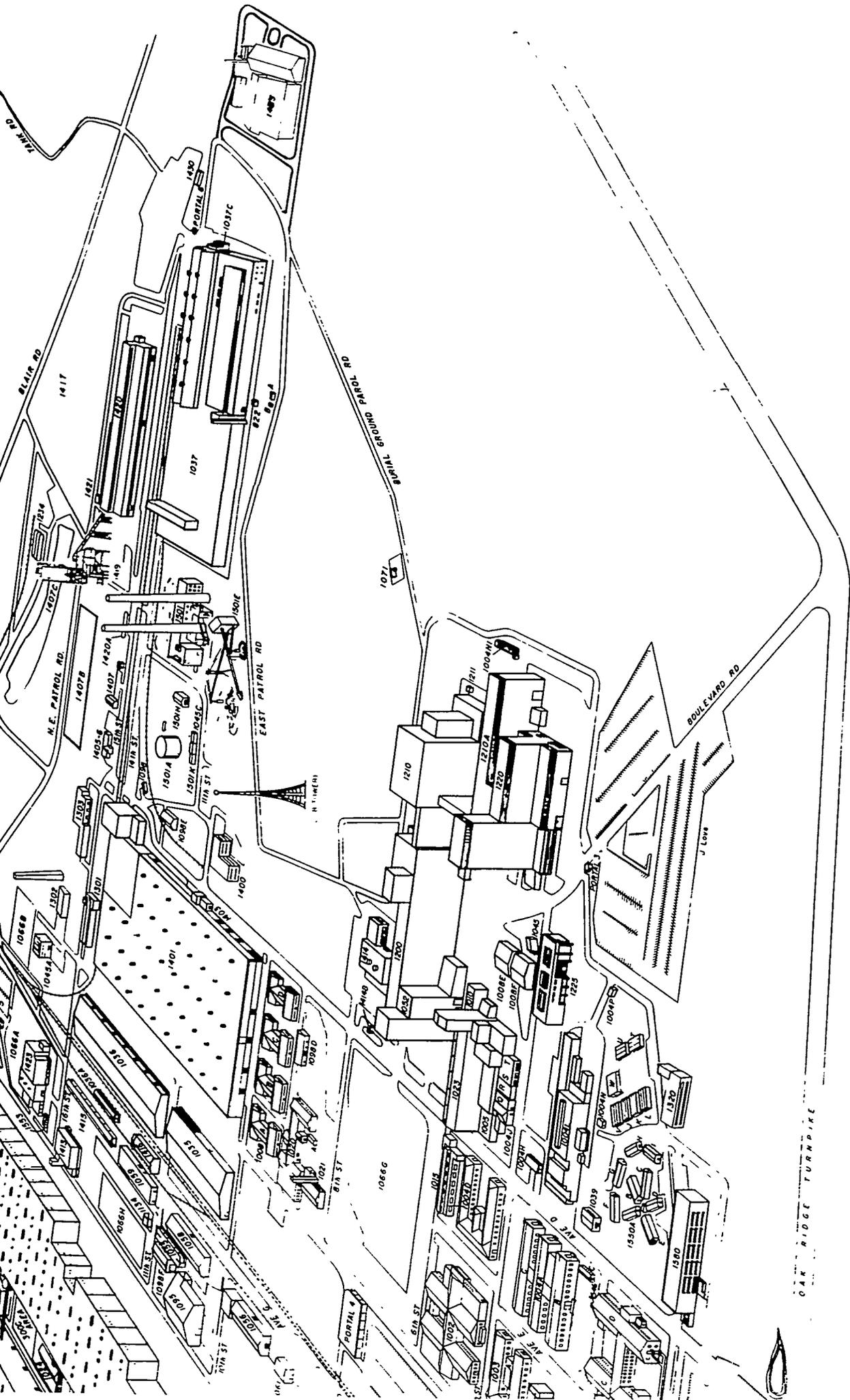
# KEY

K-101	PROCESS (VACANT)	K-896	COOLING WATER TREATMENT PLANT
K-131	FIELD MAINT. SHOP & OFFICE	K-902-1 Thru K-902-8	K-33 PROCESS
K-303-1 Thru K-312-3	K-25 PROCESS	K-1000	CONFERENCE ROOM (PORTAL 2)
K-402-1 Thru K-402-9	K-27 PROCESS	K-1001	ADMINISTRATION BUILDING
K-413	PRODUCT WITHDRAWAL	K-1002	CAFETERIA
K-502-1 Thru K-502-3	K-29 PROCESS	K-1003	DISPENSARY
K-601	MAINTENANCE TRAINING	K-1003A	DISPENSARY OFFICE TRAILER
K-602-1 Thru K-602-6	K-31 PROCESS	K-1004-A Thru K-1004-C	LABORATORY FACILITIES
K-631	PROCESS TAILS	K-1004-D	LABORATORY FACILITIES
K-633	ORGRP TEST LOOP FACILITY	K-1004-H	GAS CYLINDER STORAGE
K-701	BOILER HOUSE (VACANT)	K-1004-J	LABORATORY COMPLEX
K-702	TURBINE ROOM & DISCH. TUNNEL (VACANT)	K-1004-L	LABORATORY FACILITY
K-704	K-25 MAIN SWITCH HOUSE	K-1004-N	COOLING TOWER
K-709	K-25 SWITCHYARD	K-1004-N1	COOLING TOWER
K-710	SEWAGE TREATMENT	K-1004-P	ISOSTATIC TEST FACILITY
K-711	WELD TRAINING FACILITY	K-1006	LABORATORY FACILITIES
K-722	STORAGE WAREHOUSE	K-1007	COMPUTER CENTER
K-723	STORAGE WAREHOUSE	K-1008A Thru K-1008D	CHANGE HOUSES
K-724	EXCESS STORAGE	K-1008E Thru K-1008F	CHANGE HOUSES
K-725	WAREHOUSE (VACANT)	K-1010	LABORATORY REC. & HANDLING
K-726	STORAGE BLDG.	K-1015	LAUNDRY
K-731	K-27 & K-29 SWITCH HOUSE (CONTROL ROOM)	K-1020	HEALTH, SAFETY & ENVIRONMENTAL AFFAIRS
K-732	K-27 & K-29 SWITCHYARD	K-1021	OLD FIRE HEADQUARTERS
K-735	STORAGE BUILDING	K-1022	LABORATORY
K-736	STORAGE BUILDING	K-1023	LABORATORY & MAINT. TRAINING
K-761	K-31 SWITCH HOUSE (CONTROL ROOM)	K-1024	RAD. SOURCE STORAGE & WHSE. SHIP. DRUMS
K-762	K-31 SWITCHYARD	K-1025A Thru K-1025E	MAINTENANCE SHOP & OPERS. ANALYSIS OFF
K-791	K-33 SWITCH HOUSE (CONTROL ROOM)	K-1030	PLANT RECORDS VAULT
K-792	K-33 SWITCHYARD	K-1034A	MAINTENANCE BUILDING
K-796-A	MAINTENANCE STORAGE	K-1035	MAINTENANCE STORES-SHIP. & REC.
K-801	INTAKE WATER PUMP HOUSE	K-1036	AVLIS FACILITY
K-801A	WATER TREATMENT PLANT	K-1037	TELEPHONE BUILDING
K-801B	CLARIFLOW TANK	K-1039	MAINTENANCE SHOP K-633
K-801H	COOLING TOWER (PARTIAL BASIN ONLY)	K-1040	STORAGE BUILDING
K-802	RECIRCULATING WATER PUMP HOUSE	K-1045	FIRE TRAINING FACILITY
K-822	PUMP HOUSE	K-1045A	AMDL LABORATORY
K-822A	COOLING TOWER	K-1052	COMPRESSED GAS CYLINDER STORAGE
K-822B	COOLING TOWER	K-1055	LUMBER WAREHOUSE
K-832	RECIRCULATING WATER PUMP HOUSE	K-1056	
K-832H	COOLING TOWER		
K-861	K-31 COOLING TOWER		
K-862	K-31 RECIRCULATING WATER PUMP HOUSE		
K-891	RAW WATER PUMP HOUSE		
K-892	FIRE WATER & RECIRC. WATER PUMP HOUSE		
K-892A	WATER TREATMENT PLANT CENTER		
K-892B	WATER TREATMENT PLANT SOUTH		
K-892C	WATER TREATMENT PLANT NORTH		
K-892G	COOLING TOWER		
K-892H	COOLING TOWER		
K-892-J	COOLING TOWER		



