



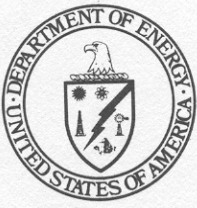
U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

Beryllium Oxide Operations at the
Y-12 National Security Complex

DOE/IG-0595

April 2003



Department of Energy

Washington, DC 20585

April 16, 2003

MEMORANDUM FOR THE SECRETARY

FROM:

Greg Friedman
Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on "Beryllium Oxide
Operations at the Y-12 National Security Complex"

BACKGROUND

The Department of Energy's Y-12 National Security Complex is a vital part of the Department's national defense mission and, specifically, its mandate to ensure the viability of the nation's nuclear weapons stockpile. As part of its stockpile stewardship responsibilities, Y-12 makes widespread use of beryllium oxide primarily as a ceramic component in nuclear weapons. Beryllium oxide is highly toxic, posing significant health risks to workers. Y-12's beryllium oxide operations included 141 active storage and operational areas.

We initiated this audit to determine whether the Department was conducting its beryllium oxide operations in the most efficient and effective manner.

RESULTS OF AUDIT

The audit disclosed a number of inefficiencies in Y-12's beryllium oxide operations. For example, operations were spread across the Y-12 site, and, in some cases, were co-located with other Y-12 operations. In addition, manufacturing equipment and facilities were outdated, which increased manufacturing time and costs, and exacerbated health hazards associated with the use of beryllium. Problems persisted because the Department did not have an approved, consistent plan for improving operations. Further, the Department did not consider materials other than beryllium oxide that may be capable of performing the same function without the harmful health effects. If issues with beryllium oxide operations are not addressed, further health problems could arise and additional expenditures could be unnecessarily incurred. As of September 2002, the Department had spent about four years and \$10 million on activities designed to mitigate the identified problems, but improvements were still needed.

The report included a number of recommendations designed to facilitate these improvements. The Associate Administrator for Management and Administration, National Nuclear Security Administration (NNSA), agreed with our recommendations and stated that NNSA will begin the appropriate corrective action process immediately.



The findings in the report, relating to outdated facilities and equipment, are consistent with previous infrastructure issues identified in *Management Challenges at the Department of Energy* (DOE/IG-0580, December 2002). The Office of Inspector General also recently issued a report, *Management of Beryllium Metal Supply* (DOE/IG-0583, January 2003), which disclosed that the adoption of alternatives (such as changing the beryllium metal manufacturing process and recycling) had the potential to save the NNSA as much as \$42 million, drastically reduce its need for additional material, and reduce worker exposure to potentially harmful material.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Associate Administrator for Management and Administration
Director, Policy and Internal Controls Management, NA-66

BERYLLIUM OXIDE OPERATIONS AT THE Y-12 NATIONAL SECURITY COMPLEX

TABLE OF CONTENTS

Beryllium Oxide Operations

Details of Finding	1
Recommendations and Comments.....	3

Appendices

1. Objective, Scope, and Methodology	4
2. Management Comments.....	5

BERYLLIUM OXIDE OPERATIONS

Status of Beryllium Oxide Operations

Much of the manufacturing equipment and facilities used for beryllium oxide operations were spread across the Y-12 site and, in some cases, co-located with other Y-12 operations. This situation led to increased manufacturing time and costs, and exacerbated the health hazards associated with the use of beryllium. For example, when material is moved from one location to another, laboratory samples are taken to ensure that a contaminated item is not carried outside of the contained area. However, our review showed that if beryllium oxide operations were consolidated, Y-12 could reduce the number of laboratory samples by over 50 percent. Also, exposure to beryllium hazards for workers in other Y-12 operations could be reduced if beryllium oxide activities were isolated, rather than commingled with the other operations.

The age and condition of existing equipment and facilities contributed to operational inefficiencies. The equipment, based on 1960's technology, experienced excessive downtime. Specifically, the equipment had numerous mechanical, hydraulic, and vacuum problems and, in some cases, replacement parts were not available. Although most of these problems were smaller in scope, they often took days or weeks to be resolved. Uncontrolled temperatures resulting from the outdated facilities and equipment also caused problems. Employees worked partial shifts in the summer months and computer equipment failed because facility temperatures often exceeded 80 degrees.

