

## SAFE MANAGEMENT OF DISUSED SEALED SOURCES IN PERU

M. MALLAUPOMA

Instituto Peruano De Energía Nuclear (IPEN)

Nuclear Research Center "RACSO"

Peru

### Abstract

The future safe development of nuclear energy and progressive increasing use of sealed sources in medicine, research, industry and other fields in Peru, in the past years have determined the necessity to formulate and apply an Institutional policy to assure harmless and ecologically rational management of disused sealed sources in Peru. Some results of the studies, which served as a basis for design and construction of a facility for treatment, conditioning and storage of conditioned sealed sources are presented in this paper. The waste management system in Peru comprises operational and regulatory capabilities. Both of these activities are performed under a legislation. The Nuclear Reserach Center RACSO has a radioactive waste management department which is in charge of the management of disused sealed sources produced in the country. It is considered as a centralized waste processing and storage facility (WPSF).

### 1. INTRODUCTION

At the Peruvian Institute of Nuclear Energy (IPEN), there is a centralized waste processing and storage facility (WPSF) for disused sealed sources produced in Peru. They are produced in the applications in medicine, industry and research studies. All the wastes are segregated and collected according to their phisico-chemical proprieties and available treatment facilities. For this purpose a IPEN waste management strategy was established. The option to reduce the risks for accidents with disused sealed sources is their conditioning including embedding in a matrix of cement mortar. This method is applicable to radiation sources with activities up to a few terabecquerel, depending on the radionuclide. The method has the advantage of using a simple technology, material and equipment which is available and it gives a waste package which is stable for a long time under interim storage conditions.

### 2. ORIGIN AND QUANTITIES OF DISUSED SEALED SOURCES

All disused radiation sources with an activity above the applicable exemption levels are conditioned and then they are put in an interim storage. Disused sealed sources which normally are conditioned in 200 litre drums are: brachithrapy sources, calibration sources, industrial gauges, soil moisture and density-gaunges and industrial radiography sources. In the case of short lived disused sealed sources, they are stored, without conditioning, in a suitable interim storage. Table 1 shows the inventory of conditioned disused sealed sources, the quantity and activity.

TABLE 1: Summary of Data of Disused Sealed Sources at the Interim Storage

<b>Radionuclide</b>	<b>Quantity of Sources</b>	<b>Total Activity (GBq)</b>
Cs-137	54	3.70E+05
Co-60	6	2.60E+04
Ra-226	30	8.56E+00
Am-241	157	1.01E+00
Am-Be	6	1.48E+00
Ir-192	6	7.10E-03
<b>TOTAL</b>	<b>267</b>	<b>8.82E+05</b>

### 3. TRANSPORT OF DISUSED SEALED SOURCES TO WPSF

Disused sealed sources are often stored at the place of use; hospitals, research institutes or industry, and then are transported to the WPSF. Such transport is in accordance with the internationally agreed transport regulations, which are based on recommendations from the IAEA. Before transport of a disused sealed sources is carried out, it is necessary to know if the source is leaking or if it is contaminated on the outside. Normally, leak-tests are done on all disused sealed sources. For transport of radium sources, the inner containment of the packaging is airtight to prevent radon from escaping if the source is damaged during transport. On receipt at the conditioning facility, the package is unloaded and the external radiation and surface contamination levels are checked again.

### 4. REGULATORY REQUIREMENTS

Conditioning of disused sealed sources is considered a nuclear activity for which operating license requirements apply. These requirements define the scope for conditioning operations, as well as any specific rules that must be complied with. The conditioning operation is furthermore governed by criteria for acceptance of waste packages for interim storage.

### 5. COLLECTION OF INFORMATION REGARDING THE DISUSED SEALED SOURCES

One of the important aspect considered for conditioning of disused sealed sources is to obtain all relevant facts about the sources to be conditioned in order to ensure that the conditioning method is compatible with the source, and to plan the conditioning process and the radiation protection measures. Information needed includes:

- radionuclide, activity and date;
- physical and chemical form of radionuclide;
- producer of the source;
- source type including dimensions and shape;
- sources serial number;
- user of the sources including details of the source history;
- results of tests which have been done;
- measured dose rates.

All information is collected and filed in a structured form in a data base programme.

## 6. CONDITIONING OF RADIUM NEEDLES

During the conditioning of radium sources, extra precautions have to be taken because of the radon problem. In order to take care of the radon, the disused sealed sources are placed in an airtight inner container in the waste package. The sources are included in a stainless steel capsule with a welded lid. The sealed capsule is then placed in a 200 l drum, which is marked with a permanent identification mark which includes: the trefoil symbol for radioactive material, an identification number of the package, the content of the package and the date.

## 7. QUALITY ASSURANCE

Two essential parts are considered in the quality assurance system for disused sealed sources: the conditioning process and documentation of conditioning.

### 7.1 Conditioning Process

The only way to assure that the end product complies with requirements is to apply appropriate quality assurance measures to each of the steps in the conditioning process. Such measures include documented procedures on:

- procurement and acceptance of raw material,
- identification and selection of disused sealed sources,
- immobilisation process,
- waste packages identification marks and labels,
- equipment maintenance and repair,
- operational staff requirement; skills and training,
- record keeping.

### 7.2 Documentation of Conditioning

Documentation is completed immediately after the work to ensure that correct information is registered. The information on record includes the following:

- package identification mark,
- activity content,
- radionuclide content,
- surface dose rate,
- dose rate at 1 m,
- contamination level,
- date and place of conditioning,
- conditioning method,
- responsible conditioner,
- storage category,
- number of sources conditioned.

## 8. INTERIM STORAGE OF CONDITIONED DISUSED SEALED SOURCES

The storage facility is designed and operated in accordance with regulatory requirements. The storage facility has two separate storage areas; an operational store for the temporary storage of unconditioned sources, and an interim store for the long term storage of conditioned disused sealed sources. An inspection and monitoring programme is established

and there is a record keeping of all disused sealed sources during the storage period. A repository storage, for final disposal, is not available. Interim storage is in a simple hall on the ground surface with a concrete construction. Its capacity, which can be increased up to 60 cubic meters, makes this facility suitable for meeting the country needs during more than 20 years.

## 9. CONCLUSIONS

Not too much radioactive wastes are produced in Peru. However, safe management for disused sealed sources has been established. Safe management for disused sealed sources must consider all steps of radioactive waste management in order to avoid that such wastes lead to accidents, which could have a negative impact on society.

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