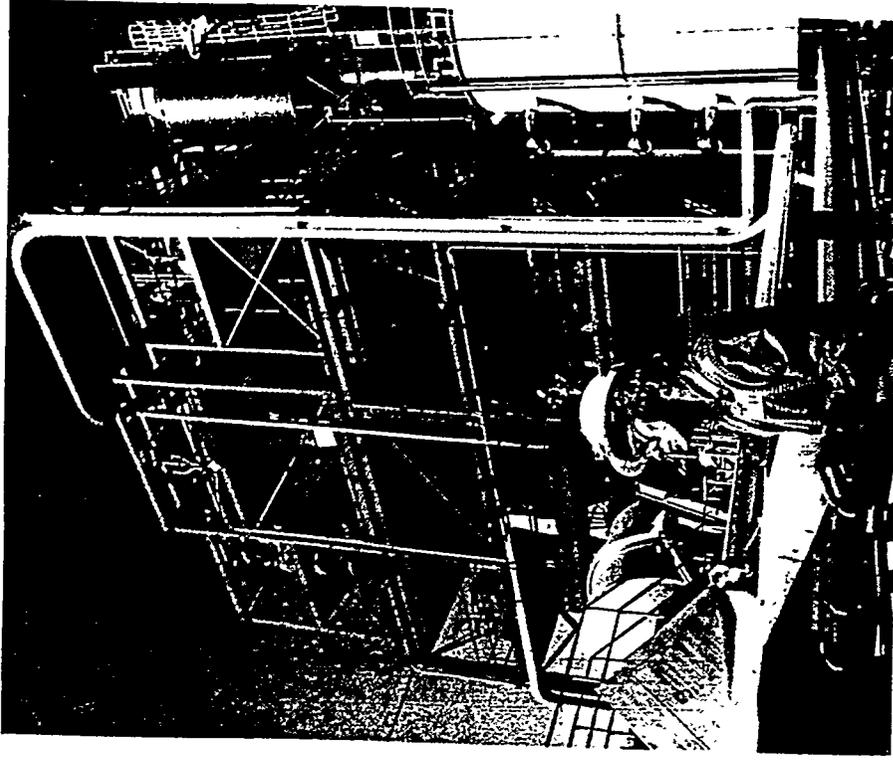






# Gas Diffusion Plant

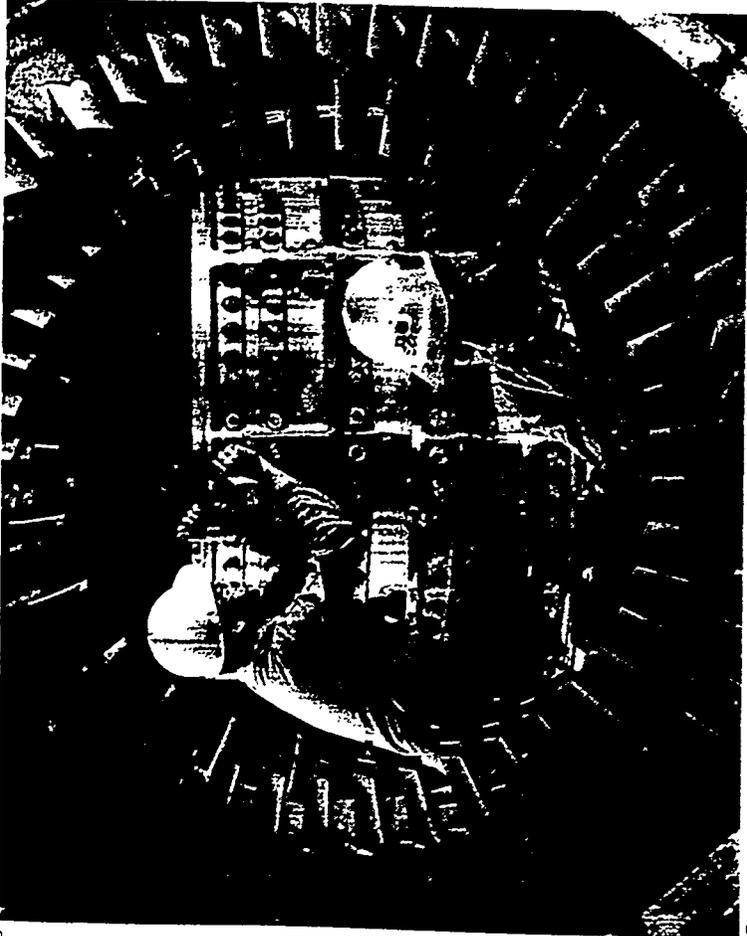
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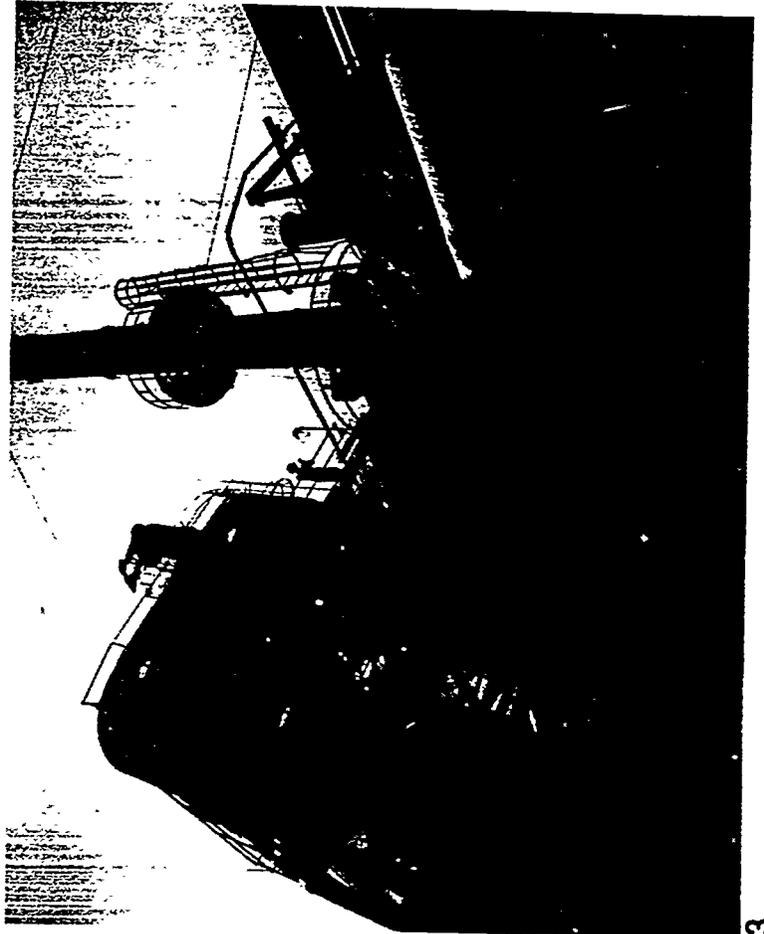
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### Inside ORGDP

