NEWSLETTER

RADIOACTIVE WASTE MANAGEMENT

May 2008
No.20

Issued by
Thailand Institute of Nuclear Technology (TINT)

The FNCA 2007 Workshop on Radioactive Waste Management

November 19-23, 2007 in Bangkok, Thailand

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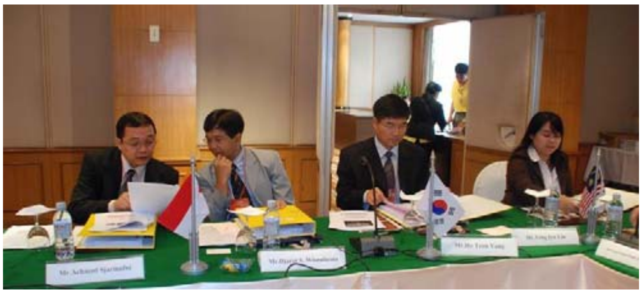
The FNCA 2007 Workshop on Radioactive Waste Management (RWM) was held from November 19-23, 2007, at Amari Boulevard Hotel, Bangkok, Thailand. This workshop was hosted by the Thailand Institute of Nuclear Technology (TINT), and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, in cooperation with Nuclear Safety Research Association (NSRA).

Representatives from RWM Implementing organizations, Regulation sectors, and R&D institutes on radioactive waste management attended the workshop from countries under the FNCA frame work, i.e. Australia, Bangladesh, China, Indonesia, Japan, Korea, Malaysia, the Philippines, Thailand, and Vietnam. An IAEA representative from Waste Technology Section, also participated in the workshop upon the invitation from the workshop organizers.



On the first day, country reports were presented about present status and progress of radioactive waste management activities in each FNCA country. A Poster/Mini-Exhibition session to introduce industrial level technologies in relation to radioactive waste management was also held.

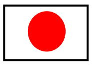
On the second day, the Sub-meeting in several themes were presented by FNCA country members, such as, theme 1 “Management of Medical Radioactive Wastes”, theme 2 “Siting of disposal facilities” and theme 3 “Safety Assessment and Design Concept of Disposal Facilities”. And in the last session, the Recent IAEA Initiatives in RWM and D&D was presented by the IAEA representative.

On the third day, the Technical Visit to GENCO was conducted by the local host organization. The GENCO provided the information and the sharing of experiences on Management of Industrial Waste and Disposal site as well.

On the fourth day, the morning session started by the presentation on “Issues and Trends in RWM: The IAEA’s Perspective”. The Roundtable Discussion on Interim Report on Decommissioning and Clearance Task Group Activities and on the Overview of FNCA-RWM Activities and the Future Direction were then performed by Prof. Kosako. The Technical Visit to TINT was made in the afternoon.

On the final day, the participants reviewed the Workshop Minutes and express their deep gratitude to the FNCA-RWM Workshop and Japanese sponsors. All participants agreed that the activities of RWM in FNCA were much meaningful for the FNCA-RWM members. The RWM project has been held since 1995, and now completely fulfilled. Finally the FNCA-RWM Workshop in Thailand was successfully done on 23 November 2007.

Development of an activity evaluation system using laser shape measurement and Monte Carlo calculation techniques for clearance measurements



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In CRIEPI, low level activity detection technique for metal scraps has been developed which inspects whether or not the activity of wastes satisfies the clearance level. This technique consists of 3D non-contact laser shape measurement and MCNP Monte Carlo calculation. By the laser scanning, the measurement targets are recognized as dot image and they are converted into assembly of voxels after noise removal and written in MCNP input files. Two MCNP calculations, one is for calibration factor and the other is for background correction factor (ISO 11932:1996), are done during gamma ray measurements. The activity of the target can be obtained by the gross count rate, background (BG) count rate, BG correction factor and the calibration factor (Fig. 1).

