Nuclear Metals, Inc.

Facsimile Coversheet

Telephone:	(508) 369-5410	
Fax Numbers:	(508) 287-0478	CORPORATE COMMUNICATIONS
	(508) 371-0237	Engineering
	(508) 371-0214	Finance
	(508) 371-3275	Purchasing
	(508) 287-5129	QC
	(508) 369-4045	Sales
	(508) 287-5124	Shipping
	(703) 524-5348	NMI VA
	(803) 259-3622	CMI

Date: 15 March 1996
***To:** NRC Operations Center
Company: US Nuclear Regulatory Commission
Fax #: (301) 816-5151
Telephone (301) 816-5100
****From:** Frank J. Vumbaco
Subject: 10 CFR Part 21 Report of Findings
# of pages 6 **Including coversheet**
Message: Please call and confirm receipt of this FAX transmission to the office of Frank J. Vumbaco @ 508-369-5410 X510 or X296

**Please notify above named upon receipt*
***If all data is not received, please notify sender*

A22

NUCLEAR METALS, INC.

15 March 1996

United States Nuclear Regulatory Commission
NRC Operations Center

Transmitted VIA FAX (301) 816-5151

Facility:
Nuclear Metals, Inc.
2229 Main Street
Concord, MA 01742

Docket No.: 040-00672
License No.: SMB-179
Reference: PN1-96-11 and PN1-96-11A
Radiation Safety Officer: Frank J. Vumbaco

The attached report details the findings of a root cause investigation made subsequent to the failure of a basic component essential to safe operation of an ancillary system used to process waste waters in support of a 10 CFR 40 licensed manufacturing process.

This manufacturing process involving depleted uranium materials is performed under NRC License number SMB-179 held by Nuclear Metals, Inc. (NMI) of Concord Massachusetts. The event which followed the failure of the basic component has been reported to Region I, and the NRC Operations Center and is described in the above two PN references. This letter and attachment is intended to satisfy the notification requirements contained in 10CFR21.21(d)(3)i.

The basic component was a temperature thermocouple which is fully described in the attached report. Basic component in the above and below context is defined in 10CFR21.3(2) as:

"When applied to other facilities...basic component means a structure, system, or component, or part thereof that affects their safety function, that is directly procured by the licensee of a facility or activity subject to the regulations in this part and in which a defect or failure to comply with any applicable regulation in this chapter, order, or license issued by the Commission could create a substantial safety hazard."

Our investigation revealed that the thermocouple was incorrectly manufactured with reverse polarity and was the principle precipitating factor to the event. The

9605020221 960327
CF SUBJ
ID&R-11C IEIN CF

Type J thermocouple at fault is unique to the waste water treatment equipment and is the only one of it's kind in service at the licensee's plant and facilities.

The undersigned is NMI's designated responsible company officer who is charged with the obligation of reporting to the NRC items subject to the requirements of 10CFR Part 21.

Upon receipt of the following information any questions or comments should be directed to the undersigned.

Frank J. Vumbaco

Frank J. Vumbaco
Vice President, Health and Safety

attach\

Note: NRC contacts at Region I are:

M. Miller	R. Bellamy
610-337-5205	610-337-5200

OFFICE MEMORANDUM Nuclear Metals, Inc.

To: Frank J. Vumbaco **Date:** March 14, 1996

From: George Shinopulos George Shinopulos

Subject: REPORT OF DEFECT; Sonodyne Thermocouple

The following is provided in support of Nuclear Metals, Inc.'s report to the US Nuclear Regulatory Commission in accordance with their Part 21 "Reporting of Defects and Noncompliance".