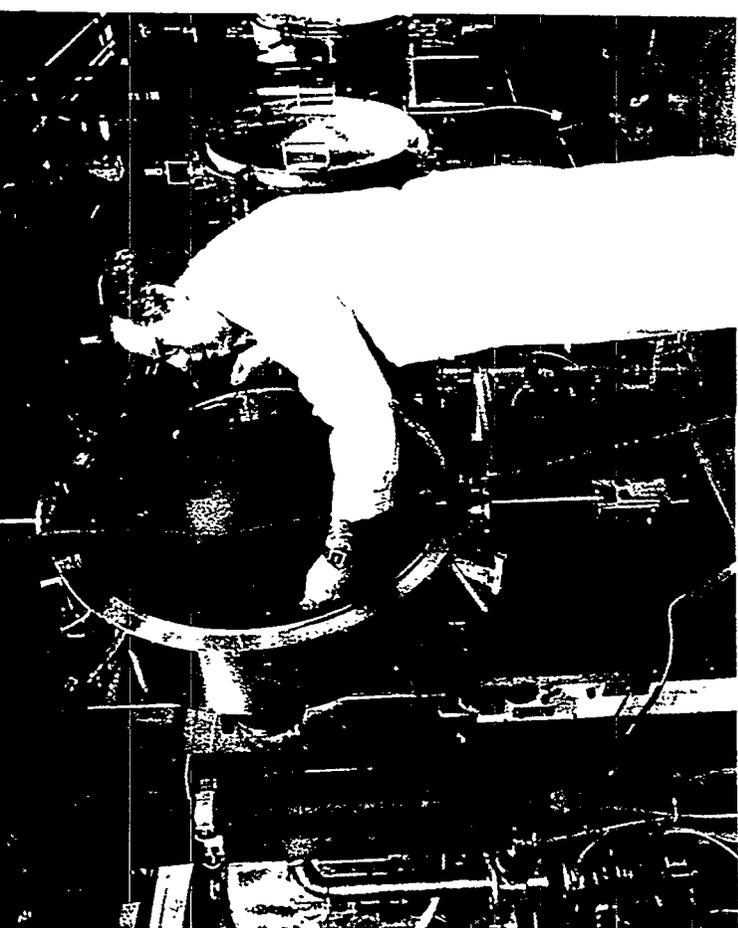
1. The Sludge Treatment Facility encapsulates low-level radioactive-waste-bearing materials in cement for safe, interim storage. 2. ORGDP fabrication shops support a variety of DOE missions. 3. A state-of-the-art incinerator has been built at ORGDP to destroy uranium-contaminated PCB wastes and hazardous organic materials. 4. The plant's gaseous diffusion cascade has been placed in standby. 5. A laboratory technician uses a scanning electron microscope in support of high temperature structural studies. 6. A variety of computer operation missions are conducted in the Automated Data Processing Service Center located at ORGDP. 7. A part of the Enrichment Technology Applications Center activity includes stress life tests performed on fiber composite rings within environmentally-controlled chambers.



2



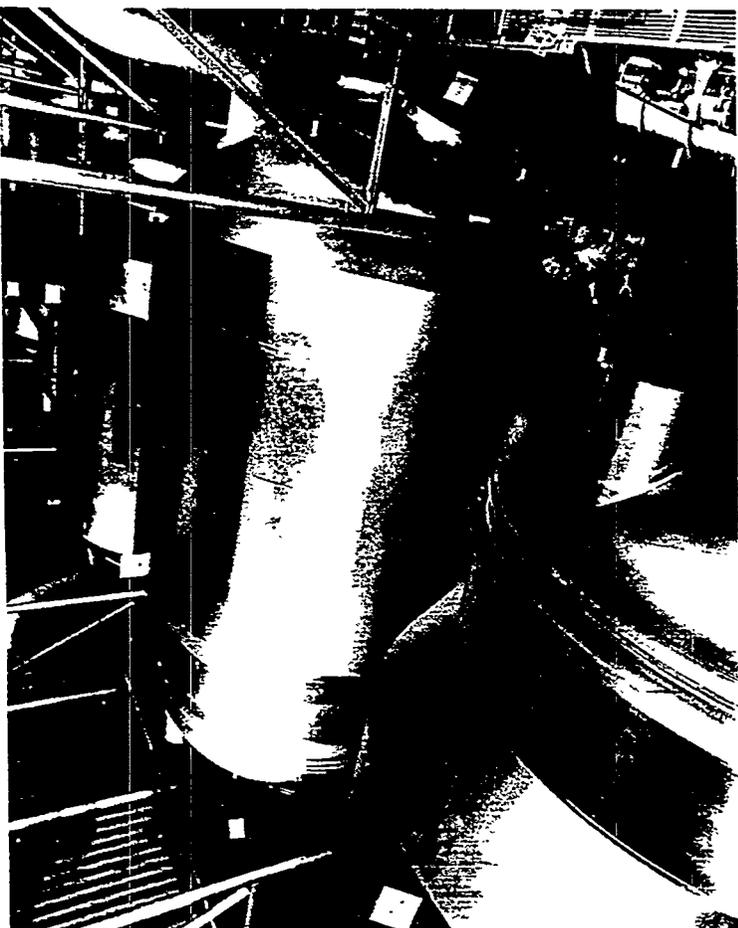
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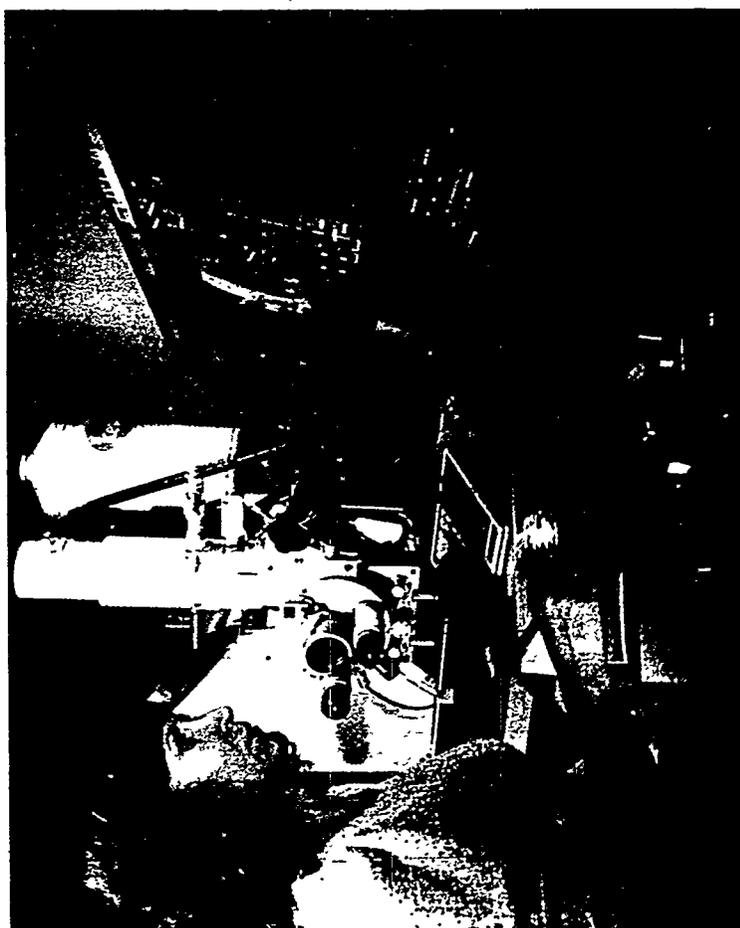
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5

# Milestones, memories—ORGDG celebrates 40th anniversary

**December 14, 1942** The Manhattan Engineering District signs a contract with the Kellogg Corporation to serve as architect engineer for construction of a gaseous diffusion plant.

**January 18, 1943** Union Carbide & Carbon Corporation is awarded a contract to operate the gaseous diffusion plant.

**September, 1943**—Ground is broken for the K-25 building.

**1960**—AEC accepts proposal for experimental work on the gas centrifuge at Oak Ridge.

**1961**—First cascade of 35 centrifuges operates successfully, demonstrating technical feasibility of gas centrifuge.

**1965**—K-25 Process Building shut down.

**1967** ORGDG, in cooperation with ORNL, still, develops a new zonal centrifuge for



A garage crew in the early years

producing ultra pure vaccines. Patented by the government and transferred to industry, these centrifuges were used by Dr. Jonas Salk to obtain a quantity of polio virus for early batches of his vaccine and by Eli Lilly Company to produce the first large batches of purified influenza vaccine.

