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# MODERNIZATION AND REFURBISHMENT OF THE CENTRAL INTERIM STORAGE

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## ABSTRACT

The Central Interim Storage for radioactive waste in Brinje, being put into operation in 1986, needs refurbishment and modernization in order to meet the up-to-date operational and safety requirements and to ensure the normal and undisturbed acceptance of radioactive waste from small producers in the future. Because of the waste, being already stored in the storage, the lack of reprocessing capacities and the lack of auxiliary room, the refurbishment and modernization is a complex problem, which needs to be addressed with care. The plan of refurbishment and modernization requires an integral approach, covering all different aspects of renewal and reconstruction. The implementation plan, however, must be based on the actual state of the storage and real conditions for the implementations: from technical to financial. In this paper the project for refurbishment and modernization of the storage, and some activities that have already been implemented, are presented.

## 1 INTRODUCTION

The initial plan for refurbishment and modernization of the storage was prepared already in 2000, soon after the operation of the storage was transferred to ARAO. The plan consists of three main segments:

- refurbishment of the facility in order to remediate the detected defectiveness or malfunctioning of the storage facility,
- neccessary repacking and re-arrangement of the inventory with the aim of improving the storage utilization and to provide further safe storing of waste, and
- modernization of storage aimed at providing missing reprocessing waste capacities.

When preparing the plan the major restrictions on planned activities and time schedule were imposed by the fact that the storage is filled with waste. The presence of waste required an integral approach to the plan of refurbishment and modernization of the storage. Although for each individual activity a special project including technical description and implementation plan was prepared, in the implementation phase the renewal and reconstruction activities are planned to be performed in parallel, storage section by storage section, in order to assure the ALARA principle.

For most urgent maintenance and refurbishment works the plan was immediately followed by preparation of the necessary documentation and licencing procedure in order to start the works as soon as possible. These works include the renewal of the hydroisolation of

the storage to prevent leaking, the erection of an auxiliary building beside the storage and conditioning of radium applicators.

For other, more complex refurbishment and reconstruction activities, which require work in the storage, the project documentation including the implementation plan was completed in 2001. The project covers the renewal of electric installations, water supply and sewage system, ventilation system, the improvement of the fire safety measures and remediation of minor defects discovered in the building (cracks in walls, ceiling and groundfloor). In parallel, ARAO also prepared a proposal for new packaging of waste, which is necessary before reshuffling and rearrangement of the waste. The proposal takes into consideration the present packaging and provides possibilities for more consistent and uniform packaging.

## 2 SHORT DESCRIPTION OF THE CENTRAL INTERIM STORAGE

### 2.1 Storage building

The Central Interim Storage facility in Brinje (Fig. 1) is the only storage in Slovenia for radioactive waste arising from medical, industrial and research applications. The construction of the facility started in 1984 and was put into operation in 1986.

**Figure 1:** The Central Interim Storage and the newly erected auxiliary building.

The storage is a near-surface concrete building covered with soil layer. The building is subdivided by concrete walls into nine storage sections and an entrance area (Fig. 2). The ground plan of the facility is 10.6 m x 25.7 m with a height of 3.6 m. The useful capacity of the storage is less than 500 $m^3$, the remaining small area is intended for workers, for loading and unloading the waste and for inner transport. The storage section at the back-end of the building is deepened relative to the level of the other sections, and is intended for more active spent sources.

The facility is equipped with a ventilation system with two exhausts on the roof for reducing radon concentration and air contamination in the storage. The water and sewage collecting system was constructed as part of the water and sewage system of the research reactor center. The system is designed as a closed system to retain all liquids from the storage. The electric supply system is used for illumination of the storage, for heating the auxiliary rooms and for powering the ventilation. The storage facility is physically protected by an alarm system, which is connected to the 24-hour security service.

## 2.2 The inventory

Currently around 60 –70 $m^3$ of radioactive waste is kept in the storage. According to the type of packaging the waste is divided into three categories: waste packed in drums, contaminated or activated bulky items, and spent sealed sources.

**Figure 2 and 3:** The interior of the Central Interim Storage.

The drums contain mostly contaminated cleaning material, paper, glass and plastic material with induced radioactivity because of neutron exposure in the research reactor. Different contaminated or activated metal tubes and metal pieces that are too big to fit into the drums are stored as special bulky items. Disused sealed ionizing sources are stored in the original shielding containers.

The total activity of the waste at the end of 2001 was estimated at 3500 GBq. The major contribution to the total activity comes from the disused teletherapeutic source of Co-60 with present activity of 2900 GBq. It is expected that during normal operation the Central Interim storage will receive approximately 2 $m^3$ of radioactive waste annually.

## 2.3 Main problems

The storage has no capacities for treating and conditioning the waste. There is no room in the storage to provide these services within the facility. The room for staff is small and

insufficient, the room for decontamination is not meeting the needs, and the checking point at the entrance to the controlled area - which was provisionally introduced few years ago - should be optimised.

