

**REACTOR SHARING
FINAL REPORT
DOE GRANT No. DE-FG03-95ER38125
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INTRODUCTION

This is the final report for DOE Grant No. DE-FG03-92ER38125, Reactor Sharing, for the University of Arizona. The purpose of this report is to document the facility usage which was possible because of DOE support under the contract. The reactor is operated under License R-52 from the United States Nuclear Regulatory Commission.

The University of Arizona has a well-developed program of assistance to other educational groups, particularly high schools. The Reactor Sharing program has provided the opportunity to extend and develop these programs.

USES OF THE UNIVERSITY OF ARIZONA RESEARCH REACTOR

The University of Arizona Research reactor is a 100-kilowatt TRIGA reactor operated under the administration of the Arizona Research Laboratory. The nuclear reactor supports faculty research and graduate student research for the M.S. and Ph.D. degrees in nuclear engineering and other scientific disciplines, through reactor experiments, neutron activation analysis, and preparation of otherwise unavailable short-lived radioisotopes for tracer studies.

The TRIGA reactor has been in operation in the Engineering Building on the main campus of the University of Arizona since its installation in 1958. The reactor and its laboratory were extensively modernized in 1972. At that time the original reactor console was replaced, as were the control rods, control rod drives, in-core neutron detectors, bridge, and radiation monitoring systems. The original aluminum-clad TRIGA fuel was replaced by stainless-steel-clad fuel which can be used for reactor pulsing.

Other equipment which has been added to the Reactor Laboratory to enhance its capability include an in-core fast neutron irradiation facility, a vertical beam tube for thermal neutron radiography, and an aluminum-clad graphite thermal column for producing a well-thermalized neutron flux for neutron activation analysis. A natural uranium/light water subcritical assembly is permanently installed in one of the rooms of the Reactor Laboratory, where it is used for teaching and research in measurement of subcriticality.

The Nuclear Reactor Laboratory provides irradiation facilities within the core and reflector regions of the reactor. These may be used for neutron activation analysis, radiation effects studies in materials, isotope production experiments and dosimetry experiments. There is available a variety of reactor experiments, involving both steady state and transient operations. Instrumentation available for these experiments, in addition to the reactor control console instrumentation, includes a digital monitoring system capable of recording more than twenty data channels. Visiting school groups usually see the reactor's dynamic

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response to slow and fast transients, including observation of the Cerenkov light produced during a pulse above prompt critical.

Associated equipment used both for teaching and for research includes a counting laboratory with high-resolution germanium gamma ray detectors, multichannel pulse height analyzers for gamma spectrometry and instrumental neutron activation analysis, and a radiochemistry laboratory. Gamma irradiation facilities using cobalt-60 sources are also associated with the Nuclear Reactor Laboratory, and may be used by groups visiting the reactor.

SCHOOLS AND COLLEGE TOURS AND DEMONSTRATIONS

Under the support provided by the DOE Reactor Sharing Program the Reactor Laboratory has provided tours, lectures, and demonstrations in support of science teaching in Arizona high schools. The reactor has also been used in a very successful summer program to encourage high school students who are members of population groups underrepresented in engineering to consider careers in engineering fields. This program is in the form of one or two week on-campus workshops given several times each summer to students at different levels of junior or senior high school. The Reactor Laboratory was one of six or eight areas of engineering to which the participants were introduced. The degree of involvement ranged from tours and demonstrations of reactor operation in small groups for the younger students, to neutron activation analysis experiments, with student participation, at the higher grade levels.

A summary of the program's students and classes over the period of the grant is presented below:

	Dates	Number of Students	Reactor Hours	Academic level
Science Class tours and demonstrations	2/26/97	11	1	Pre-college
	3/17/97	23	1	Pre-college
	3/19/97	11	2	Pre-college
	3/24/97	11	2	Pre-college
Minority Engineering Program and APEX Program	7/17/97	19	2	Pre-college
	7/13/98	14	1	Pre-college
	7/21/99	16	1	Pre-college
Pre-Engineering Workshops for Women and Minorities	6/26/97	26	2	Pre-college
Adopt-an-Engineer Day tours	2/17/97	24	2	Pre-college
Pima Community College Chem 198	6/17/98	2	3	Faculty
	6/18/98	12	3	Undergraduate
TOTALS		169	20	

Visitors to the facility include students from other educational institutions, students in University of Arizona classes, and prospective students for the Nuclear Engineering degree program. During 1996-97 and 1997-98 academic years, 426 visitors were admitted to the reactor laboratory for tours, orientation, demonstrations, or experiments. A selection of the groups of visitors during the reporting period is listed below:

- Summer Pre-Engineering Workshops for Women and Minorities (2)
- Sechrist Middle School

- Castle Hill School
- Cub Scout Pack 186
- Greenfields Country Day School
- "Adopt-an-Engineer Day" students
- Summer Education and Enrichment for Kids (2)
- Pima Community College Chemistry 198 Class

SUMMARY

The reactor time funded by this DOE grant has provided significant service to students and faculty from other educational institutes using our facilities. In addition, we have had the opportunity to provide public education in nuclear reactor science and engineering to a wide variety of groups, especially school children.



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