**1969**—Beginning of Toll Enrichment Program in which uranium is enriched for private nuclear power plants worldwide.

**1972-1981**—Cascade improvement and development programs conducted, increasing efficiency and capacity of gaseous diffusion plant.

**April 1, 1982**—DOE selects AVLIS from among three enrichment technologies for large scale engineering development and demonstration.

**August 1982-September 1984**—ORGDG's Centrifuge Plant Demonstration Facility successfully demonstrates the producibility, constructibility and operability of equipment for Gas Centrifuge Enrichment Plant in Ohio.

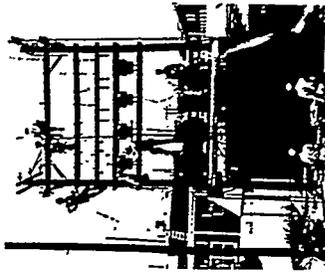
**January 1983**—Materials Handling Demonstration Module, key component of the AVLIS process, installed at former ORGDG Bunker Plant, and AVLIS research and development staff members move from Y-12 to ORGDG.

**April 1, 1984**—Maren Marinetta Energy Systems, Inc., acquires contractor responsibility for ORGDG from Union Carbide Nuclear Corp.

**March 1986**—ORGDG celebrates 40th anniversary as gaseous diffusion plant producer of enriched uranium.



Instrument mechanic bending pipe in 1945



Ummen working in 1946



President Center, Ken Sommerfeld and then Congressman Albert Gore Jr. in 1978



MAW Program in 1965



The Company Store in 1983



Centrifuge building construction in 1977



Inside the K-25 "U" in 1945

## Employees recall early days

"I'm from Newport. The reason I came here was to get a job. It might have been a peashooter trial setting up based on the Oak Ridge. So I came down here. I didn't think I would be here a year, but I've stayed this long and loved it."

— Kenneth Moore, Production Maintenance

"My family and I moved from Memphis in 1943. I started with Tennessee Eastman at Y-12, and in March of 1947, I came to K-25. I left in 1950, to come back in 1953 and have been here since, working in the Operations Division. It's been my second home."

— Lab Boyd, Production Operations

"I came here in August 1944 to stay out of the Infantry. I came from the Air Force, where I'd been a pilot. They didn't need pilots any more, but they threatened to put us in the Infantry. The Knoxville papers said 'Clinton Engineering Works—Military Detachment Guaranteed.' So I thought it would be safe to come here. I intended to stay only until the

"I grew up in New York City, and I lived in it until I moved to March 1944. I was supposed to go to Columbia University, but they were evacuated, so I went to the University of Tennessee. Later moved to the University of Tennessee where I had a very pleasant experience. I had my future wife. And I've been here ever since."

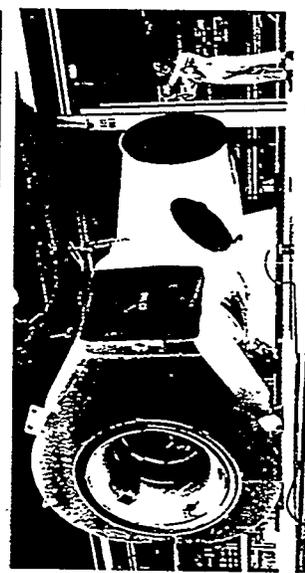
— Hank Cubbert, Production Operations

"I'm from Middle Tennessee. When I was 18, I went to work at Ford Motor Company in Michigan on a production line. You didn't get any break there; if you couldn't keep up, they'd tell you to hit the streets. So I came here in May of 1944. I had planned on staying two weeks, but I liked it so good I continued on."

— Jim Young, Plant Support and Protection

"I was over, but I got involved in the work. I've been in development type work my whole career here."

— Ed Babicky, Centrifuge



ORGDG program work on compressor in 1978

**ENERGY HISTORY SERIES**

**The Manhattan Project:  
SCIENCE IN THE SECOND  
WORLD WAR**



**August 1990**

**U.S. Department of Energy  
Office of Administration and  
Human Resources Management  
Executive Secretariat  
History Division**

Groves arrived on December 15 and shut the racetrack down. The coils were sent to Allis-Chalmers with hope that they could be cleaned without being dismantled entirely, while measures were taken to prevent recurrence of the shorting problem. The second Alpha track now bore the weight of the electromagnetic effort. In spite of precautions aimed at correcting the electrical and oil-related problems that had shut down the first racetrack, the second Alpha fared little better when it started up in mid-January 1944. While all tanks operated at least for short periods, performance was sporadic and maintenance could not keep up with electrical failures and defective parts. Like its predecessor, Alpha 2 was a maintenance nightmare.

Alpha 2 produced about 200 grams of twelve-percent uranium-235 by the end of February, enough to send samples to Los Alamos and feed the first Beta unit but not enough to satisfy estimates of uranium requirements. The first four Alpha tracks did not operate together until April, a full four months late. While maintenance improved, output was well under previous expectations. The opening of the Beta building on March 11 led to further disappointment. Beam resolution was so unsatisfactory that complete redesign was required. To make matters worse, word spread that the K-25 gaseous diffusion process was in deep trouble because of its ongoing barrier crisis. K-25 had been counted upon to provide uranium enriched enough to serve as feed material for Beta. Now it would be producing such slight enrichment that the Alpha tracks would have to process K-25's material, requiring extensive redesign and retooling of tanks, doors, and liners, particularly in units that would be wired to run as hot, rather than as cold, electrical sources.<sup>33</sup>

### Reworking the Racetracks

It became clear to Groves that he would have to find a way for a combination of isotope separation processes to produce enough fissionable material for bombs. This meant making changes in the racetracks so that they could process the slightly enriched material produced by K-25. He then concentrated on further expansion of the electromagnetic facilities. Lawrence, seconded by Oppenheimer, believed that four more racetracks should be built to accompany the nine already finished or under construction. Groves agreed with this approach, though he was not sure that the additional racetracks could be built in time.

As K-25 stock continued to drop and plutonium prospects remained uncertain, Lawrence lobbied yet again for further expansion of Y-12, arguing that it provided the only possible avenue to a bomb by 1945. His plan was to convert all tanks to multiple beams and to build two more racetracks. By this time even the British had given up on gaseous diffusion and urged acceptance of Lawrence's plan.