Nuclear Metals, Inc. (NMI) has a waste water Pulse Combustion Drier at 2229 Main Street, Concord MA, 01742 which was put into operation in 1985. NMI generates radioactive contaminated waste waters during the manufacture of depleted uranium parts. The waste water is principally composed of floor wash water, pickle rinse water, general cleaning water, part cleaning water, quench water and small quantities of pickle acids. The drier is used to evaporate the water into an air stream which is discharged to the atmosphere through a HEPA filtered and monitored vent leaving behind the dried contaminated solids which are collected for burial at an approved burial site. The solids are separated first in the Primary Collector (a large diameter, low velocity solids drop-out chamber) which is an integral part of the drier itself. That portion of the dried solids that passes through the Primary Collector then enters a Dust Collector containing 24 cartridge filter elements which are reverse pulsed with compressed air to separate the solids from the air stream. The small portion of the very fine solids that passes through the Dust Collector is then passed to the prefilters and HEPA filters to achieve maximum efficiency of removing the solids from the exhaust air stream. The drier operates with natural gas as the fuel which ignites within the drier combustion chamber. The waste water is pumped into the hot gasses being expelled from the combustion chamber within the evaporation cone. Temperature control of the gas stream and solids is accomplished by the operator adjusting the flow rate of the waste water into the evaporation cone. Should the temperature start increasing, the flow is increased and similarly should the temperature start to fall, the flow is decreased. Temperature control is readily achieved and rather stable. The temperature is sensed from a thermocouple located in a length of duct between the Primary Collector and the Dust Collector and digitally read out by an instrument at a control panel. That same instrument has a high temperature set point at which the system will automatically shut down.

The thermocouple had been changed to a spare unit during trouble shooting a lead wire problem on February 15, 1996. That spare thermocouple was found to be of reverse polarity during a test run and the problem was thought to have been corrected

by intentionally reversing the lead wire polarity at the instrument. All appeared to read correctly at room temperature and during a ten minute test run during February 20, 1996. However, approximately an hour into a full run the next day, the indicated temperature began to behave erratically; mostly dropping. A fire ensued in the Dust Collector.

The root cause of the fire was that the vendor supplied type J thermocouple was manufactured with reverse polarity. A secondary cause of the fire was the reversing of the lead wire polarity to compensate for the reversed thermocouple. After the hour of operation, sufficient error was introduced by the lead wire, then acting as a secondary thermocouple as heat built up at its connection to the 8 gauge thermocouple wire. The indicated temperature began going down while, in fact, the real internal temperature of the drier and filter train was increasing. Ultimately the ignition temperature of the filter media of the Dust Collector cartridges was achieved and burning ensued.

The defective thermocouple spare part was purchased (see attached Sonodyne Industries part drawing number C.D.00125) with the Pulse Combustion drier in 1985 from Sonodyne Industries in Portland, Oregon through Carlson Corporation of Cochituate, MA which had been hired as the general contractor. Both companies no longer exist. The thermocouple had been manufactured for Sonodyne Industries by Gulton Measurement & Control Systems Division (a division of Gulton Industries) located in East Greenwich, Rhode Island. I have been informed that they are no longer in the business of making thermocouples.

The following corrective action was taken to ensure that a similar defect will not cause the drier system to overheat. An additional thermocouple, lead wire and instrument, all totally independent of the original temperature measurement circuit, were installed. This thermocouple is monitoring the downstream temperature of the Dust Collector. That instrument is set to automatically shut down the drier should the original temperature measurement circuit fail to sense a high temperature condition. Additionally, a manually actuated hard piped water deluge system was installed in the Dust Collector to rapidly extinguish a fire without need to open the system.

