Reactor TRIGA PUSPATI (RTP) Maintenance Programme Improvement: Implementation of IAEA Safety Standards NS-G-4.2

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Presentation Outline

1.0 INTRODUCTION

- The Safety Guide NS-G-4.2 was developed by IAEA and intended for use primarily by operating organization, regulatory bodies and other organizations involved in the operation of a research reactor.
- The implementation of the Safety Guide for RTP started in 2009 to achieve a systematic way of maintaining RTP system.
- The establishment of general requirements regarding maintenance, periodic testing and inspection of safety related system for RTP to ensure that the safety level is not reduced during reactor operation and maintenance.

2.0 OVERVIEW OF RTP MAINTENANCE PROGRAMME

Maintenance programme for RTP is carried out on periodic basis:

Annual Maintenance
- Major (all Rx systems involve)
- Period: 4 weeks (Jan every year)

Semi-annual Maintenance
- Minor (mechanical and I&C)
- Period: 2 weeks (Jan and June every year)

Check List
- Daily (before and after reactor operation)
- Monthly (monitoring and inspection only)

* All maintenance activities require the reactor to be shutdown

2.0 OVERVIEW OF RTP MAINTENANCE PROGRAMME

EQUIPMENT	MONTH												Responsibility
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	
Reactor System		√	√				√	√					O&M
Experimental and irradiation facilities		√						√					O&M, Facility owner
Reactor water system	√	√	√	√	√	√	√	√	√	√	√	√	O&M, BKJ
Electrical Supply							√						BKJ
Reactor ventilation	√	√	√	√	√	√	√	√	√	√	√	√	O&M, BKJ
Nuclear Fuel element		√						√					O&M
Air Compressor	√	√	√	√	√	√	√	√	√	√	√	√	BKJ
Crane	√	√	√	√	√	√	√	√	√	√	√	√	BKJ
Safety Equipment		√						√					BST, BKS
Firefighting & Protection System		√						√					BST, BKJ
Reactor Building		√						√					BKJ
Air Conditioning System		√			√			√			√		BKJ

RTP System Maintenance Overview

2.0 OVERVIEW OF RTP MAINTENANCE PROGRAMME

A	AKTIVITI BERKALA. (Periodic Testing)
1	Memeriksa fungsi reactor Interlock System :
	a. Had Neutron Source (>2 cps)
	b. Mencegah Penarikan 2 rod kawalan serentak
	c. Ujian Sistem Interlok RWP
	d. Mencegah butang FIRE digunakan
	e. Ujian Sistem Interlock HV Fission Chamber
2	Ujian Masa Rod Jatuh
3	Laporan baki bahan nuklear (Material Balance Report)

B	AKTIVITI PENYENGGARAAN. (Maintenance)
1	a) Penyenggaraan & pemeriksaan mekanisma rod kawalan
2	Mekanisma Rotary Rack (servis seperti biasa/check lubang reposition).
3	Penggantian RESIN untuk Demineraliser System, (filter = jika perlu)
4	Penyenggaraan konsol serta sistem-sistemnya
5	Pengukuran voltan bekalan kuasa sistem konsol (sebelum akt mekanikal)
6	Kemaskini Sistem CCTV
7	Access & Security

C	AKTIVITI TENTUKURAN (Callibration)
1	Fuel Temperature Channel #1 & 2
2	Percent Power Channel #1 & 2
3	Water Temperature (bulk)
5	Water level sensor (check in tank ruler)
6	Control rods callibration
7	Power Calibration (25 Feb)
9	Radiation monitoring equipment callibration (ARM, CAM, Survey Meter)

D	AKTIVITI PEMERIKSAAN (Inspection)
1	Beamport 1& 2
2	Thermal Column
3	NUR-2
4	SANS
5	PTS (blower, selonoid valve, receiver/sender)
6	Reactor building Fire Protection System and First Aid Kits
7	Utility Support System, back up power system
8	Primary & Secondary Cooling System
9	Ventilation System (HEPA filter)
10	AHU & Chilled Water System (Dapatkan rekod BKJ)
11	Air Compressor System (Dapatkan rekod BKJ)
12	Sliding Door System
13	Overhead Crane (Dapatkan rekod BKJ)
14	Fuel Inspection (Kalau sempat siap selepas control rod)
15	Tank Inspection (ISI)

3.0 IMPLEMENTATION OF NS-G-4.2

- RTP maintenance programme includes **maintenance**, **periodic testing** and **inspection** in one programme.
- Reactor Operation & Maintenance Section is responsible in coordination and conducting the programme.

- The Safety Guide draws a very clear distinction between maintenance, periodic testing and inspection activities.
- Maintenance, periodic testing and inspection have a common objective that is to ensure that the SSCs function in accordance with the design intents and requirements, and in compliance with the SAR and the OLCs.

3.0 IMPLEMENTATION OF NS-G-4.2

1. **Maintenance**

Include tests similar to periodic testing (namely inspection, operability checks and calibration). Primarily intended to verify that the maintenance has been properly completed, a test performed may be considered to satisfy a requirement.

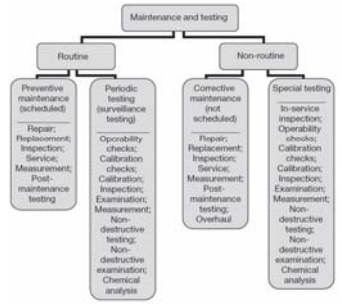
2. **Periodic Testing**

Include tests performed to ensure compliance with the OLCs and therefore to verify the safety status of the reactor.

3. **Inspection**

Activity to examine the SSCs for deterioration to determine whether they are acceptable for continued operation or whether remedial measures should be taken.