The capacity of the ventilation system is insufficient. Reduction of radon concentration in the storage to an acceptable level takes several hours. For improving the working conditions in the storage the capacity needs to be increased. More efficient filters should be installed for filtering the discharges. Easy replacement of filters should also be provided.

The electric installation is time worn, the illumination of the storage is weak and, by being unconveniently installed, it impedes the handling of the waste. The old installation should be replaced with the new one, meeting the requirements of the more powerful ventilation system and providing better and more practically positioned lighting of the storage.

The storage sewage system is connected to the sewage system of the research reactor. From both facilities the sewage goes into a common tank in the basement of the Reactor Chemistry Section to control the discharges. No separate control of discharges from the storage and from the reactor is possible. The examination of the sewage system also showed that the pipes are no longer tight, and some leakage was detected at the junctures.

The waste inventory in the storage is poorly documented. About 5 % of waste in the storage can be regarded as historical waste since no data exist at all. In the past no acceptance criteria existed and no sorting of waste was provided. Packaging was not uniform – the waste was packed in a number of different drums (by volume and in material), containers or boxes. Unfortunately in the past no systematic approach was taken when putting the waste into the storage. Although the presently stored waste quantities represent less than 15 % of total capacity, the waste - placed in disorder and only at one level - practically occupies the entire storage. The storage utilization is very low and should be improved in order to provide sufficient room for future waste streams (Fig. 4).


**Figure 4:** Present situation in the storage: all sections are filled with waste.

## 3 IMPROVEMENTS ALREADY MADE

In 2001, three activities for remediation and modernization of storage were carried out: an auxiliary building next to the storage facility was erected, the hydroisolation of the storage was renewed, and all radium applicators in the storage were conditioned and repacked.

The new auxiliary building (Fig.1) serves as a store for equipment and tools needed for waste accepting and handling. Due to the lack of an auxiliary room in the storage, additional room was urgently needed for the renewal and modernization of the storage.

In June 2001 treatment and conditioning of the spent sealed radium sources was performed in co-operation with the IAEA. Most of the sealed radium sources were already stored in the storage, and some were additionally collected from producers. The project was realized through technical assistance of the IAEA. All radium sources were first welded into steel capsules, which were inserted into a specially designed lead container. During the activities 730 mg of Ra was conditioned. Two lead containers were filled up and then repacked into a 200 L steel drum with concrete matrix. By repacking the radium sources the working conditions in the storage are being improved.

In the autumn we started with the more complex maintanance activities on the storage facility itself. The old and damaged hydroisolation on the roof and walls of the facility, causing the leaking to the storage, was completely removed and replaced with new, two-layered hydroisolation. Pre-conditions for refurbishment activities in the facility are now ensured.

## 4 REFURBISHMENT OF THE BUILDING

### 4.1 Ventilation system

The ventilation system in the storage consists of two fans installed in the 40 cm diameter and 3 m high ventilation shafts, being positioned at the back of the storage, and the grid for outside air intake at the bottom of the entrance gate. The ventilation by natural convection is provided by the 6 m height difference between the air-grid and the outlet of the shafts, the ventilators (each of the power of 160 W) provides the forced convection.

The capacity of the ventilation system is insufficient. In a forced convection regime the exchange rate of air in the storage is slightly above one exchange per hour. Because the air intake is not provided in the sections but only in the central corridor, the efficiency of the ventilation is additionally reduced by walls, separating the sections. The quality of filters at the outlet of the shafts is not known. Since they are fixed, control or replacement is not possible.

The capacity of the new ventilation system will provide four exchanges of air in the storage per hour, thus reducing the ventilation time. In the regime of forced convection the air intake will be installed at two different levels: above the floor and below the ceiling of each section. The ventilation system will be provided with a new filter unit for filtering the discharged air, placed in a small engine room at the back-end of the storage. The required

filtering efficiency will be achieved with a series of three different filters. Heating of filters in case of low temperatures will also be provided and replacement of filters will be eased. Swithching on the ventilation system will be made possible also by remote control from ARAO headquarters.

### 4.2 Electric supply system

The storage is provided with a simple electric supply system for lighting, for heating and for running the ventilation system. Each storage section has a light, fixed to the ceiling. These lights represent an obstacle for handling the waste and filling the sections with waste in several layers. Electrical heating is provided only in the auxiliary room. Two electromotors are used for driving the ventilators. The electric installation is time - worn and does not meet present requirements.

It is planned to replace all electric installations with the new, fire-resistant one, meeting present requirements. It includes also the telephone and computer installations and fire and physical protection alarm systems. The lighting is redesigned: the lights will be replaced from storage sections to the main corridor. The switches for turning on the lights in individual sections will, for practical reasons, be placed on the central panel in the entrance section.

### 4.3 Sewage system

The new, redesigned sewage system will collect all liquid discharges from the storage in a one drainage-tube, leading to a tank in front of the storage. Two shafts to the tank will permit the control of discharges.

### 4.4 Fire protection

In order to improve fire protection in the facility, special fire-protection doors will be built in, dividing the controlled area from the auxiliary rooms. Smoke detectors will be installed in each storage section and connected to the fire alarm. In front of the storage the fire-plug will be fitted.

