AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

PNL-9440

BATTELLE-NORTHWEST

PACIFIC NORTHWEST LABORATORIES a division of BATTELLE MEMORIAL INSTITUTE

PACIFIC NORTHWEST LABORATORY

P. O. Box 999 Richland, Washington 99352

Telephone: Area Code 509, 942-1111, Ext. 6-5400

Cable Address: BATNORLAB

February 11, 1965

To: M. E. Borgeson, Engineer
Chemical Processing Department
234-5 Building
200-West Area

From: T. C. Nelson, Manager
Plutonium Product Development Unit
231-Z Building, 200-W Area

Subject: Examination of Furnace Belt Failure in 232-Z Incinerator

Metallographic examination has been completed on samples from the Nichrome V wire mesh furnace belt in the 232-Z building incinerator. During service the furnace belt had broken in several places where the wire was welded together. The service conditions in the incinerator consisted of intermittent heating from room temperature to 800 or 900 C in the incinerator atmosphere which varies from load to load due to the wide variety of material that is burned. A detailed gas analysis of the incinerator atmosphere is not available at this time.

Figure 1 shows the etched microstructure of the "as-received" Nichrome V wire. The photomicrograph is taken on a longitudinal cross-section and shows inclusions aligned parallel to the direction of working. Note the size of the recrystallized grain structure.

A section through the weld of the "as-received" wire mesh belt is shown in Figure 2. The lower part of the figure is the Nichrome wire while the upper part is the weld metal. Although this is an as-polished structure, a grain boundary phase can be seen in the weld metal. Figure 3, which is a higher magnification of a similar area after etching, shows this grain boundary phase more clearly.

Figures 4 and 5, were taken of a wire sample from the failure area of the furnace belt. This sample was mounted for longitudinal cross-sectional examination. Figure 4, shows the etched microstructure away from the failure end of the sample. This structure is essentially the same as the structure of the starting material (Figure 1). Figure 5 shows structure of the Nichrome V at the failure end of the wire sample. The large grain size indicates that this area was in the heat affected zone adjacent to the weld. The large grain size at the failure end of the wire was typical of all samples submitted for examination; i.e., none of the weld metal could be found in any of these samples.

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ym

Examination of Furnace Belt Failure in 232-Z Incinerator

Page 2.

Figure 6 and 7 are photomicrographs taken near the outer edges of a transverse cross-section of the Nichrome V furnace belt wire and show general corrosion. Figure 7 was taken after etching and shows intergranular attack proceeding the more general type of corrosion. Another transverse cross section of the wire showing general corrosion is Figure 8. Note that only about 0.060 inches of sound material is left of the original 0.125 inch diameter wire. Other samples similarly examined measured from 0.060 inches to 0.100 inches in diameter.

Summary

Material failure during service was noted to occur in the weld areas of the Nichrome V wire mesh furnace belt in the 232-Z building incinerator.

A grain boundary phase was found in weld metal during metallographic examination of the "as-received" material. It is probable to conclude that the failure during service was caused by accelerated corrosion of the weld and that the accelerated corrosion in that area was related to the structure of the weld metal. It would be informative to examine welds from the furnace belt that have not failed to further study the cause for the failure.

Corrosion penetration away from the weld area varied from a maximum of 0.032 inches to less than 0.010 inches.

TCN:DDH:vs

cc: PS Kingsley	-	CPD
DD Hays		BNW
TC Nelson		BNW
OJ Wick		BNW

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, makes 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.

DATE

FILMED

6/27/94

END