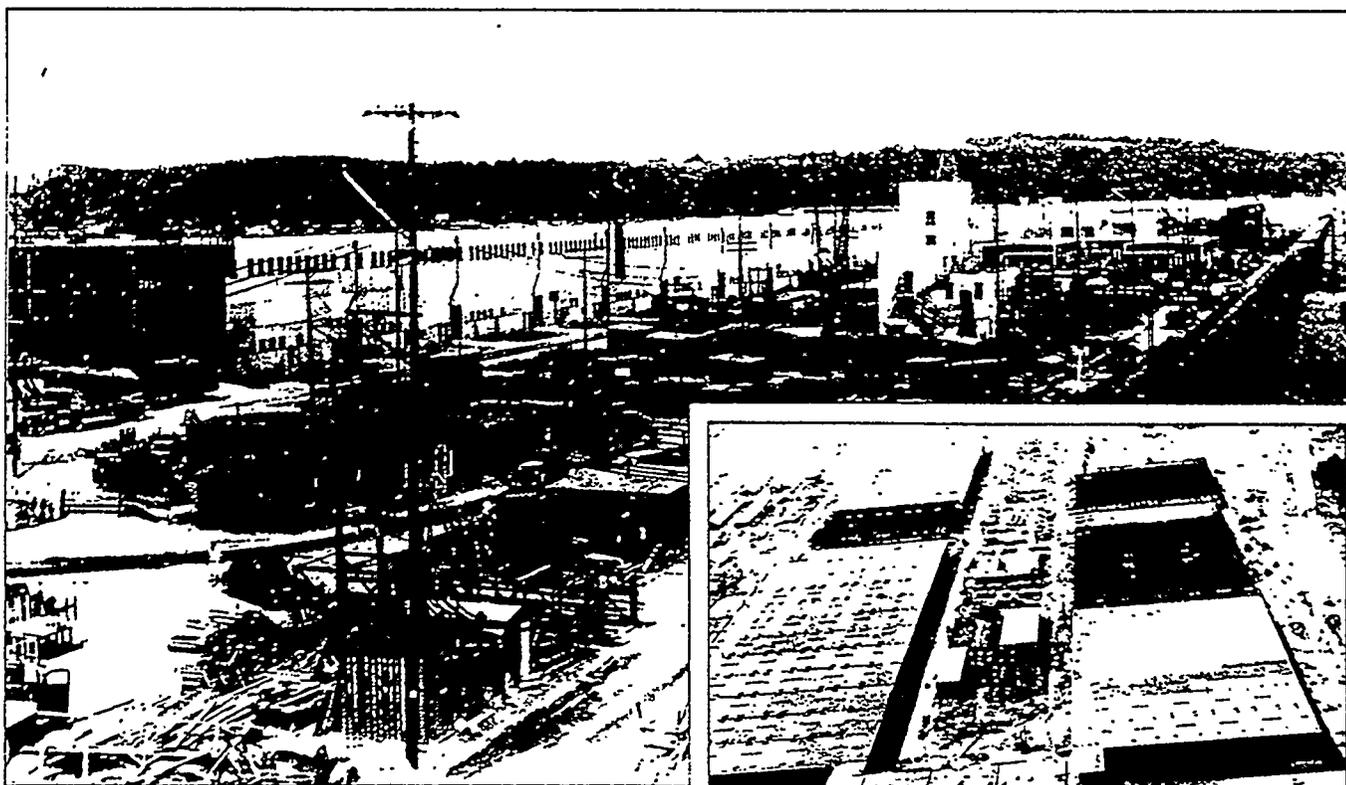
Time was running out, and an element of desperation crept into decisions made at a meeting on July 4, 1944. Groves met with the Oak Ridge contractors to consider proposals Lawrence had prepared after assessing once again the resources and abilities of the Radiation Laboratory. There was to be no change in the completed racetracks; there simply was not enough time. Some improvements were to be made in the racetracks then under construction. In the most important decision made at the meeting, Lawrence was to throw all he had into a completely new type of calutron that would use a thirty-beam source. Technical support would come from both Westinghouse and General Electric, which would cease work on four-beam development. It was a gamble in a high-stakes game, but sticking with the Alpha and Beta racetracks might have been an even greater gamble.

### The K-25 Gaseous Diffusion Plant

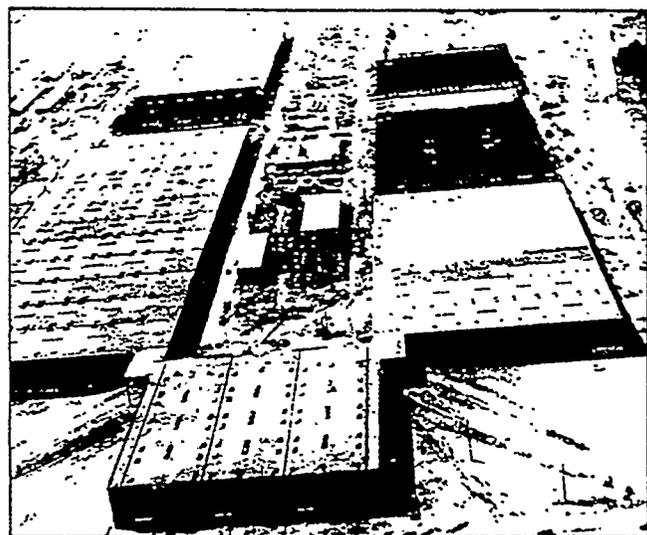
Eleven miles southwest of Oak Ridge on the Clinch River was the site of the K-25 gaseous diffusion plant upon which so much hope had rested when it was authorized in late 1942. Championed by the British and placed first by the Lewis committee, gaseous diffusion seemed to be based on sound theory but had not yet produced samples of enriched uranium-235.

At Oak Ridge, on a relatively flat area of about 5,000 acres, site preparation for the K-25 powerplant began in June. Throughout the summer, contractors contended with primitive roads as they shipped in the materials needed to build what became the world's largest steam electric plant. In September work began on the cascade building, plans for which had changed dramatically since the spring. Now there were to be fifty four-story buildings (2,000,000 square feet) in a U-shape measuring half a mile by 1,000 feet. Innovative foundation techniques were required to avoid setting thousands of concrete piers to support load-bearing walls.

Since it was eleven miles from the headquarters at Oak Ridge, the K-25 site developed into a satellite



K-25 Gaseous Diffusion Plant Under Construction at Clinton. Reprinted from Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939-1946*, Volume I of *A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1962).



K-25 from Opposite End. White Building in Center of Previous Picture Discernible at Far End. Reprinted from Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939-1946*, Volume I of *A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1962).

town. Housing was supplied, as was a full array of service facilities for the population that reached 15,000. Dubbed Happy Valley by the inhabitants, the town had housing similar to that in Oak Ridge, but, like headquarters, it too experienced chronic shortages. Even with a contractor camp with facilities for 2,000 employees nearby, half of Happy Valley's workers had to commute to the construction site daily.

### Downgrading K-25

In late summer 1943 it was decided that K-25 would play a lesser role than originally intended. Instead of producing fully enriched uranium-235, the gaseous diffusion plant would now provide around fifty percent enrichment for use as feed material in Y-12. This would be accomplished by eliminating the more troublesome upper part of the cascade. Even this level of enrichment was not assured since a barrier for the diffusion plant still did not exist. The decision to downgrade K-25 was part of the

larger decision to double Y-12 capacity and fit with Groves's new strategy of utilizing a combination of methods to produce enough fissionable material for bombs as soon as possible.

There was no doubt in Groves's mind that gaseous diffusion still had to be pursued vigorously. Not only had major resources already been expended on the program, but there was also the possibility that it might yet prove successful. Y-12 was in trouble as 1944 began, and the plutonium pile projects were just getting underway. A workable barrier design might put K-25 ahead in the race for the bomb. Unfortunately, no one had been able to fabricate barrier of sufficient quality. The only alternative remaining was to increase production enough to compensate for the low percentage of barrier that met specifications. As Lawrence prepared to throw

## Part IV:

everything he had into a thirty-beam source for Y-12, Groves ordered a crash barrier program, hoping to prevent K-25 from standing idle as the race for the bomb continued.

### Help From the Navy

As problems with both Y-12 and K-25 reached crisis proportions in spring and summer 1944, the Manhattan Project received help from an unexpected source—the United States Navy. President Roosevelt had instructed that the atomic bomb effort be an Army program and that the Navy be excluded from deliberations. Navy research on atomic power, conducted primarily for submarines, received no direct aid from Groves, who, in fact, was not up-to-date on the state of Navy efforts when he received a letter on the subject from Oppenheimer late in April 1944.

Oppenheimer informed Groves that Philip Abelson's experiments on thermal diffusion at the Philadelphia Naval Yard deserved a closer look. Abelson was building a plant to produce enriched uranium to be completed in early July. It might be possible, Oppenheimer thought, to help Abelson complete and expand his plant and use its slightly enriched product as feed for Y-12 until problems with K-25 could be resolved.

The liquid thermal diffusion process had been evaluated in 1940 by the Uranium Committee, when Abelson was at the National Bureau of Standards. In 1941 he moved to the Naval Research Laboratory, where there was more support for his work. During summer 1942 Bush and Conant received reports about Abelson's research but concluded that it would take too long for the thermal diffusion process to make a major contribution to the bomb effort, especially since the electromagnetic and pile projects were making satisfactory progress. After a visit with Abelson in January 1943, Bush encouraged the Navy to increase its support of thermal diffusion. A thorough review of Abelson's project early in 1943, however, concluded that thermal diffusion work should be expanded but should not be considered as a replacement for gaseous diffusion, which was better understood theoretically. Abelson continued his work independently of the Manhattan Project. He obtained authorization to build a new plant at the Philadelphia Naval Yard, where construction began in January 1944.