### 4.5 Inventory

By reshuffling and re-arrangement of waste at two or three levels the utilization of the storage could be significantly improved. The pre-condition for re-arrangement is, however, the repacking of waste. At present the waste in the storage is packed in 9 different types of drums: they differ by volume as well as by material. Even wooden and paper packaging is used.

When repacking, it is planned if possible, to sort the waste into compressible and non-compressible, burnable and non-burnable, in order to facilitate future waste reduction. Volume optimization is possible also by repacking spent sealed sources by joining the sources of the same type in one container. However, limits are set by the ALARA principle.

After repacking, the waste will be re-arranged. It is planned to emplace the repacked waste in several layers (2 to 3). The scheme of the new arrangement is shown in Fig. 5. After re-arrangement several sections will be released for acceptance of new waste, as shown in Fig. 6. Further reduction of waste volume will be possible only after providing possibilities for waste treatment and conditioning.

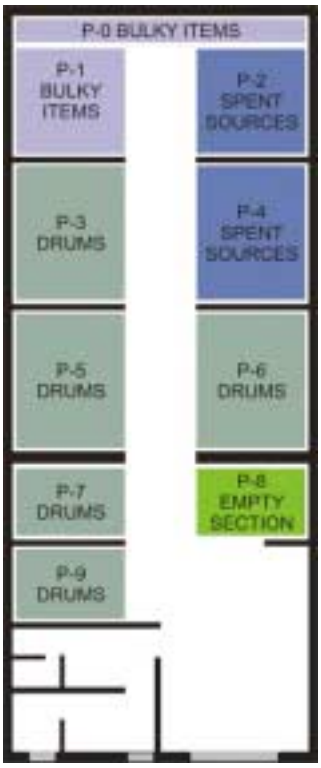


**Figure 5 :** The scheme of new arrangement of waste in the Central Interim storage.

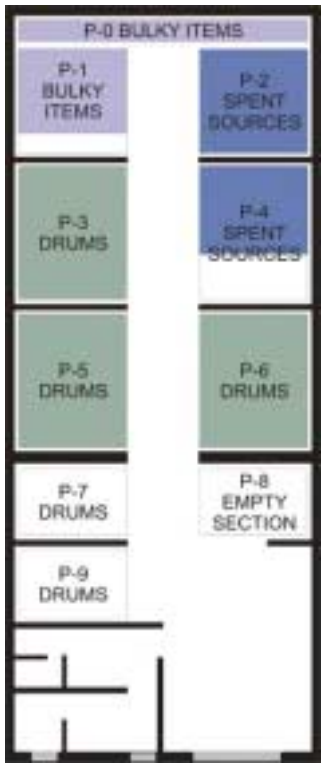


**Figure 6:** After repacking and rearrangement of waste several sections in the storage will be released.

## 5 FUTURE ACTIVITIES

In 2001 the project documentation and implementation projects for reconstruction and modernization of the storage facility and for repacking and rearrangement of the waste were completed. Before the implementation the administrative procedure to obtain the licences from the competent authorities needs to be accomplished and the licences granted. The licencing procedure has already been initiated. Before final approval, the Final Safety report for the storage should be supplemented and the environmental impact assessed. The licencing procedure is expected to be concluded by the end of 2002.

According to the time schedule the reconstruction works should start in 2003. The nature of renewal and reconstruction works in the storage needs to be performed simultaneously with all remedial and reconstruction works, first in one storage section then in the next. Careful planning, good preparations and efficient co-ordination of all activities are essential for successful implementation. However, financial resources are a precondition for all these activities. It is hoped that the budgetary funds will be sufficient to cover the needs for refurbishment and reconstruction of the storage.

In parallel to these activities the plan for the treatment and conditioning (T&C) facility is also being prepared. Already in 2000, the basic needs were identified and the conceptual design prepared. The planned T&C facility is adapted to relatively small quantities to be treated and conditioned. It will provide simple but efficient treatment, such us sorting and

compressing the waste and conditioning by cementation. The more costly options, like burning the waste, are being investigated in co-operation with some other waste management organisations. Within the T&C facility, special room will also be provided for waste acceptance and for performing different measurements, which have not been possible so far because of the high background in the storage.

## 6 CONCLUSIONS

To provide further safe and reliable storing of waste being generated by small producers in Slovenia, the refurbishment and reconstruction of the Central Interim storage in Brinje needs to be accomplished. After successful completion of most urgent maintanance works last year, in 2002 the project documentation for major refurbishment and reconstruction works in the storage was completed. It covers the renewal and reconstruction of the ventilation system, electric installation, fire protection, sewage and water supply system, remediation of defectiveness on the facility construction and repacking and rearrangement of the waste. The licencing procedure has already been initiated and it is hoped to start the reconstruction activities in 2003.

In parallel to these activities plans for the treatment and conditioning facility are being developed as well. It will provide the treatment and conditioning services for small producers, which are required by special governmental decree and need to be provided by ARAO.

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