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DEVELOPMENT REPORT

MASTER

PLUTONIUM PASSIVE ASSAY FACILITY
PLANT INSTRUMENTATION PROGRAM

Second Quarterly Progress Report
July through September 1970

November 30, 1970

Work Performed on UNC Project 2359
Contract AT(30-2)-66 with the
Brookhaven Area Office of the
United States Atomic Energy Commission

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July through September 1970**

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November 30, 1970

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**UNITED NUCLEAR CORPORATION
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1. INTRODUCTION

As increased amounts of special nuclear materials are processed by private industry, an important problem that emerges is the measurement and accounting of feed materials, fuel, scrap, and waste. This problem has been recognized by the AEC in its timely inauguration of the Plant Instrumentation Program (PIP). The purpose of the PIP is to demonstrate and evaluate the effectiveness of non-destructive techniques for assay of special nuclear material under actual fuel fabrication and processing plant (privately owned) conditions. Use of the instrumentation is intended to increase the effectiveness of the accountability system, and thereby, assure the early detection of an unauthorized diversion or loss.

Under contract to the AEC, United Nuclear Corporation has undertaken to demonstrate and evaluate the relative merits of passive neutron and gamma assay of plutonium fuel rods, scrap packages, and waste barrels using boron trifluoride neutron detectors and a lithium-drifted germanium gamma detector. This work is being performed at the UNC Plutonium Facility at Pawling, New York.

The Plutonium Passive Assay Project consists of assembling the neutron and gamma systems, preparing calibration standards, constructing a counting shield, and routinely operating the entire system. System operating experience, in conjunction with the results of data analyses, will be used to evaluate system performance.

2. HIGHLIGHTS

All of the equipment and materials for the neutron detection systems were received. The slab detectors for scanning the 55-gallon drums were completed and tested.

The design of the counting shield was completed. Bids for the construction of the shield were obtained.

All instrumentation, except the multichannel analyzer, for the gamma detection system has been received.

3. CURRENT PROGRESS

3.1 NEUTRON SYSTEM

3.1.1 Small Package Counter

The high-density polyethylene blocks for the well counter were fabricated by an outside vendor. The blocks were received at United Nuclear and accepted.

The BF_3 detectors were tested in the waste drum detector assemblies (Section 3.1.2) and all are acceptable.

3.1.2 Large Package Counter

The three waste drum detectors were completed and tested. The efficiency of the detectors is in the range of 20% to 25%.

Ten of the BF_3 detectors were replaced with those to be used in the well counter. The readings obtained with these detectors were identical to those previously obtained.

The turntable for rotating the 55-gallon drums was completed and received at United Nuclear.

3.1.3 Electronics

The electronic components were assembled and tested. The pre-amplifier was found to be defective and was returned to the manufacturer for repair.

Extraneous pulses, not associated with the detector system, have been observed in the counting system. These have been attributed to connector breakdown resulting from the presence of a jumper connection in the preamplifier which should have been removed prior to use.

3.2 GAMMA SYSTEM

3.2.1 Detector

The Ge(Li) detector and associated electronics were received. Preliminary testing of the detector showed that it meets the resolution specification.

3.2.2 Electronics

Delivery of the multichannel analyzer was rescheduled to late November because of manufacturing difficulties at the vendor.

3.2.3 Traversing Mechanism

The conceptual design of the traversing mechanism was completed and a commercially available lifting platform selected and ordered. The actuating mechanism of the platform is manually operated and will be modified to an electric drive after receipt.

3.3 COUNTING SHIELD

The design of the counting shield was completed and construction bids obtained. Contract documents were prepared and are pending BNL and NYOO approval.

3.4 CALIBRATION STANDARDS

The metallic impurities, plutonium isotopic, and americium-241 results, for the mixed-oxide material used to prepare the standards, were received. The chemically determined plutonium concentration value was adjusted on the basis of the Am²⁴¹ content.

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