As a practical system, Clearance Automatic Laser Inspection System (CLALIS) has been developed using our technique, as shown in Fig. 2. This system is composed of 4 laser scanners, 8 large NE102A plastic scintillation detectors surrounding with 5cm-thick lead shielding. The measurement area is 80cm x 80cm x 40 cm height.

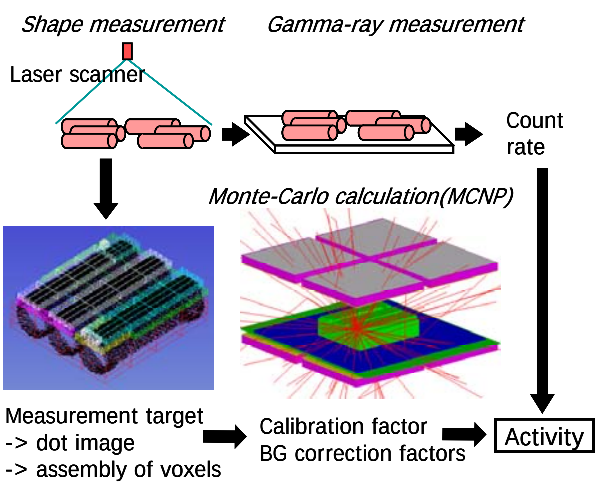

Fig.1 Flowchart of activity evaluation.

using a number of mock metal waste samples and standard radioactive sources. It was found that the values measured using CLALIS and the actual radioactivity level agreed within +/- 20%, and the corrected and actual background reductions agreed within +/- 2%.

On the other hand, for the clearance measurement of concrete segments, the effect of BG gamma rays from natural radionuclides in the measurement target, such as K-40 and the radioactive decay products of Th-232 and U-238, should be compensated for to ensure adequate waste management.

Recently, to apply CLALIS to the clearance measurement of concrete segments, the original flowchart of activity evaluation was improved by adding a new compensation procedure. In this procedure, BG count rate due to natural radionuclides is estimated by a Monte Carlo calculation with preanalyzed data of a representative sample of the measurement target.

The activity concentration of natural radionuclides in concrete differs markedly depending on the production location of its components, such as cement and aggregates. Using six mock concrete waste samples, which were composed of cement and fine aggregate from various production locations in Japan, the accuracy of BG compensation was experimentally estimated. In addition, the accuracy of calibration for concrete waste was also estimated using a number of mock concrete segments of small and large triangular prisms. As a result, it was revealed that CLALIS has appropriate detection ability for clearance measurement of not only metal scraps, but also concrete segments.

CLALIS can give objectivity to the measurement results by automatic measurement. We hope that CLALIS will be a helpful tool that can provide reliability and quality assurance in the clearance measurement of nuclear plant waste materials.

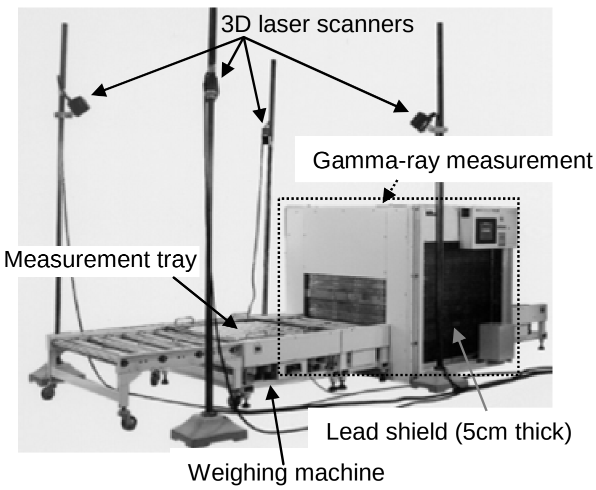

Fig.2 Photograph of CLALIS.

