

1. Some Unique Activities of the Smallest Reactor: UTR-KINKI

**TOSHIKAZU SHIBATA**

**Atomic Energy Research Institute, Kinki University**

**ABSTRACT**

In the UTR-KINKI, school teachers trainings are being done, besides utilizations for research and student experiments. In this paper, some details of the school teachers training course are presented. 267 teachers have attended the training since 1987, the beginning of the program. Drastic impacts by the training were recognized in impressions of the attended teachers about nuclear energy.

**INTRODUCTION**

The UTR-KINKI was built initially at the Exposition which was held in Tokyo. The Kinki University bought the reactor, and transported to the university campus near Osaka City in 1961.

The nominal power was 0.1 watt for the first 12 years, and then increased to 1 watt. Because the power is very small, radio-activities of the core elements including fuel elements are very weak. The core elements can easily be handled by hands just after the shutdown of reactor. And the irradiation of samples can be set up by manually with sufficient accuracy. Also the induced activity of the irradiated sample is so small, that precise treatments of the sample are possible.

Various experiments are being done using the UTR-KINKI. Typical annual record of the reactor utilization is shown in Table 1. Each utilization has unique feature in order to compensate the lack of the reactor power. In this paper, school teacher's training program, which is one of the significant utilizations of the UTR-KINKI, shall be explained.

**SCHOOL TEACHER'S TRAINING PROGRAM**

**OBJECTIVES**

In Japan, many debates about the nuclear energy issues are being done. But some of them are not based on scientific basis. Sometimes, only emotional opinions overwhelm cool and scientific discussions. At the present proper considerations and decisions have to be required for energy problems at the global level. And, public acceptance is the most important condition for realizing the decisions.

High school teachers are supposed as very influential for young people

who will make future public opinions. And if teachers had sufficient training and experience about nuclear energy, their influences will be increased in proper directions.

The training program started with the above considerations.

Table.1 UTR-KINKI Typical Annual Working Records

Subjects		Operating Days
Reactor Physics and Reactor Applications		37
Biological Effects of Radiations		31
Reactor Chemistry, Radio Chemistry		19
Neutron Radiography		10
Student Experiments	Kinki Univ.	22
	Other Univ.	11
School Teacher's Training		21
Annual Official Examinations		10
Overhauls, Preparations		6
Total		221

## CURRICULUM

The main parts of the training are reactor experiments and free discussions on not only nuclear energy but general educational problems. The contents of the experiments in the training course are ; 1) critical experiment, 2) control rod worth measurement, 3) neutron flux distribution and power evaluation, 4) activation analysis, 5) measurements of radiations, and so on.

These contents are very similar to the student experiments in the university curriculum, but descriptions of the experiments are so contrived that is quite easy to understand even for teachers of non scientific fields.

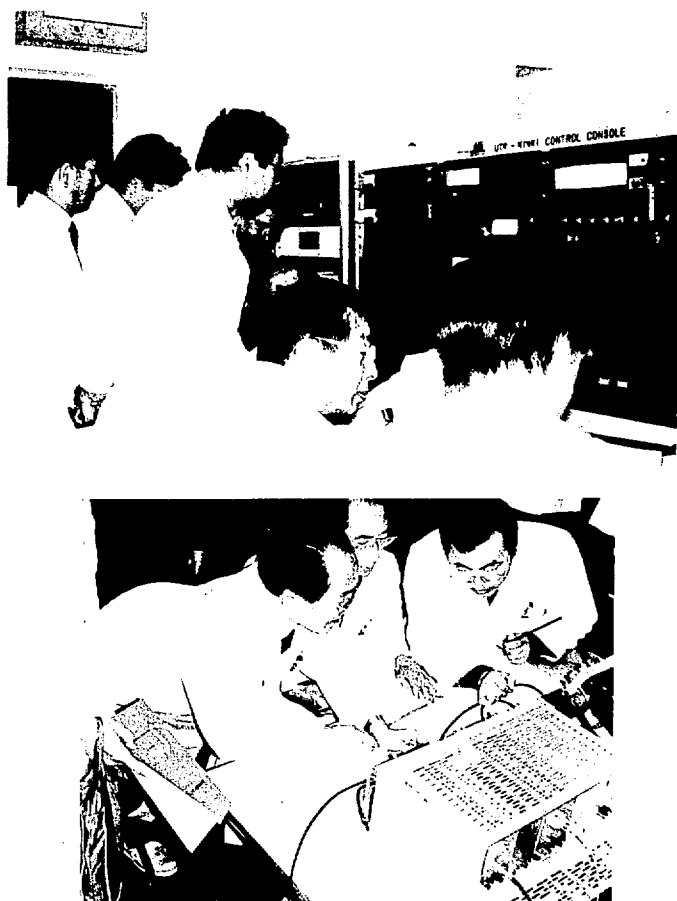
## TRAININGS

The training program started in 1987 and courses have been done 18 times. Affiliations of the attended teachers in the past are listed in Table 2. Some photographs of practical scenes are shown for better understandings.

Table.2

## Affiliations of Attendants to School Teacher's Training Course

Year	No. of courses	A f f i l i a t i o n s					Total
		University	senior High	Junior high	Education center, Comm.	Graduate Student	
1987	1		8		5		13
1988	4	15	16		16	1	48
1989	4	6	36	3	16	2	63
1990	4	1	42	1	10	4	58
1991	5	1	52	26	3	3	85
Total		23	154	30	50	10	267



## IMPACTS TO THE ATTENDANTS

Some questionnaire were requested to the attended teachers at the recent two courses for investigating the impacts of the training. The results of questionnaire are listed in Table 3 and 4. The changes in impressions and self-confidence in teaching on nuclear energy are quite obvious.

Table.3 Changes in Impressions as to Nuclear Energy  
(Results of questionnaire, secret ballots by attendee)

Feeling about nuclear Energy (Reactor, Radiations etc)	1 st		2 nd	
	before training	after training	before training	after training
1, Very terrible still very terrible	6	0	4	0
2, Considerably terrible still considerably terrible	4	5	6	5
3, Neutral	3	8	3	4
4, Almost not terrible	2	3	2	6
5, Not terrible at all	1	0	0	0

Table.4 Changes in Self Confidence in Teaching Nuclear Energy  
(Result of questionnaire, secret ballots by attendee)

Self confidence in teaching nuclear energy	1 st		2 nd	
	before training	after training	before training	after training
1, Not confident at all	4	1	1	0
2, Not confident almost	3	2	3	3
3, Neutral	8	5	7	2
4, Confident considerably	1	8	3	9
5, Confident absolutely	0	0	1	1

## FREE DISCUSSIONS

The free discussions are held in every evening until midnight. Almost of the attendant were satisfied for the contents. Some of the attending teachers are "against nuclear." In general, they stated, however, that learning and experience on real reactors and facilities are important for sufficient considerations and correct decisions.

## CONCLUSION

It is supposed that real results of educational efforts will appear after many years. Therefore the efforts should be continued for long period.