3.0 IMPLEMENTATION OF NS-G-4.2



3.0 IMPLEMENTATION OF NS-G-4.2

RTP Annual Monitoring and Maintenance: January 2013 [rev.]

No.	ITEMS	LEADERS	REFERENCE	REMARKS
A	AKTIVITI BERKALA (Periodic Testing)			
1	Memeriksa fungsi reactor interlock System :	En Fazli		
	a. Had Neutron Source (>2 cps)	En Fazli		
	b. Mencegah Penarikan 2 rod kawalan serentak	En Fazli		
	c. Ujian Sistem Interlok RWP			
	d. Mencegah butang FIRE digunakan	En Fazli		
	e. Ujian Sistem Interlock HV Fission Chamber			
2	Ujian Masa Rod Jatuh	EN Razali	12-Apr-13	
3	Laporan baki bahan nuklear (Material Balance Report)	Datin		
B	AKTIVITI PENYENGGARAAN (Maintenance)			
1	a) Penyenggaraan & pemeriksaan mekanisma rod kawalan	En Fauzi		
2	Mekanisma Rotary Rack (servis seperti biasa/check lubang reposition).	En Fauzi		
3	Penggantian RESIN untuk Demineraliser System, (Ether = jika perlu)	En Fauzi		Resistivity at meter at demineraliser & calibration
4	Penyenggaraan konsol serta sistem-sistemnya	En Roslan/Razali		Justify condition by visual and working
5	Pengaturanuithan bekalan kuasa sistem konsol (sebelum akt mekanikal)	En Roslan/Razali		condition
6	Kemaskini Sistem CCTV	Pn Farizan		
7	Access & Security	Pn Farizan		
C	AKTIVITI TENTUKURAN (Calibration)			
1	Fuel Temperature Channel #1 & 2	En Roslan/Razali		
2	Percent Power Channel #1 & 2	En Roslan/Razali		
3	Water Temperature (bulk)	En Roslan/Razali		Check system
5	Water level sensor (check in tank ruler)	En Razali		
6	Control rods calibration	En Razali	5,6,7 March 2013	
7	Power Calibration (25 Feb)			
9	Radiation monitoring equipment calibration (ARM, CAM, Survey Meter)	En Shaiful		Contact SSDL & KFK
D	AKTIVITI PEMERIKSAAN (Inspection)			
1	Beamport 1& 2	En Nabil		Check For Humidity
2	Thermal Column	En Nabil		Check For Humidity
3	NUR-2	En Nabil		Check Shutter (should be closed)
4	SANS	En Nabil		Check Shutter (should be closed)
5	PTS (blower, selonoid valve, receiver/sender)	En Nabil		Visual Inspection (joints, leakage, layout, etc)
6	Reactor building Fire Protection System and First Aid Kits	En Alfred		Follow up UMK, keep maintenance record
7	Utility Support System, back up power system	En Alfred		Follow up UMK, keep maintenance record
8	Primary & Secondary Cooling System	En Nabil		Visual Inspection (joints, leakage, layout, etc)
9	Ventilation System (HEPA filter)	En Nabil		Pressure Difference Reading
10	AHU & Chilled Water System (Dapatkan rekod BKI)	En Nabil		Visual inspection working condition, and follow up check. Cooperate with BKI
11	Air Compressor System (Dapatkan rekod BKI)	En Nabil		Drain out water (Record last service)
12	Sliding Door System	En Nabil		Visual Inspection working condition
13	Overhead Crane (Dapatkan rekod BKI)	En Nabil		Visual Inspection working condition
14	Fuel Inspection (Kabu sempat siap selepas control rod)	En Fazli		
15	Tank Inspection (SS)	En Alfred		

3.0 IMPLEMENTATION OF NS-G-4.2

Process Implementation

- The activities for the maintenance, periodic testing and inspection for RTP were planned, controlled and managed (in January) to ensure effective communication and the clear assignment of responsibility.
- Administrative controls and work controls are established consists of maintenance procedures that include all requirements for performing activities in the research reactor facility.
  a) The use of written procedures for maintenance, periodic testing and inspection (RTP forms);
  b) The use of work permits (RTP-F37);
  c) Radiation protection considerations;
  d) Calibration of tools and equipment;
  e) The use of interlocks and keys;
  f) Housekeeping;
- The results of inspection, periodic testing and maintenance were assessed by properly qualified personnel (reactor manager or supervisor), verify that the activities have been accomplished as specified in the appropriate procedure and shall verify compliance with the OLCs.

3.0 IMPLEMENTATION OF NS-G-4.2

Maintenance

Periodic testing

Inspection

4.0 IMPROVEMENT

- **SSCs included in the programme**

The list of all SSCs is included in the programme with very clear subject to maintenance, periodic testing and inspection.

- **Management systems**

Records essential to the performance and verification of activities are well prepared, reviewed, approved and archived.

- **Scheduling**

The new restructuring for the annual and semi-annual maintenance schedule in accordance with AELB and Safeguards inspection.

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4.0 IMPROVEMENT

- **Equipment upgrading**

a) The new SCADA system for Primary Cooling system complete with data acquisition, recording and trending

b) The new RTP control system (ReDICS) will improve the safety and control of the reactor operations and also reduce maintenance time and cost

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5.0 SUMMARY

- The Safety Guide NS-G-4.2 provide guideline to establish general requirement for maintenance programme, however it does not provide guidance on how to conduct the maintenance.
- RTP is a low power research reactors and only need less comprehensive maintenance, some recommendations may not be applicable and it is based on complexity of the design and safety of the systems.

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THANK YOU
FOR YOUR ATTENTION

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