BATAN Activities

on Radioactive Waste Storage and Disposal

Djarot S. Wisnubroto

Radioactive Waste Technology Center-BATAN

At the present time, The Radioactive Waste Technology Center (RWTC) is the only institution in Indonesia that has capabilities to treat radioactive waste in the forms of liquid, spent resin, combustible waste, high active waste, and sealed source. RWTC is equipped with evaporator, compactor, incinerator, chemical treatment, conditioning facilities for spent sources and also interim storage and quite recently been assigned to be responsible to manage the interim storage for spent fuel from the adjacent research reactor. The cumulative non NPP waste coming from hospitals, industries and laboratories in RWTC is shown below and smaller parts of this waste have to be disposed some time later in a final repository.

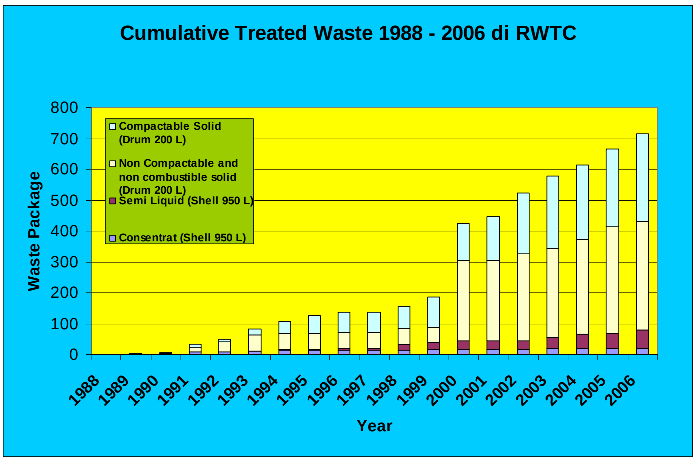

Fig. 1. Cumulative treated waste 1988-2006 in RWTC-BATAN

All of the waste stored in RWTC BATAN are placed in the Interim Storage Building No. 1 and No. 2 as seen in Fig. 2 and Fig. 3. In addition, RWTC is also equipped with the High Active Waste Interim Storage intended for waste coming from radioisotope production center or from radioisotope production company (PT. BATAN TEKNOLOGI) as shown in Fig 4. This building is still empty since there is no such kind wastes sent to RWTC.

Fig. 2. Interim Storage Building No. 1 with total area 1420 m^2 and capacity 420 drums, 90 concrete shell

Fig. 2. Interim Storage Building No. 2 with total area and capacity same with No. 1.

Fig. 3. Interim Storage for High Active Waste (Capacity 120 drums)

In the year of 2006, Interim Storage for Spent Fuel (ISSF) facility (Fig. 4) was handed over to RWTC from Serpong Research Reactor Center. In the early years of Serpong Reactor Operation, uranium materials were coming from the USA and fabricated in BATAN as the nuclear fuel. No requirement for managing this spent fuel since the US origin are repatriated with contract up to 2010. However recent uranium used for research reactor is non US that in the near future must be managed in the ISSF. There are 200 bundles of spent fuel still in reactor pool, and 42 bundles of them will be sent back to US on 2009.

Fig. 4. Spent Fuel Storage Facilities

On the R&D, RWTC conducts the disposal study since 1989. Site investigation has been done, and two universities were involved in the preliminary study. The locations for this activity include:

- some uninhabited islands with the characteristic of basaltic rock, andesitic rock in the north of Java island,
- and in Java with the characteristic of volcanic host rock, clay host rock.

The block area surveyed is shown in Fig. 5.

