**Cover Sheet for a Hanford
Historical Document
Released for Public Availability**

Released 1995

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DECLASSIFIED

HW-24740

RECORD CENTER FILE

-1-

- cc: 1. T. Frudich
2. W. N. Mobley
3. T. W. Eauff
4. R. J. Bell
5. A. B. Greninger
6. O. H. Greager - W. K. Woods
7. R. B. Richards
8. V. R. Cooper
9. P. E. Collins - W. B. Kerr
10. Pink Copy
11. Yellow Copy
12. 700 File
13. 300 File

This document consists of 3 pages, No. 11 of 13 copies, Series A.

COPY 1 OF 1

June 12, 1952

DECLASSIFIED

By Authority of CH Henager

11-25-91, CG-PR-2

by DK Hanson, 3-19-92

Verified By DA But 3-20-92

NOT UCN

TO: T. Frudich
W. N. Mobley
Separations Section

FROM: P. E. Collins, Leader
234-5 Plant Assistance
Separations Technology Unit
Technical Section

PRODUCTION OF "X" BUTTONS IN THE 234-5 BUILDING

- Ref. No. 1 Document HW-24060, "Production of 'X' Buttons in the 234-5 Building", P. E. Collins to T. Frudich, W. N. Mobley, April 8, 1952.
- Ref. No. 2 Document HW-24261, "Trip Report - Visit to Los Alamos Scientific Laboratory, April 7 and 8, 1952, To File from V. R. Cooper - R. W. Benoliel

RECEIVED

300 AREA
CLASSIFIED FILES

MASTER
DECLASSIFIED

This document contains restricted data as defined in Atomic Energy Act of 1946. Transmission of the contents in any manner to an unauthorized person is prohibited.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

TS

SUMMARY

Plutonium metal in the form of chips may be recycled to the reduction operation by mixing with the normal reactants fed to this operation, i.e. plutonium tetrafluoride, calcium metal, and elemental iodine, in a mixer having a dry air or inert atmosphere. The process performance with respect to hazard may be expected to be as satisfactory as has been experienced with the currently approved method described in Reference 1 and the yields are expected to show an improvement. These expectations are based upon theoretical considerations and a one-year demonstration of incident-free and satisfactory process operation at Los Alamos Scientific Laboratory, where basically the same operation as proposed for Hanford Works have been in practice.

DISCUSSION

One of the elements of concern discussed in the previous recommendation (HW-24060) relative to the production of "X" buttons is the possibility of igniting the reactants prematurely due to the friction between turnings during the crucible loading operation. The turnings as produced in the machining operation are randomly oriented strings or ribbons of plutonium metal and are mechanically intertwined in such a manner that movement, such as compression of the massed turnings, is reasoned to result in high unit loadings between the small areas of contact. In order to essentially eliminate the possibility of spark generation resulting from movement at metal to metal surfaces, which can lead to premature reaction, document HW-24060 prescribed that argon or helium be employed to displace oxygen and nitrogen from the system. Production operations conducted in accordance with the recommendations contained in the foregoing document have been carried out without incident. However, the procedure reduces the flexibility of materials handling and has resulted in generally lower average yields. From an examination of the reasons for confining the turnings to the bottom of the crucible together with the employment of an argon or helium gas flush, it is evident that if the residual mechanical forces present due to the configuration of the mass of turnings or forces exerted during loading which serve to bring the metal turnings into contact under pressure could be eliminated, that the specific procedures designed to minimize the hazard could be revised. This situation can be theoretically achieved by subdividing the turnings into individual metal chips with an average length of approximately $3/8$ " or less (thickness is necessarily small, about 40 mils) since there would not be any continuous structural elements present to transmit force beyond the individual weight of the chips present.

Verification of the conclusions arrived at by reasoning is found in the experience accumulated at the Los Alamos Scientific Laboratory for a period of one year, beginning May 1, 1951, which has been demonstrated to be a satisfactory operation process-wise and safety-wise. As described in reference document HW-24261, the procedure at Los Alamos is to mix calcium, iodine, plutonium tetrafluoride and clean metal chips in a tumble mixer operated in air at 65°F with 10 to 20 per cent relative humidity. The clean metal chips are produced by passing turnings through a chip cutter, shaking the chips on a 100 mesh screen. The metal as retained on the screen constitutes the recycle to the reduction operation. The powder that

DECLASSIFIED

passes through the screen (mainly oxides of plutonium) is recycled to the skull dissolver. Although some slight differences exist in the type of turnings produced at Hanford Works vs. those produced at Los Alamos, the difference is essentially one of degree and does not constitute a change in principle. The turnings at Hanford Works obtained by direct machining range from string-like material approximately 3 by 5 mils to broad ribbons of plutonium with a width of approximately 1/2" and a thickness of up to 3 mils, whereas the machining operation at Los Alamos produces almost exclusively strings of plutonium metal. It is not believed that this slight difference in physical size will in any way change the process or safety considerations.

It must be recognized that the foregoing considerations apply only to the methods and procedures employed in mixing the components charged to the reduction operation. Limitations existent with respect to quality and quantity relationships are unaffected.

It is therefore concluded that mixing and charging of reactants to the reduction operation may be accomplished with the same degree of safety as now exists through a reversed procedure wherein clean metal chips are added directly to the balance of the reactants and mixed in equipment operated within a dry air, helium or argon atmosphere (10 to 20 relative humidity at 65°F).

VRC-PEC-PEC

DECLASSIFIED