Finally, the health of the beryllium oxide workers remains a significant concern under the existing operating conditions. The numbers of beryllium-sensitized workers and chronic beryllium disease cases continue to grow at a steady rate. The scientific community continues to study the effects of beryllium exposure as well as how to properly characterize beryllium concentrations. New scientific evidence regarding particulate sampling suggests that worker exposure may be even greater than anticipated.

Planning for Beryllium Oxide Operations

Problems in beryllium oxide operations persisted because the Department did not have an approved, consistent plan for improving operations, nor did it fully consider all viable alternatives. Specifically, beginning in September 1998, local National Nuclear Security Administration (NNSA) management began to work on improving beryllium oxide operations through the Stockpile Management Restructuring Initiative (Initiative). One of the goals of the Initiative was to relocate beryllium oxide machining operations to a more structurally sound location. The planned direction was cancelled in Fiscal Year 2000, due in part to a new effort to build a Special Materials Complex. The Special Materials Complex was expected to

consolidate several special materials processing capabilities, including beryllium oxide operations, into one facility. However, in January 2001, Y-12 management notified local NNSA management that it did not want to pursue the Special Materials Complex proposed by the prior contractor.

Subsequently, local NNSA management directed the contractor to establish a new stand-alone, small-scale production facility. According to an NNSA program requirement document, the new manufacturing facility was supposed to be operational by June 2005. However, because of technical complexities associated with the project, the contractor estimated a 2012 operational date at an estimated cost of \$260 million. In February 2002, the contractor began preparing documentation in support of the manufacturing facility, but NNSA Headquarters has not formally approved the proposed facility. In fact, during discussions with NNSA Headquarters management, we found that the Y-12 contractor was directed to revisit the proposed manufacturing facility because of unacceptable scope, cost, and capability.

Additionally, the Department of Energy (Department) did not fully consider all viable alternatives to beryllium oxide operations. We noted that the Department had worked with materials other than beryllium oxide in the past that could perform the same function as beryllium oxide, without the harmful health effects. The Department has worked with one material in particular¹ that seemed especially promising. A 1988 report concluded that this material appeared to be a viable replacement for beryllium oxide in future weapons systems. In support of the replacement material, technical experts reported that the substitute material lacked one of the undesirable performance characteristics and presented none of the toxicity problems associated with beryllium oxide. The substitute material's lack of toxicity is significant considering the enormous health care liability currently faced by the Department for beryllium exposure to workers.

As a result of our audit, NNSA Headquarters plans to approach the weapons design laboratories about pursuing further research and development of substitute materials. However, we recognize that additional immediate measures, such as a new manufacturing facility, may need to be considered in conjunction with the use of a substitute material to solve the problems resulting from existing beryllium oxide operations.

¹Specific material name is classified.

Health and Monetary Concerns

If issues with beryllium oxide operations are not addressed, further health problems could arise and additional expenditures could be unnecessarily incurred. Specifically, until the Department decides on a path forward and implements it, funds will continue to be expended to "band-aid" beryllium oxide operations, but significant improvements to worker health and safety may not be achieved. As of September 2002, the Department had spent about four years and \$10 million on activities designed to mitigate the identified problems, but improvements are still needed.

RECOMMENDATIONS

We recommend that the Deputy Administrator for Defense Programs:

1. Ascertain the viability of using a substitute for beryllium oxide;
2. Determine the most efficient and effective path forward for supporting the enduring stockpile;
3. Prepare a plan to implement the decision; and,
4. In the interim, take action to mitigate the existing beryllium oxide operational efficiency and effectiveness issues, as noted in this report.

MANAGEMENT REACTION

The Associate Administrator for Management and Administration, NNSA, agreed with our recommendations and stated that NNSA will begin the appropriate corrective action process immediately. We have included management's comments in their entirety as Appendix 2.

