

INTERIM REPORT

Accession No. _____

ORNL/CSD/INF-79/9

Contact Program or Project Title:

Program for Standardized Analysis of Fuel Shipping Containers

Subject of this Document: Technical Progress

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Date of Document: July 25, 1979

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Prepared for
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under Interagency Agreement DOE 40-550-75
NRC FIN. No. B-0172

UNION CARBIDE CORPORATION, NUCLEAR DIVISION
operating the
Oak Ridge Gaseous Diffusion Plant . Oak Ridge National Laboratory
Oak Ridge Y-12 Plant . Paducah Gaseous Diffusion Plant
for the
DEPARTMENT OF ENERGY

957300

INTERIM REPORT

NRC Research and Technical
Assistance Report

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OAK RIDGE NATIONAL LABORATORY

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UNION CARBIDE CORPORATION
NUCLEAR DIVISION


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OAK RIDGE, TENNESSEE 37830

ORNL/CSD/INF-79/9

DATE: July 25, 1979

SUBJECT: Quarterly Report on Program for the Standardized Analysis of
Fuel Shipping Containers

TO: U.S. Nuclear Regulatory Commission

FROM: G. E. Whitesides

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NRC Research and Technical
Assistance Report

PROGRAM FOR THE STANDARDIZED ANALYSIS
OF FUEL SHIPPING CONTAINERS

Quarterly Summary

January 1, 1979 to March 31, 1979

Personnel Time -- 2442 man hours

(a) This quarter	\$ 80,994
(b) Fiscal year-to-date	305,152
(c) Projected to End of Fiscal Year	53,614

357302

QUARTERLY REPORT ON PROGRAM FOR THE STANDARDIZED
ANALYSIS OF FUEL SHIPPING CONTAINERS

SCALE System Development

During this quarter, effort under this task centered on preparation for the distribution of the initial IBM-compatible version of SCALE and conversion of this version of SCALE for operation on CDC-7600 computers. Also, the testing of existing control modules and the development of advanced control modules is proceeding. The progress is briefly summarized by category.

1. Functional Modules

The KENO-V module is in the final stages of development. The module is being readied for application in the CSAS4 analytical sequence. New options for specifying initial source distributions were implemented into KENO-V. Also, an effort to relax some of the KENO geometry restrictions is underway. A draft of the KENO-V input instructions has been prepared.

The testing of the new version of the MORSE Monte Carlo Shielding program, MORSE-SGC/S, has been successfully completed. This module is being applied in the shielding analytical sequences SAS3 and SAS4 and in the radiative heat transfer module HTAS2. MORSE-SGC/S was developed on the CDC-7600 computer at the Idaho National Engineering Laboratory. Presently, the module is being converted for operation on the IBM computers at Oak Ridge.

957303

2. Data Base

Three of the neutron cross section libraries available in the SCALE system have been applied in the analysis of seventy critical experiments designed to simulate nuclear fuel shipping casks and storage pools. The results for the three libraries, 27GROUPNDFB4, 123GROUPGMTH and HANSEN-ROACH, were satisfactory. The work is reported in ORNL/CSD/INF-79/8, "Review of Critical Experiments Performed for Fuel Cycle Safety Guidance," July 16, 1979.

A data set for calcium has been added to the 123GROUPGMTH library to facilitate the calculation of systems containing concrete.

An error was discovered in the 218 and 27 group ENDF/B-IV libraries for gadolinium. The source of the error was traced to the AMPX module, NEWLACS. After appropriate modifications, new data sets will be generated for gadolinium.

The 27 neutron-18 gamma group coupled cross section library was applied in the analysis of a light-water-reactor shielding benchmark problem approved as a standard by the Radiation Protection and Shielding Division of the American Nuclear Society. The results were satisfactory for steel shields. For concrete shields, the need for a finer neutron energy group structure above 6 MeV was indicated.