Groves immediately saw the value of Oppenheimer's suggestion and sent a group to Philadelphia to visit Abelson's plant. A quick analysis

demonstrated that a thermal diffusion plant could be built at Oak Ridge and placed in operation by early 1945. The steam needed in the convection columns was already at hand in the form of the almost completed K-25 powerplant. It would be a relatively simple matter to provide steam to the thermal diffusion plant and produce enriched uranium, while providing electricity for the K-25 plant when it was finished. Groves gave the contractor, H. K. Ferguson Company of Cleveland, just ninety days from September 27 to bring a 2,142-column plant on line (Abelson's plant contained 100 columns). There was no time to waste as Happy Valley braced itself for a new influx of workers.

### The Metallurgical Laboratory

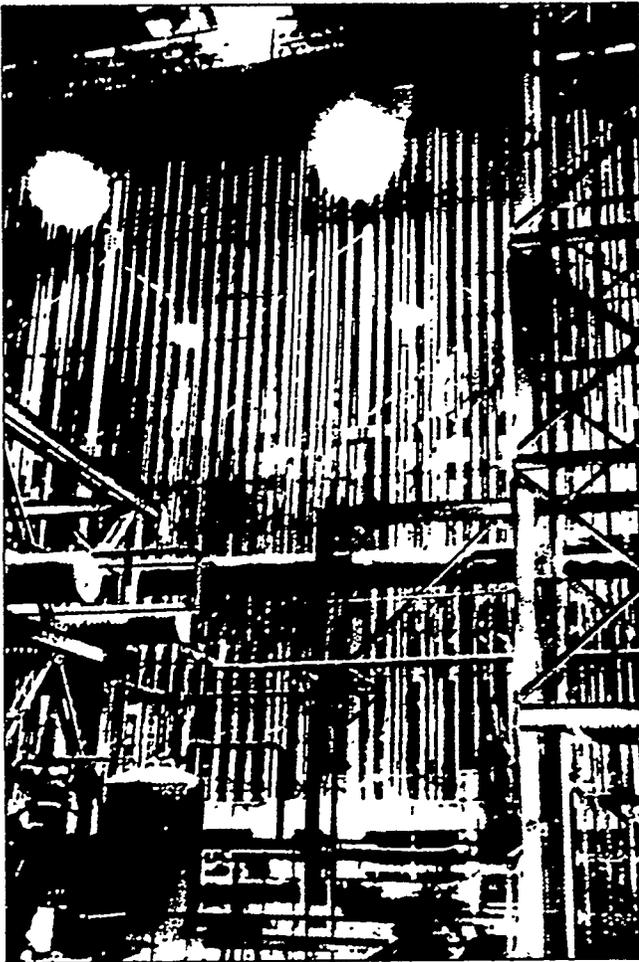
One of the most important branches of the far-flung Manhattan Project was the Metallurgical Laboratory (Met Lab) in Chicago, which was counted on to design a production pile for plutonium. Here again the job was to design equipment for a technology that was not well understood even in the laboratory. The Fermi pile, important as it was historically, provided little technical guidance other than to suggest a lattice arrangement of graphite and uranium. Any pile producing more power than the few watts generated in Fermi's famous experiment would require elaborate controls, radiation shielding, and a cooling system. These engineering features would all contribute to a reduction in neutron multiplication (neutron multiplication being represented by  $k$ ); so it was imperative to determine which pile design would be safe and controllable and still have a  $k$  high enough to sustain an ongoing reaction.<sup>34</sup>

### Pile Design

A group headed by Compton's chief engineer, Thomas V. Moore, began designing the production pile in June 1942. Moore's first goals were to find the best methods of extracting plutonium from the irradiated uranium and for cooling the uranium. It quickly became clear that a production pile would differ significantly in design from Fermi's experimental reactor, possibly by extending uranium rods into and through the graphite next to cooling tubes and building a radiation and containment shield. Although experimental reactors like Fermi's did not generate enough power to need cooling systems, piles built to produce plutonium would operate at high power levels and require coolants. The Met Lab group considered the full range of gases and liquids in a search to isolate the substances with the

## Progress at Oak Ridge

During winter 1944-45 there was substantial progress at Oak Ridge, thanks to improved performance in each of the production facilities and Nichols's work in coordinating a complicated feed schedule that maximized output of enriched uranium by utilizing the electromagnetic, thermal diffusion, and gaseous diffusion processes in tandem. Nine Alpha and three Beta racetracks were operational and, while not producing up to design potential, were becoming significantly more reliable because of maintenance improvements and chemical refinements introduced by Tennessee Eastman. The S-50 thermal diffusion plant being built by the H. K. Ferguson Company was almost complete and



Section of S-50 Liquid Thermal Diffusion Plant at Clinton. Reprinted from Richard G. Hewlett and Oscar E. Anderson, Jr., *The New World, 1939-1946*, Volume I of *A History of the United States Atomic Energy Commission* (University Park: Pennsylvania State University Press, 1962).

was producing small amounts of enriched material in the finished racks, and the K-25 gaseous diffusion plant, complete with barriers, was undergoing final leak tests. By March 1945, Union Carbide had worked out most of the kinks in K-25 and had started recycling uranium hexafluoride through the system. S-50 was finished at the same time that the Y-12 racetracks were demonstrating increased efficiency. The Beta calutrons at the electromagnetic plant were producing weapon-grade uranium-235 using feed from the modified Alpha racetracks and the small output from the gaseous diffusion and thermal diffusion facilities. Oak Ridge was now sending enough enriched uranium-235 to Los Alamos to meet experimental needs. To increase production, Groves proposed an additional gaseous diffusion plant (K-27) for low-level enrichment and a fourth Beta track for high-level enrichment, both to be completed by February 1946, in time to contribute to the war against Japan, which many thought would not conclude before summer 1946.

## Hanford's Role

With the abandonment of the plutonium gun bomb in July 1944, planning at Hanford became more complicated. Pile 100-B was almost complete, as was the first chemical separation plant, while pile D was at the halfway point. Pile F was not yet under construction. If implosion devices using plutonium could be developed at Los Alamos, the three piles would probably produce enough plutonium for the weapons required, but as yet no one was sure of the amount needed.

## Pile Operation

Excitement mounted at Hanford as the date for pile start-up approached. Fermi placed the first slug in pile 100-B on September 13, 1944. Final checks on the pile had been uneventful. The scientists could only hope they were accurate, since once the pile was operational the intense radioactivity would make maintenance of many components impossible. Loading slugs and taking measurements took two weeks. From just after midnight until approximately 3:00 a.m. on September 27, the pile ran without incident at a power level higher than any previous chain reaction (though only at a fraction of design capacity). The operators were elated, but their excitement turned to astonishment when the power

## THE K-25 GASEOUS DIFFUSION PROCESS BUILDING

In January 1942, soon after the beginning of World War II, Columbia University Scientists made the first small-scale separation of uranium isotopes by the gaseous diffusion process. Analyses showing that separation had been accomplished were performed at the University of Minnesota. This long-distance collaboration proved that uranium isotopes could be separated by diffusion. Within a year, under the stimulus of an all-out war, scientists at Columbia and other universities had enough information on gaseous diffusion to show that production of large quantities of Uranium-235 was possible.

Between 1942 and 1945, nearly \$2 billion (unadjusted) was spent for construction (labor and materials), process equipment and for what continues to be one of the greatest research and development programs ever attempted. Approximately half of this was spent for the Clinton Engineer Works near Knoxville, TN. This consisted of three U-235 separation process plants (one each of electromagnetic separation, gaseous diffusion and thermal diffusion), and the town of Oak Ridge.

In May 1943, a Special Engineer Detachment was formed by the Commanding General of the Army Service Forces (Corps of Engineers) to help provide essential technical personnel for the Manhattan District. The first roster consisted of 334 men. By September 1945, the roster has increased to 1,257 men. In the fall of 1943, a recruitment program was begun at colleges and universities to line up draftable men for assignment to the SED. The men in SED came from every state of the union and represented approximately 300 colleges and universities.

