# PUSPATI TRIGA Reactor:

# 25 years of Safe Operation and Strategies for Ensuring Safety and Security

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## Abstract

The PUSPATI TRIGA Reactor (RTP) has been safely operated for the last 25 years with no incidents as listed in the unusual event reporting categories being reported. However, in order to maintain the reactor integrity, several reactor systems or components have been repaired, refurbished or replaced over the years,. The reassessment of the present physical protection system and emergency preparedness at the reactor site has also been conducted to reflect he recent emphasis placed on the security of research reactors world wide. The strategies for ensuring the continued safety and security of the reactor are elaborated below.

## Introduction

The PUSPATI TRIGA Reactor (RTP) is a pool-type 1 MW research reactor which has been in operation since 28 June 1982. During its 25 years of safe operation, no incidents as listed in the unusual event reporting categories have been reported. The operational history for is shown in Figure 1.

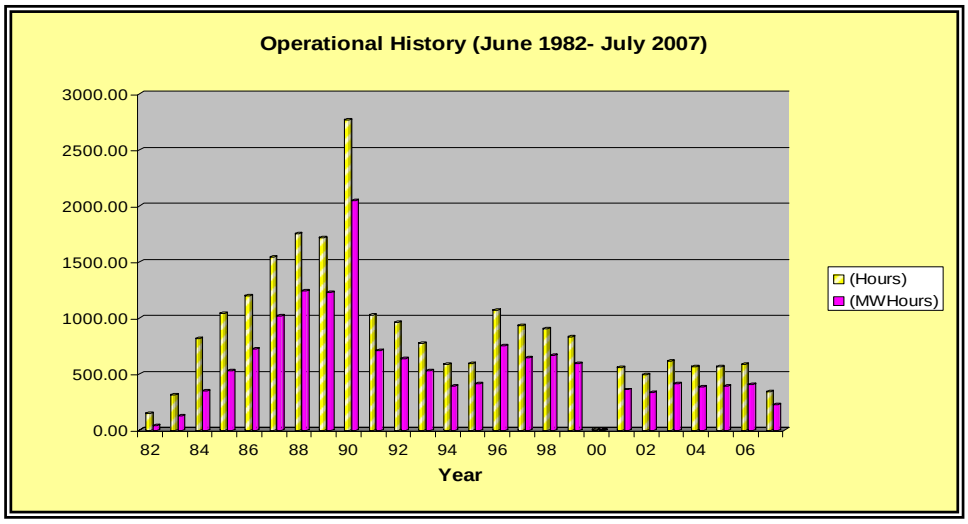


Figure 1: Operational History of the TRIGA PUSPATI Reactor

The recent emphasis on the safety and security of research reactors world wide has lead to the reassessment of the safety and physical protection systems and emergency preparedness at the reactor site. Improvements are being implemented and systems are being enhanced.

**Safety Strategies**

A pragmatic approach to safety has ensured that the reactor is operated within its operating limits and controls, while regular maintenance has been carried out according to manufacturer's recommendations. In addition to this, several reactor systems or components have been repaired, refurbished or replaced over the years, in order to maintain the reactor integrity. However, ageing systems and components especially the instrumentation and control systems are of pressing concern. This has lead to the initiation of a project to upgrade the present analog reactor control console. An in-service inspection has also been initiated with the assistance with the non-destructive testing group in Malaysian Nuclear Agency.

The view of the reactor top, control room and experimental facility are shown in Figures 2 - 4 respectively.

Fig 2. Top View of Reactor

Fig 3 Control Room

Fig 4 SANS facility

An important element in ensuring reactor safety is the personnel involved in the reactor operation and maintenance. Previously, insufficient personnel were allocated to the reactor facility however this has changed since early 2006 where the number of personnel has more than doubled. Retraining and upgrading of the current reactor operators are underway and new

reactor operators are also being trained. The training programme syllabus is based on the DS325 'Guideline on Certification and Recertification of Research Reactor Operators'

The last safety analysis report (SAR) for RTP was written in 1983, a year after the reactor started its operation. Hence, in 2006 and 2007, there was a concerted effort to update the SAR and it has been submitted to the regulatory body in August 2007 as part of the requirement for the issuance of the operation license of RTP.

The use of neutronics codes TRIGAM, SRAC and MVP and thermal hydraulic code RELAP5 are also being pursued to obtain the reactor characteristics and assure that the reactor can be operated safely. In addition an internal safety committee vets all experiments, modifications and operating personnel. This safety committee not only covers radiation safety but it also covers occupational and environmental safety.

In 2004 RTP was awarded the ISO9001:2000 for its irradiation services for neutron activation analysis. However, in order to be in line with the practice in the nuclear industry, a quality assurance programme (QAP) was developed in 2006 and implemented in mid 2007.

An assessment of the safety culture at RTP was carried out by an international peer review team in early 2006. In response to the recommendations of this peer review, several changes and improvements to the facility and procedures were implemented. Subsequently, the peer review revisited the facility and commended on the improvement and prompt implementation of the majority of the recommendations.

On-line radiation and airborne release monitoring have been installed to record radiation and radioactivity levels. In addition exposure levels of radiation workers are continuously monitored and bi-annual health checks conducted to ensure workers are safe.

This year the fire alarm and public announcement system were upgraded. A national level emergency drill is scheduled for the end of 2007 to test the preparedness of organisational, local authority and national emergency response bodies. Any emergency will be coordinated at the Emergency Command Centre manned round the clock.

Early in 2007, Malaysia became a member of the Incident Reporting System for Research Reactors (IRSRR). The experience of other member states in analysing the causes of incidents or accidents will help in enhancing the safety level of the reactor.

**Security Strategies**

The reactor is situated on a 26.7 hectares site about 35 km south of the capital, Kuala Lumpur. It has been gazetted as Restricted Area 1 under Malaysian Federal Law and Category 1 Key-point Target under State Law.

The site has double fencing and only one entry/exit gate. Entry is by electronic access card for staff and security pass for visitors or vendors. Vehicles are registered and check on entry and exit. However, only designated personnel have electronic access to the reactor block while all visitors are accompanied and vendors are given work permits. As an added measure, all permanent staff undergoes security vetting carried out by the police while temporary staffs are vetted by the Malaysian Nuclear Agency.

Surveillance of the site is carried out by security personnel 24 hours 365 days. CCTV cameras are placed in the reactor building and intrusion detectors at all entries to the reactor building. Currently, the whole system is being upgraded.

The fresh fuel elements are placed in locked steel cabinets situated in a double lock storeroom while, the reactor top covers are padlocked at the end of the day and the key held by reactor supervisor.

**Regulatory Control**

The reactor is subjected to regulatory control by the Atomic Energy Licensing Board under the following acts/regulations:

- Atomic Energy Licensing Act 1984 (Act 304)
- Radiation Protection (Licensing) Regulations 1986
- Radiation Protection (Basic Safety Standards) Regulations 1988
- Radiation Protection (Transport) Regulations 1989

Safety review and audits are regularly carried out by the regulatory body. Recently a security audit has been initiated. The reactor facility is also subjected to annual safeguards inspection by IAEA safeguards inspector.

**Conclusion**

The reactor has been operated for 25 years without any incidents being reported. The various strategies taken to enhance the safety and security of the RTP are in line with international practice and standards, will assure the safe operation of the last 25 years is continued in the future.