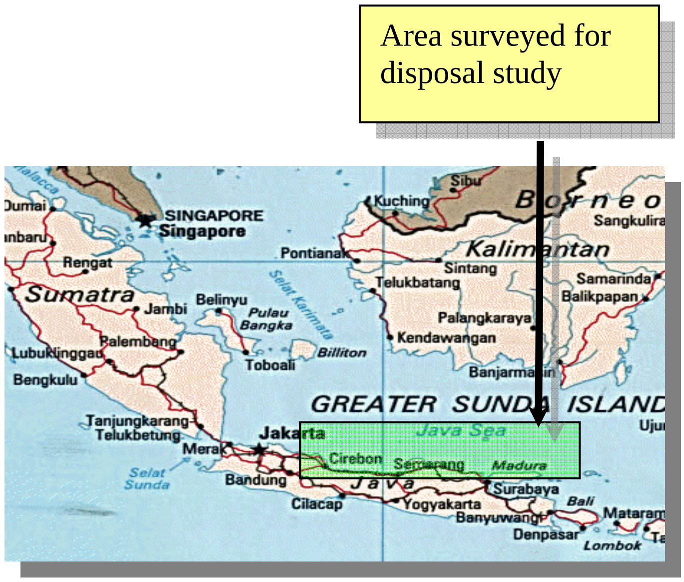

Fig. 5. Area in Java island and in some small islands north of Java surveyed for radioactive waste disposal study.

Repackaging of Pu-239/Be neutron sources for repatriation to USA

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As part of a program to repatriate sources of US origin the repackaging of Pu-239/Be neutron sources was conducted at ANSTO during September 2006. The exercise was conducted under the Off-Site Source Recovery Project (OSRP) by the expert team from Los Alamos National Laboratory (LANL) and the IAEA in conjunction with ANSTO and ARPANSA personnel.

The OSRP is part of the National Nuclear Security Administration's (NNSA) Global Threat Reduction Initiative, formerly under the Department of Energy's Office of Environmental Management. The sources were packaged to facilitate shipment as radioactive material, Type A Package, Special Form. These packaged sources are destined for disposal at the Waste Isolation Pilot Plant in Carlsbad, New Mexico, USA.

The program in Australia involved training by Mohamed Al-Mughrabi from the IAEA and a LANL team comprising Shelby Leonard, Jim Matzke, Leonard Manzanares and Andy Tompkins on the Pu/Be source conditioning and repackaging procedures for the Australian representatives. This program completed the necessary training for an Australian IAEA-based team for source conditioning in the Southeast Asian region. Class room training and hands-on practice was followed by the removal of sources from existing packages, confirmation of identification, dose and contamination checks, encapsulation and packaging into the 200L shipping containers by the trainers and the contingent of Australian trainees.

IAEA, LANL, ANSTO and ARPANSA participants.

A total of 11 Pu/Be neutron sources were conditioned by encapsulation in permanently-sealed stainless steel capsules and further sealing in the S-300 pipe overpack containers incorporating neutron shielding material within 200L drums.

A selection of Pu-239/Be sources in original containers.

Removal of the source from original packaging.

Monitoring of source on removal from original packaging.

Encapsulation of Pu-239/Be source

S-300 pipe overpack containers with neutron shielding material inside 200L drums.

Sealing of overpack containing encapsulated Pu-239/Be source.

Type A Package with Pu-239/Be source

The Roles of Nuclear Energy Regulatory Agency (BAPETEN) on Radioactive Waste Management

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Radioactive Waste Technology Center - BATAN

To carry-out the development and the use of nuclear energy, on 1958 the Government has established Atomic Energy Board, and on 1964 the name was changed into the National Nuclear Energy Agency (BATAN). As the consequence of Act No. 10/1997 on Nuclear Energy, an independent regulatory body was established and separated from BATAN. This independent regulatory body is called Nuclear energy Regulatory Agency (BAPETEN).

BAPETEN has the task to control any activity using nuclear energy. The purpose of control is to prevent the workers, the public, and the environment from any harmful effect of radiation.

The task is administered by the following means:

Establishing regulation on the nuclear safety covering the radiological and radiation safety.

Issuing the licenses to control that the user of nuclear energy is qualified and in accord with the nuclear safety regulation, criteria, standards, and guidance as well as practices.

Doing inspection to ensure that all regulations are observed in practices.