Appendix 1

OBJECTIVE

The objective of this audit was to determine whether the Department was conducting its beryllium oxide operations in the most efficient and effective manner.

SCOPE

The audit was performed from July 2002 to February 2003 at the Y-12 National Security Complex in Oak Ridge, Tennessee, and NNSA Headquarters in Washington, DC. The scope of the audit included a review of the Department's beryllium oxide operations.

METHODOLOGY

To accomplish the audit objective, we:

- Evaluated Federal and Department guidance concerning beryllium oxide operations;
- Reviewed research and development documentation related to substitute materials;
- Analyzed current and planned beryllium oxide operations;
- Conducted tours of beryllium oxide operations; and,
- Held discussions with cognizant Department and contractor personnel.

The audit was performed in accordance with generally accepted Government auditing standards for performance audits, and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the objective of the audit. Accordingly, the audit included a review of the Department's beryllium oxide activities. Because our audit was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. As part of our review, we also evaluated the Department's implementation of the Government Performance and Results Act of 1993. We found that the Department had implemented specific and measurable performance measures related to beryllium operations. We did not conduct a reliability assessment of computer-processed data because only a very limited amount of computer-processed data was used during the audit.

NNSA waived the exit conference.

Appendix 2



Department of Energy
National Nuclear Security Administration
Washington, DC 20585

MAR 21 2003

MEMORANDUM FOR Frederick D. Doggett
Deputy Assistant Inspector General
for Audit Services

FROM: Anthony R. Lane *Anthony R. Lane*
Associate Administrator
for Management and Administration

SUBJECT: Comments to Draft Report; Beryllium Oxide
Operations

The Office of Inspector General (IG) issued their draft report, "Beryllium Oxide Operations at the Y-12 National Security Complex" on February 20, 2003. We appreciate having had the opportunity to have reviewed the draft report. NNSA understands that the scope of this audit was to determine whether the NNSA is conducting beryllium oxide operations in the most efficient and effective manner.

The draft report indicates that the IG believes that there are inefficiencies in the oxide operations, that operations are scattered, that manufacturing equipment and facilities are outdated, and that problems will persist because there is no approved, consistent plan for improving operations. NNSA appreciates the fact that the report does acknowledge that the Department has spent an estimated four years and \$10 million on activities and actions designed to mitigate the identified problems.

NNSA's Y-12 National Security Complex also had the opportunity to review the draft report and has no comments to make. We understand that there are four recommendations and we will begin the appropriate corrective action process immediately.



Printed with soy ink on recycled paper

CUSTOMER RESPONSE FORM

The Office of Inspector General has a continuing interest in improving the usefulness of its products. We wish to make our reports as responsive as possible to our customers' requirements, and, therefore, ask that you consider sharing your thoughts with us. On the back of this form, you may suggest improvements to enhance the effectiveness of future reports. Please include answers to the following questions if they are applicable to you:

1. What additional background information about the selection, scheduling, scope, or procedures of the audit would have been helpful to the reader in understanding this report?
2. What additional information related to findings and recommendations could have been included in this report to assist management in implementing corrective actions?
3. What format, stylistic, or organizational changes might have made this report's overall message more clear to the reader?
4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?

Please include your name and telephone number so that we may contact you should we have any questions about your comments.

Name _____ Date _____

Telephone _____ Organization _____

When you have completed this form, you may telefax it to the Office of Inspector General at (202) 586-0948, or you may mail it to:

Office of Inspector General (IG-1)
Department of Energy
Washington, DC 20585

ATTN: Customer Relations

If you wish to discuss this report or your comments with a staff member of the Office of Inspector General, please contact Wilma Slaughter at (202) 586-1924.

The Office of Inspector General wants to make the distribution of its reports as customer friendly and cost effective as possible. Therefore, this report will be available electronically through the Internet at the following address:

U.S. Department of Energy, Office of Inspector General, Home Page
<http://www.ig.doe.gov>

Your comments would be appreciated and can be provided on the Customer Response Form attached to the report.