CC: BEZ, RTF, MAN, DSS, FGO'K,

Prediction / [illegible] / Sonodyne TIC

LTR	DATE	REVISION	BY

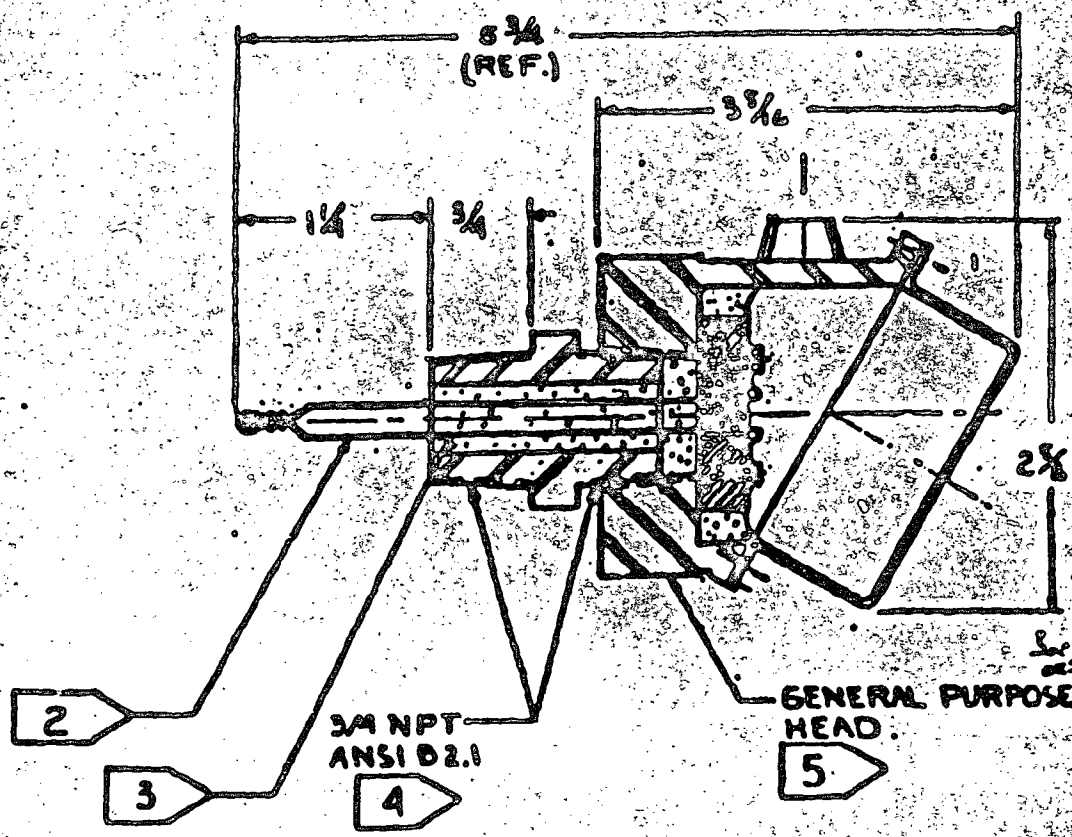

FIG. 1

7. APPROVED SOURCE: GULTON MEASUREMENT & CONTROL SYSTEMS DIVISION, GULTON INDUSTRIES INC. EAST GREENWICH, RHODE ISLAND 02818. PH. 401-884-6800.
LOCAL VENDOR: APOLLO SERVICES CO. 1902 N. AINSWORTH PORTLAND, OR 97217. PH. 503-286-3081
6. THERMOCOUPLE MUST WITHSTAND VIBRATION LOADING AS HIGH AS 100 G AT 250 HZ.

5. MATERIAL FOR HEAD: DIE CAST ALUMINUM.

4. MAKE FROM STAINLESS STEEL AISI TYPE 304 OR TYPE 316.

3. FILL WITH SILICONE RTV SEALER OR EQUIVALENT AS SHOWN FIG. 1. SEALER MUST WITHSTAND -4°F + 300°F TEMPERATURE

2. BASE METAL ELEMENTS & GAUGE:
FOR -1 PART TYPE K (CHROMEL-ALUMEL)
FOR -2 PART TYPE J (IRON-CONSTANTAN)

1. PART NUMBER CONSISTS OF DRAWING NUMBER PLUS DASH NUMBER. EXAMPLE: C.D.XXXXX-XX

TITLE THERMOCOUPLE

Schlumberger Industries
Instrumentation Systems

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/16
ANGULAR ± 0°

MATERIAL SEE NOTES

DATE 8.11.1983 | SHEET 1 OF 1

SCALE NONE | DRAWING NUMBER C.D.00125 | REV

NOTICE
THIS DRAWING IS THE PROPERTY OF SCHLUMBERGER INDUSTRIES INC. IT IS LOANED TO YOU SUBJECT TO RETURN ON DEMAND. ITS CONTENTS ARE CONFIDENTIAL AND MUST NOT BE COPIED OR GIVEN TO ANY THIRD PARTIES FOR USE OR EXAMINATION UNLESS OTHERWISE AGREED TO IN WRITING BY