Primary objective of the regulatory body is to ensure that site personnel, the public and the environment are protected from possible adverse effects arising from nuclear activity. In order to achieve these objectives, BAPETEN has responsibility in:

1. Rule making of national policy in the field of the control of nuclear energy utilization;
2. Planning of national program in the field of the control of nuclear energy utilization;
3. Guidance and the rule making and the implementation of nuclear safety, radiation safety, and safeguards assessments;
4. Implementation of licensing and inspection to the development and the operation of nuclear reactor, nuclear installation, nuclear material facility, radiation source, and the development of nuclear preparedness;
5. Implementation of co-operation in the field of control of nuclear energy utilization with other Government agencies or organizations either internally or externally to the Government of Indonesia;
6. Implementation of safeguards and SSAC (State's system on accounting for and control of nuclear material);
7. Implementation of the guidance and counseling for the effort that related to the safety and health of the worker and the people, and the effort of environmental conservation.

Fig.1 is the organization chart of BAPETEN.

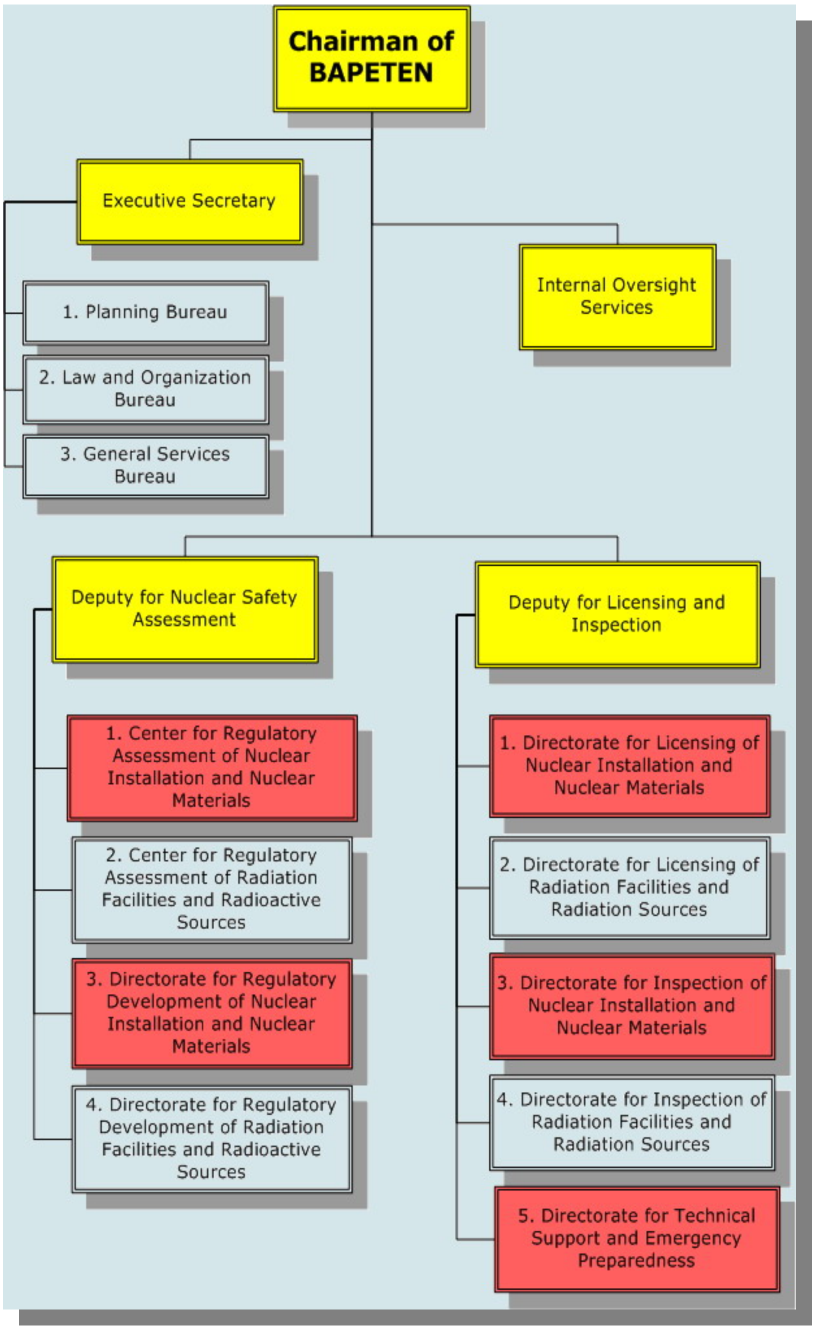

Fig. 1. BAPETEN structure chart

Up to now there are licenses issued by BAPETEN, radiation sources fpr gauging application and x-ray application licenses are the majority in industry and hospitals respectively.