The Oak Ridge Gaseous Diffusion Plant is located on a 1,500-acre tract of land west of the City of Oak Ridge. ORGDP is often referred to as "K-25," which was the plant's wartime code name and the name of the first process building. The term is still used by many as a synonym for ORGDP. As the first building to be constructed on the site, K-25 was considered an engineering marvel. It was built in the shape of a "U" three stories high, with each leg of the "U" being about half a mile long. The structure covers an area of 60 acres.

In October 1990, the K-25 Building was named an Historic Nuclear Site by the American Nuclear Society.

Some statistics on the building follow:

### **K-25 Building**

Floor Area	5,560,000 sq. ft.
Structural Steel	35,000 tons
Reinforcing Steel	14,000 tons
Concrete	450,000 cubic yards
Earth Excavation	5,000,000 cubic yards
Rock Excavation	300,000 cubic yards
Compact Fill	500,000 cubic yards

### **Process Equipment**

3000 Converters with Coolers	150,000 Instruments
6,000 Pumps	4,000,000 ft. Copper Tubing
5,000 Compressors	3,000,000 ft. Copper Wire
9,500 Electric Motors	100 miles Process Piping
500,000 Valves	1,000 miles Vacuum-tight Welding

BASIC FACTS  
ON  
THE OAK RIDGE AREA  
OF  
THE U. S. ATOMIC ENERGY COMMISSION  
AND  
THE COMMUNITY OF OAK RIGE

This material contains information on:

- I. The Oak Ridge Area (Page 1)
- II. Operating and Research Units (Pages 4 - 17)
  - The Gaseous Diffusion Plant (Page 4)
  - The Electromagnetic Plant (Page 7)
  - Oak Ridge National Laboratory - Nuclear Research Center  
(Page 10)
  - The Steam Power Plant (Page 12)
  - The Oak Ridge Institute of Nuclear Studies, Inc.  
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- VI. Contractors' Officials in Charge of Various Operations (Page 24)

Prepared at  
Oak Ridge, Tennessee  
by  
The Office of Public Information  
Office of Oak Ridge Operations  
Atomic Energy Commission

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Issued November 15, 1949

## II. THE OPERATING UNITS

### The Gaseous Diffusion Plant

The gaseous diffusion plant for the concentration of U-235 lies in Roane County in the southwest corner of the area near the Clinch River, approximately 13 miles from the town of Oak Ridge. Design work on this plant was started in the spring of 1943 by the Kellogg Corporation, a unit of the M. W. Kellogg Corporation of New York City, which also handled the supervision of construction and procurement of equipment. Chief construction contractor was the J. A. Jones Construction Company of Charlotte, North Carolina, while Ford, Bacon & Davis, Inc. of New York, designed, constructed and for a time operated an auxiliary 400 x 1000-foot plant to condition equipment before placement in the process plant. The main gaseous diffusion process building is a huge U-shaped structure. Each side of the building is 2,450 feet long and averages 400 feet in width and 60 feet in height. The total area of the main building is 44 acres. Nearby is a second gaseous diffusion process building approximately one-fourth as large as the main process building. The plant area contains 70 additional buildings, bringing the total area to 600 acres. Besides the conditioning building, the plant has a repair shop and special warehouses containing tens of thousands of different types of spare parts. A third U-235 process plant costing \$65,000,000 will be completed in 1951.

Construction of the main process plant started September 10, 1943 and the first units for the production of U-235 began operating February 20, 1945. The construction forces on this particular plant reached 25,000 in May, 1945. The peak operating force for this process was around 12,000.

Employment as of November 15, 1949, was around 4000. The entire gaseous diffusion plant cost around \$500,000,000.

The vast structure and its process equipment has been described as a monument to the ingenuity and vision of America's top scientists and development engineers, headed by Dr. Harold C. Urey, the discoverer of "heavy water" and Dr. John R. Dunning, both of Columbia University and P. C. Keith of the Kellogg Corporation. The immensity of the project of constructing the gaseous diffusion plant is evidenced by some of the statistics of the quantities of materials required. These materials were: concrete, 350,000 cubic yards; structural steel, 40,000 tons; sheet steel, 15,000 tons; and bricks, 5,000,000.

The purpose of the gaseous diffusion plant is large-scale separation of the uranium isotope 235 from a chemical compound of uranium by gaseous diffusion through porous barriers -- barriers which must contain billions of holes smaller than two-millionths of an inch, withstand a pressure head of 15 pounds per square inch, can not become enlarged or plugged up as a result of corrosion or dust coming from elsewhere in the system, amenable to manufacture in large quantities (measured in acres) and in uniform quality. The process involves several thousand stages in which half of the gas processed in each stage diffuses through the porous barriers as enriched U-235 product and is then sent on to the next higher stage for further concentration. The impoverished half is re-pressured and re-cycled through the next lowest stage. The volume of gas re-cycled is enormous -- over 1,000,000 times the volume of the enriched gas. The principal behind the separation of U-235 from natural uranium (U-238) is to convert the solid metal into a gas and make use of the difference in the velocity of the two isotopes in diffusing through the porous barriers. U-235 being the lighter, has a faster diffusion velocity, so the gas

eventually diffused through the barrier is richer in U-235 than the feed gas. After passing through the several thousand stages, an appreciable concentration of U-235 is effected.

No similar plant had ever before been contemplated, much less built. Essential tolerances and complexities were such that many advisors considered the plant impossible to build, and many more felt that even if built it would not work. Problems were encountered that called for excursion far into the unknown beyond any known method of design and construction. Development of some of the materials and equipment used in the plant was not successfully completed until after construction was well under way. The equipment required the installation of many miles of piping and electrical conductors. So important was the problem of producing welded joints to meet tightness and cleanliness specifications that it was necessary to develop 14 new special welding techniques. Installation of piping for the main process building exceeds anything to this type ever before constructed. Millions of feet of copper tubing were installed in the instrument system. The successful operation of the plant is dependent to a large extent upon the reliability of the instruments. In connection with new techniques needed for the operation of the plant, pumps were developed to operate at velocities greater than the speed of sound. It has been estimated that the time spent in research, development and the design of the pumps alone total 250,000 hours or the equivalent of one engineer working 100 years. Other technical advancements made in the development work on the plant include a new improved type of mass spectroscope and an electronic gadget called the "leak detector", which has a sensitivity far in excess of any current apparatus and plays an important part in insuring that all parts of the gaseous diffusion plant are vacuum tight. Industry in

time will reap rich rewards from technical advancements made in these and other fields.

### The Electromagnetic Plant

The electromagnetic plant for the concentration of U-235, production of stable isotopes and research on process improvements, is situated in Anderson County near the center of the Oak Ridge Area approximately three miles from the town of Oak Ridge. The Stone & Webster Engineering Corporation of Boston designed and constructed the plant in cooperation with technical experts from the University of California. The cost was approximately \$427,000,000. The ground was broken for the first plant building February 1, 1943. The first production building was put into use by the operating company, the Tennessee Eastman Corporation (a subsidiary of Eastman Kodak) on January 27, 1944.

The peak of plant construction employment totaled 13,200 construction workers. The peak of operational personnel was 22,000 in 1945. Employment at the electromagnetic plant on November 15, 1949, was approximately 1680. The plant has a total of 170 buildings with a floor area of 4,500,000 square feet. The plant covers approximately 500 acres. On May 5, 1947, the plant operations were taken over by the Carbide and Carbon Chemicals Corporation after the Tennessee Eastman Corporation evinced a desire to withdraw as operator.