3. Control Modules

The optimization package to be applied in the criticality safety analytical sequences CSAS3 and CSAS4 is operational. The package searches for either a maximum or a fixed value of the system multiplication factor. A paper describing the optimization package has been submitted for presentation at the upcoming winter meeting

of the American Nuclear Society. The incorporation of the optimization package into CSAS3 and CSAS4 is proceeding.

A shielding experiment showing strong multidimensional effects has been chosen for testing the SAS3 analytical sequence. A previous analysis of this experiment with the DOT two-dimensional, discrete-ordinates transport program is available for comparison with the SAS3 results.

The modifications to the SAS2 control module have been programmed and are being debugged. A continuing effort is being made to assure that the input specifications for the fuel irradiation portion of the sequence are compatible with the requirements of SAS4 and SAS5.

4. Geometry Graphics Package

The geometry translator which interprets KENO-IV and KENO-IV/CG geometry specifications into the input format required by the geometry graphics package is operational. The package now has the capability of plotting all of the multidimensional Monte Carlo geometry models planned for incorporation into the SCALE system. Presently, the geometry graphics package is operational at INEL and is being converted for use on the IBM computers at Oak Ridge.

957305

5. BNL-CDC-7600 Implementation

The status of this multifaceted task is being summarized below.

<u>Being Converted</u>	<u>Being Tested</u>	<u>Operational/INEL</u>	<u>Operational/BNL</u>
SAS3	ORIGEN-S	NITAWL-S	NITAWL-S
	CSAS1	BONAMI-S	BONAMI-S
	CSAS2	XSDRNPM-S	27GROUPNDFB4
	COUPLE	KENO-IV/S	HANSEN-ROACH
		ICE-S	
		MORSE-SGC/S	
		27GROUPNDFB4	
		123GROUPGMTH	
		HANSEN-ROACH	
		27N-18GNDFB4	
		22N-18GCASK	

The INEL computing facility will switch to the CDC-Cyber 176 system at the end of August. Also, with the acquisition of new computing equipment at ORNL, the general support for the dedicated line to INEL will disappear. Therefore, the SCALE account will have to carry the support for the dedicated line. The use of the dedicated line is particularly important to the program conversion effort.

6. SCALE System Documentation

The binders and index tabs for the SCALE system manuals have been received. The figures for the CSAS1 and CSAS2 sections have been completed. The text for these sections is in final typing. Work continued on documenting the SCALE system functional modules.

The present objective is to provide the Radiation Shielding Information Center with the documentation for the initial version of Scale before the end of FY-1979.

957306

STANDARDIZED ANALYSIS OF FUEL SHIPPING CONTAINERS

THERMAL ANALYSIS SUPPORT

G. E. Giles

W. D. Turner

The task of incorporating additional features into HEATING6 to render the code more versatile as a tool in the thermal studies associated with the design and safety analysis of spent fuel shipping containers was continued during the past quarter.

1. HEATING6 Coding Changes

- a) Thermal Fin Effectiveness - The documentation concerning the thermal fin effectiveness was completed and released.
- b) Output Map - This feature has been essentially debugged for the HEATING5 computer code and documentation concerning its use for that code is ready for release.
- c) Numerical Technique - Some work was continued on the modularization of the numerical technique subroutines.
- d) General Maintenance - A number of errors to the HEATING5 computer code were corrected and a memorandum was written summarizing the errors and their possible impact on the solution or use of the code.

2. Implementation of HEATING6 into SCALE

Work on this task was continued during the quarter. It is anticipated that most of the work in the coming quarter will be directed towards the documentation of HEATING6.

3. Maintenance of TRUMP

The documentation concerning updates to the Oak Ridge version of the TRUMP computer code was released.

4. Maintenance of REGPLOT

The IBM 360 version of REGPLOT, a plotting program to graphically check HEATING5 input data, was implemented at the National Energy Software Center. A couple of problems that arose in this implementation were corrected and a problem that arose due to an update in the DISSPLA package was rectified.