Tabel 1. Licenses issued by BAPETEN for the radiation and radioactivities application (record on February 2008)

No.	Purposes	Numbers
1.	Industries	4465
2.	Medicals	5193
3.	Researches	48

Table 2. Some Regulations published and/or coordinated by BAPETEN related on radioactive waste management.

No.	Name of Regulation
1.	Decree of the Chairman of the Nuclear Energy Control Board No. 01/Ka. BAPETEN/V-99 on Provisions for Occupational Safety Against Radiation
2.	Decree of the Chairman of the Nuclear Energy Control Board No. 02/Ka. BAPETEN/V-99 on Radioactivity Dose Value for the Environment
3.	Decree of the Chairman of the Nuclear Energy Control Board No. 03/Ka. BAPETEN/V-99 on Safety Aspect of Radioactive Waste
4.	Decree of the Chairman of the Nuclear Energy Control Board No. 04/Ka. BAPETEN/V-99 on Radioactive Materials Transport Safety
5.	Decree of the Chairman of the Nuclear Energy Control Board No. 06/Ka. BAPETEN/V-99 on Construction and Operation of Nuclear Reactor
6.	Decree of the Chairman of the Nuclear Energy Control Board No. 07/Ka. BAPETEN/V-99 on Quality Assurance of Nuclear Installation
7.	Decree of the Chairman of the Nuclear Energy Regulatory Agency *) No. 05P/2000 on Guide for the Safety of Radioactive Materials Transport
8.	Government Regulation No. 64/2000 on Licensing of Nuclear Energy Utilization
9.	Government Regulation No. 27/2002 on Radioactive Waste Management
10.	Government Regulation No. 43/2006 on Licensing of Nuclear Reactor
11.	Government Regulation No. 33/2007 on Safety of Ionizing Radiation and Security of Radioactive Sources

Below is the radioactive waste management structure in Indonesia. BAPETEN, the Ministry of Health and the Ministry of Environment coordinate the regulation, guidance and criteria as well as examine the safety assessment. BAPETEN carries out the safety examination on the waste management organization to comply with basic radiation protection requirements as described in ICRP and IAEA Basic Safety Standard. The Radioactive Waste Technology Center, BATAN is the undertaking organization, as well as the responsible party for carrying out the radioactive waste management which is the statutory task of the Executing Body.