The building of the electromagnetic plant involved problems of design and construction never before encountered. Since it became the first and only plant of its kind in the world, there was no time to construct even a small pilot plant to carry out the methods of separating the uranium atoms (U-235 from U-238) under the electromagnetic process as developed by Dr. E. O. Lawrence of the University of California, who receives the largest share of

## THE K-25 GASEOUS DIFFUSION PROCESS BUILDING

In January 1942, soon after the beginning of World War II, Columbia University scientists achieved the first small-scale separation of uranium isotopes by the gaseous diffusion process. Before the year's end, researchers there and at other universities had enough information on gaseous diffusion to show that production of large quantities of uranium hexafluoride enriched in the uranium-235 isotope--for use in nuclear weapons and as nuclear fuel--was possible.

In December 1942, the U.S. Army's Manhattan Engineering District signed a contract with the Kellogg Corporation to serve as architect-engineers for construction of a gaseous diffusion plant near what would soon be the city of Oak Ridge, Tennessee. A month later, Union Carbide & Carbon Chemical Company was awarded a contract to operate the plant.

Ground was broken for the K-25 Building, the first process building to be constructed on the site, in September 1943. In February 1945, the first enriched uranium was extracted from the K-25 cascade.

The K-25 Building was considered an engineering marvel when it was built in 1943. Covering 60 acres, it was built in the shape of a "U" three stories high, with each leg of the "U" being about a half-mile long. Some statistics on the buildings and its process equipment follow:

### **K-25 Building**

Floor Area	5,560,000 sq. ft.
Structural Steel	35,000 tons
Reinforcing Steel	14,000 tons
Concrete	450,000 cubic yards
Earth Excavation	5,000,000 cubic yards
Rock Excavation	300,000 cubic yards
Compact Fill	500,000 cubic yards

### **Process Equipment**

3,000 Converters with Coolers	150,000 Instruments
6,000 Pumps	4,000,000 ft. Copper Tubing
5,000 Compressors	3,000,000 ft. Copper Wire
9,500 Electric Motors	100 miles Process Piping
500,000 Valves	1,000 miles Vacuum-tight Welding

Over the next decade, following the war's end, four more process buildings--K-27, K-29, K-31 and K-33--were constructed at the Oak Ridge Gaseous Diffusion Plant, and gaseous diffusion plants were constructed in Kentucky and Ohio. The K-25 and K-27 buildings were shut down in 1964, after nearly two decades of production.

In June 1985, the Department of Energy announced that the gaseous diffusion process equipment at ORGDP was to be placed on standby because of excess production capacity; two years later it directed that the process equipment be permanently shut down. ORGDP has since been re-named the Oak Ridge K-25 Site and is now managed by Martin Marietta Energy Systems, Inc. A variety of programs--including the Atomic Vapor Laser Isotope Separation (AVLIS) Program (HAZWRAP)The International Space Program, Data Systems Research and Development, The Hazardous Waste Remedial Action Program, The Space Defense Technology Program, The Toxic Substance Control Act (TSCA) Incinerator, and work for non-DOE federal agencies--are being conducted at the site under the direction of the company's Applied Technology Organization.

## OAK RIDGE K-25 SITE FACT SHEET

**Mailing Address:** Oak Ridge K-25 Site  
Post Office Box 2003  
Oak Ridge, Tennessee 37831

**Owner:** U. S. Department of Energy (DOE)

**Managing Contractor:** Martin Marietta Energy Systems, Inc.

**Site Manager:** Lincoln E. (Linc) Hall

**Present Missions:** Serves as headquarters for Applied Technology Organization (ATO), which is comprised of the following divisions: AVLIS Program (the Atomic Vapor Laser Isotope Separation process for enriching uranium), Central Waste Management, Data Systems Research and Development, HAZWRAP (Hazardous Waste Remedial Action Program), International Technology, Space and Defense Technology, and Toxic Substances Control Act (TSCA) Incinerator Operations. ATO carries out a broad range of design, development, testing and evaluation, demonstration and validation, and program-management work that (1) facilitates the effective application of advanced science and technology being developed at the five DOE facilities managed by Martin Marietta to the solution of vitally important national problems facing DOE and other federal agencies; (2) assists in the transfer of these technology applications to U. S. industry; and (3) provides an expanded base of continuing DOE work at the K-25 Site. The site also houses approximately 1,500 employees from several Central Staff divisions, including Engineering, Computing and Telecommunications, and Procurement.

**History:** Formerly the Oak Ridge Gaseous Diffusion Plant, the site began operations in 1945 as part of the U. S. government's secret Manhattan Project of World War II. The original mission was to separate the uranium-235 isotope for use in atomic weapons.

**Plant Location:** Roane County, Tennessee, on a 1,500-acre tract of land west of the City of Oak Ridge (28,000 population).

**Plant Size:** 117 buildings, with 172 acres of floor space, situated on a 706-acre area enclosed by security fencing.

**Plant Population:** 3,090 (as of December 31, 1990)

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**Unions Represented:** Oil, Chemical, and Atomic Workers International Union (OCAW) and United Plant Guard Workers of America (UPGWA).

**K-25 Site Purchases from Tennessee firms in FY 1990:** Oak Ridge \$45,972,065  
Local Area (excluding Oak Ridge) 49,803,901  
All of Tennessee 101,566,777

**K-25 Payroll, FY 1990** \$144,132,308 (including benefits)

**Employee Residence:** Oak Ridge/Anderson County 35%  
Knoxville/Knox County 31%  
Roane County 21%  
All other areas 13%

January 1991

## SUMMARY

### Oak Ridge K-25 Site

#### BACKGROUND

- The Oak Ridge Gaseous Diffusion Plant was built in 1945.
- Original mission was production of uranium hexafluoride enriched in the uranium 235 isotope, which was then shipped off site for further processing into metal or other suitable compound for use as fuel in commercial nuclear power plants, as fuel for Navy subs and ships, and in support of weapons production.
- The gaseous diffusion activities were placed in standby in 1985 and were shut down in 1987. The Site's current mission is multi-purpose. The major programmatic mission areas are:
  - Environmental restoration programs, including remediation of solid waste management units, surveillance and maintenance of the shutdown facilities, and hazardous materials management and disposal of regulated materials still residing in the shutdown facilities.
  - Waste management programs, which include the development and demonstration of waste treatment technologies, and the construction and operation of low-level waste treatment and disposal facilities for the Oak Ridge Reservation (ORR). Specific operations include the TSCA Incinerator, Central Neutralization Facility, and multi-plant waste storage. Development activities are now under way for the design and construction of the new Low-Level Waste Disposal Facilities for the ORR, scheduled for operation by 1997.
  - Applied technologies programs, which include the application of R&D capabilities, technologies, expertise, and facilities to solve problems of national importance for DOE and other federal agencies in areas such as hazardous waste management, R&D on advanced computing and information security systems, and R&D and prototype fabrication of systems and components requiring advanced materials, instrumentation, drive systems, etc.
  - Technical support to uranium enrichment, which includes development and demonstration support for the AVLIS program and the protection and transfer of surplus equipment to the operating gaseous diffusion plants
  - Engineering, computing, and business services, including payroll, accounting, procurement, auditing, etc., provided to the rest of Energy Systems and to DOE.

- Martin Marietta Energy Systems, Inc. (Energy Systems) has operated the plant since 1984.

### MANAGEMENT IMPROVEMENTS SINCE 1983

- DOE established Site Office in 1989
- New contractor selected in 1984
- Established Risk Management Organization in 1990 to implement risk-based prioritization system, coordinate audits, and ensure consistency with the rest of Energy System. The Tiger Team and Audit Preparation Program was added to this organization in late 1990.
- Established Facility Management, Waste Management, and Business Management organizations in August 1990.
- Established 12 pilot Performance Measurement Teams (PMTs) in September 1990, with a Site goal of 24 teams in 1991.
- Implementing a graded NQA-1 based QA program.
- Implementing a Total Quality Management (TQM ) process.
- Major emphasis on employee morale, team building, employee involvement, and customer focus.
- Major emphasis on ES&H

*LW Cooke*

*Brady*

- Addition of 127 ES&H personnel since shut down of gaseous diffusion process to a level of 225 employees projected for 9/30/91.

- ES&H comprises 60 percent of the award fee.

- Plant renamed Oak Ridge K-25 Site 1990