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**BATTELLE-NORTHWEST**

RICHLAND, WASHINGTON

TITLE

APPLIED MATHEMATICS DEPARTMENT  
MONTHLY REPORT - SEPTEMBER

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APPLIED MATHEMATICS MONTHLY REPORT  
SEPTEMBER 1965

DIVISION OF PRODUCTION - 02

SEPARATIONS R&D

Innovations - U233

Work began on the design of an experimental procedure for studying the dissolution of aluminum by certain solvents.

The design of an experimental procedure was completed for determining an optimal set of conditions for calciner production of  $\text{ThO}_2$ .

Innovations - Other

C-Column Extraction

Final revisions to all GE-412 Process Control computer programs, descriptions, and diagrams destined for inclusion in the Hanford 412 User's Manual have been completed and are in the printing process.

WASTE MANAGEMENT

Work continued on the formulation of a model to represent the error inherent in calculated inventories of radioactive isotopes.

PLUTONIUM PROCESSING

A preliminary report was issued relative to a statistical assessment of the current Purex material balance measurement control program.

COLUMBIA RIVER STUDIES

Effluent Quality

Certain variables were considered for use in a heat loss model, and data were employed in an investigation of correlations.

DIVISION OF MILITARY APPLICATIONS - 03

INSPECTION - PROCESS DEVELOPMENT

Work was completed on a preliminary version of an EDPM program to design power roll forming metal blanks on a "constant reduction in thickness" principle, and an experimental work piece is now being fabricated. Existing programs design on a "modified uniform shear" principle.

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DIVISION OF REACTOR DEVELOPMENT - 04NONDESTRUCTIVE TESTINGFundamental Ultrasonic Studies

Physical experiments which supply data for use in the recently developed attenuating wave model must include a means of compensating for beam divergence. This beam spread compensation can be obtained by using an equivalent quartz sample as a control for experiments on a given metal sample. An EDPM program is now available which determines the thickness of a quartz sample having the same beam divergence as a given metal sample.

A second EDPM program is also available which performs the necessary complex-valued arithmetic necessary to yield tables of the properties of attenuating plane wave motion as a function of incidence angle and specified frequency.

An estimate was obtained for the measurement error associated with using a nuclear tester to measure "loading" in standardized (NASA) radioactive bars.

A data analysis study was initiated to estimate the discrimination error associated with a fuel enrichment tester.

WASTE SOLIDIFICATION ENGINEERING

Work was completed on a revised experimental design for studying the evaporation of fuel waste solutions by a horizontal thin film evaporator.

An analysis was completed on waste solidification data obtained according to a previously designed procedure. A computer program was revised to provide computations necessary for the investigation of a phosphate additive in Purex wastes.

CONTAINMENT SYSTEMS EXPERIMENT

A study was initiated to develop an appropriate sampling procedure leading to an estimate of the time-dependent mean concentration of airborne fission product simulants in a vessel.

PLUTONIUM CERAMICS RESEARCHParticle Packing Studies

Final preparations are underway on a paper concerning particle packing theory which is to be given before the American Ceramics Society in a Los Angeles meeting scheduled for the last week of October. A similar paper has been written for inclusion in a B-NW document on fuel fabrication techniques.

HIGH TEMPERATURE REACTOR LATTICE PHYSICS STUDIESPrograms for HTLTR Process Control Computer

Programming has begun on selected portions of the PDP-7 process control computer for the HTLTR. Planning of the overall executive or timing loop is underway. Two routines have been written to save and restore vital registers for interruptable programs. A routine also has been written to facilitate teletype and display tube output.

DIVISION OF BIOLOGY AND MEDICINE PROGRAM - 06RADIOLOGICAL AND HEALTH PHYSICSRadiation Dosimetry

Continued effort was devoted to a statistical evaluation of the procedures and equipment employed in the calibration of beta, X-ray, gamma, and neutron dosage as recorded by the personnel film badge dosimeters.

ENVIRONMENTAL RADIATION STUDIESTERRESTRIAL AND FRESH WATER ECOLOGYModels for Prediction of the Transport of Radionuclides

A survey of biological and environmental data files was initiated to obtain existing data for use in estimating parameters in an initial model.

TOXICITY OF RADIOELEMENTSInhalation Studies

A data analysis study was completed relative to the mitigating effects of certain compounds on the inhalation toxicity of  $\text{Ru}^{106}\text{O}_2$  in rats.

Radiostrontium in Miniature Swine

The precoding analysis was completed relative to a computer program for the calculation of inbreeding coefficients.

A study was initiated to develop a computer program to schedule the periodic collection of response data.

Toxicity and Metabolism of Radionuclides

A data analysis study was begun to estimate the effects of  $\text{Zn}^{65}$  and  $\text{P}^{32}$  on the body burdens of fish raised in reactor effluents. Laboratory measurement precision and biases are to be estimated.

RADIATION EFFECTS - GENERALResponse of Insects to Radiation

A data analysis study was completed relative to plant root growth and seedling height as functions of levels of DMSO and methods of application.

A data analysis study was begun relative to the effects of Co<sup>60</sup> irradiation of flour beetles.

Work continued on a response surface analysis of data reflecting the effect of X-ray exposure and DDT ingestion on the survival and productivity of flour beetles.

Gastrointestinal Radiation Effects

A study was initiated to develop a method for calculating net sodium and water fluxes to plasma following irradiation.

CUSTOMER SERVICECPDCounter-Current Ion Exchange System

Two versions of the mathematical model for the counter-current ion exchange system are under investigation. These two versions represent the two extremes of resin bead migration between the containers of the process. The case of free migration has been programmed for the 7090 computer, while the case of no migrations will probably be evaluated on an analogue computer.

HANFORD OCCUPATIONAL HEALTH FOUNDATION

Work continued on the study to obtain a statistical model for predicting secretarial performance using pre-employment test results.

Work continued on the study to determine an effective composite index of obesity using Hanford personnel medical data.

A list of objectives was formulated and a general procedure outlined for a correlation study relative to coronary diseases.

Work continued on the regression analysis study of the results obtained on a five-test battery of personnel attitude and personality tests.

*R. Y. Bennett for*  
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Applied Mathematics Department

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