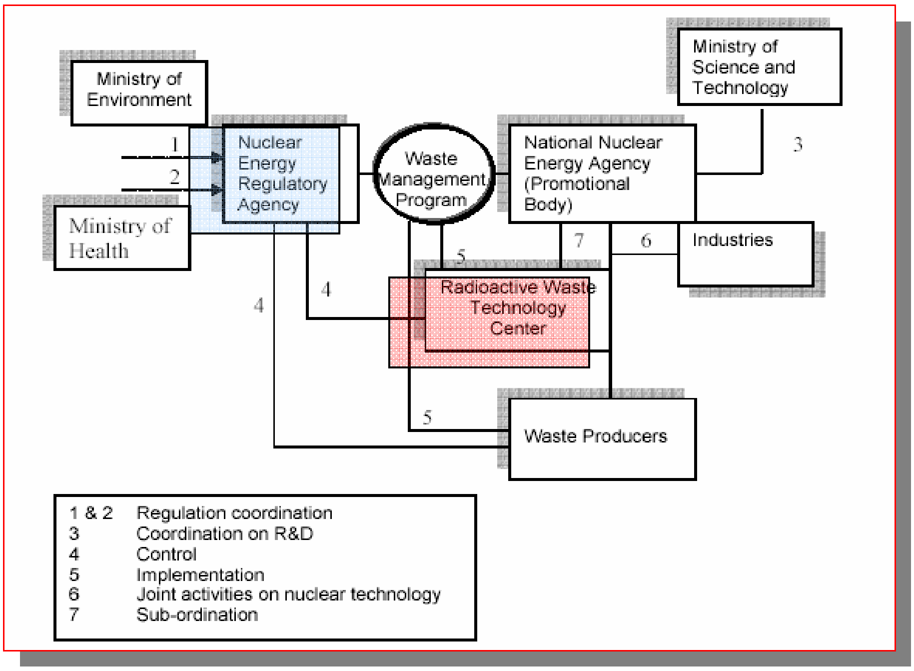

Figure 2. Radwaste Management Structure in Indonesia

DECOMMISSIONING AND DECONTAMINATION OF MINERAL PROCESSING PLANT IN MALAYSIA

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Abstract

In Malaysia, mineral processing plant is one of the Naturally Occurring Radioactive Material (NORM) processing industries in controlled by the Atomic Energy Licensing Board (AELB) through the enforcement of Atomic Energy Licensing Act 1984 (Act 304). One monazite cracking plant to extract rare earth elements operating since 1982 is now in the process of decommissioning. This is the first experience involving decommissioning and decontamination (D&D) activities of mineral processing plant for Malaysia. This D&D activities was divided into 2 phase. The objective of phase 1 is to rehabilitate the plant site and Waste Water Treatment Site and dispose of the contaminated materials into the disposal facility called Engineered Cell 1. Meanwhile, the objective of phase 2 is to transfer and dispose of the thorium hydroxide waste into the disposal facility called Engineered Cell 2. The phase 1 activities had been commenced in September 2003 and completed in October 2005. Meanwhile, the second phase of the D&D is now in the beginning process starting from September 2007 and it is expected to be completed in 3 years time. Post closure monitoring will be carried out for 2 years, starting from the closure of the Engineered Cell. The planned institutional control will be for at least 300 years.

1.0 INTRODUCTION

1.1 In Malaysia the atomic energy activities are regulated and controlled by the Atomic Energy Licensing Act 1984 (Act 304). The licensing authority of the Act 304 is the Atomic Energy Licensing Board (AELB). Malaysia has no plans to embark on a nuclear power program, it limits nuclear activities to the applications of such technologies in the industrial, medical, agricultural, and environmental sectors.

1.2 Currently, only one facility, which generates TENORM waste from rare earths extraction, has been decommissioned so far. There is one disposal facility, which caters for TENORM waste in Malaysia. The facility is designed for two engineered cells, in which the first engineered cell has been completely filled with contaminated soils and construction materials from the rare earths extraction plant which has been decommissioned.

2.0 DECOMMISSIONING AND DECONTAMINATION

2.1 One monazite cracking plant to extract rare earth elements operating since 1982 that situated in the northern part of Malaysia. The by-product or waste as a result of the operation was thorium and radium sludge, thorium contaminated equipments and the processing plant itself. The company has ceased its operation in January 1994. The waste was temporarily stored at the Long Term storage Facility (LTSF). About 84,822 drums (size of 200 L) of waste containing thorium hydroxide and contaminated material were stored in the LTSF. The plant decommissioning and decontamination (D&D) activities had been commenced in September 2003. This D&D project was divided into 2 phase:

2.1.1 Phase 1 (Plant D&D) – rehabilitation of plant site and 'Waste Water Treatment Site' (WWTS) from the radioactive contamination to the original condition where all of the contaminated materials was disposed into disposal facility called 'Engineered Cell 1'(EC 1).

2.1.2 Phase 2 (LTSF D&D) – transfer and dispose of the thorium hydroxide waste in the 'Long Term Storage Facility' (LTSF) into the disposal facility called 'Engineered Cell 2'(EC 2).

2.2 The first phase of the D&D project was completed in October 2005. The inventory of wastes disposed in the EC 1 are:

2.2.1 Contaminated soil excavated – approximately 66,000 m^3
2.2.2 Contaminated Concrete & rubble – approximately 6,330 m^3 and
2.2.3 Contaminated material – approximately 2,000 m^3

2.3 The second phase of the D&D is now in the beginning process starting September 2007 and it is expected to be completed in 3 years time. Among the planned activities include:

2.3.1 To decommission the LTSF stage by stage and installation of the ventilation system to reduce the radon and thoron gaseous release to the environment. It is expected the concentration of radon about 200 -1000 X 10^3 Bq/m^3 and up to 30 X 10^3 Bq/m^3 for thoron from the previous study.

2.3.2 To categorization the waste into thorium waste and contaminated material based on external radiation at the surface, 50uSv/hr will be used as a limit to separate the waste. The waste is categorized as thorium waste if the external radiation level exceed the limit of 50uSv/hr and the waste with level of external radiation below is categorized as contaminated material.

2.3.3 The inventory of wastes to be disposed in the EC 2 are approximately:

2.3.3.1 Thorium waste – 16,200 m^3
2.3.3.2 Contaminated material – 9,900 m^3
2.3.3.3 Rubble & others - 20,200 m^3

2.3.4 Thorium waste will be stabilized by mixing with 15% cement and 5% of additive (calcium sulphate).

2.3.5 Built-in concrete box will be used to contain the stabilized thorium waste in the EC 2. Whereas the contaminated material will be dispose of direct into the EC 2.

2.4 There will be only one final cap to cover both EC 1 and EC 2.

3.REGULATORY EXPERIENCE

LEGAL REQUIREMENT

Since Malaysia does not have any specific regulation on disposal and management of radioactive waste, AELB enforces the waste management policy through its licensing procedure and conditions of license issued to the licensee. During operation, the mineral processing plant was given class A license for milling. Class G license to store and dispose the waste was issued when the company stopped its operation and implemented the D&D activities.

The international documentations also available for the company to refer in a case of there are no regulations provided by the AELB. Such documents related to the D&D activities among others are:

ICRP Publications No.81 (ICRP 81)
IAEA Safety Series No.111-F (IAEA, 1995)
IAEA TECDOC- 1270

REGULATORY CONTROL

Routine inspection on-site was carried out by the regulatory body to ensure the safety of the D&D activities in term of radiation protection. Activities inspected by the AELB were soil excavation, transportation of the waste to the disposal facility, loading and unloading the waste in/from the transport vehicle, backfilling of the excavated area, engineered cell construction and capping of the EC 1. Regular audit by the consultant also being done to ensure the company comply with all the requirements imposed by the regulatory body. Comments and suggestion also provided by the consultant to help the company to take corrective actions regarding the non-compliances.

Assistance from the IAEA experts was also requested in order to assist the regulatory body in implementing the proper enforcement in the field of D&D. The AELB also had form the technical committee consist of various related agencies to supervise the D&D activities carry out by the company. The technical committee had their regular meeting to review all of the related D&D documents submitted by the company. The community briefing also conducted by the company to explain to the public the status of the D&D project and the compliance with the requirements by the regulatory body.

4. INSTITUTIONAL CONTROL

Post closure monitoring will be carried out for 2 years, starting from the closure of the Engineered Cell. Samples of flora, fauna, soils and water will be collected and analyzed to determine radionuclide migration as a result of any leakage. All reports on the radiation monitoring will be submitted to the regulatory body (AELB) at a regular interval as agreed by both parties.

The planned institutional control will be for at least 300 years. During this period, the owner will carry maintenance work (to mend fence, warning signs, markers), ensure no serious damage due to erosion, human intrusion for cultivation or animal encroachment which can damage the integrity of the repository.

This Newsletter is issued by Radioactive Waste Management Center, Thailand Institute of Nuclear Technology (TINT)
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