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Upgrading of cobalt 60 in temporary pool for dry storage irradiation Facility SIBO INRA/Tangier Morocco

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Introduction

Gamma irradiators may be divided into two types: self-contained and panoramic irradiators. Self-contained irradiators are specially designed for research and applications that need small doses and relatively small throughputs. A large majority of these are dry-storage irradiators and the source activity is limited. For full commercial-scale irradiations, panoramic irradiators are used. The focal point of the panoramic irradiator is the irradiation room where the product is treated with radiation. Access to this room is strongly controlled and the radiation source is fully shielded when not in use. In general these irradiators are wet storage. To upgrade cobalt in this kind of irradiators the cobalt is shipped in supplier container and transferred in the pool to the source rake of the irradiators.

For dry storage upgrading of cobalt is done in supplier facility by shipping the container of cobalt to supplier.

The transport of the cobalt 60 container is important in upgrading of cobalt 60 operation in our Irradiation facility Station d'Ionisation de Boukhalef (SIBO).The facility is a panoramic irradiator with dry store of cobalt 60 in a container used also as transport container in the first loading. We have been faced on a problem of the transport of the container and we need to find a solution to upgrade the cobalt 60.

The objective of this paper is to show a case study experience this operation has been considered as success story in by IAEA and opened the door to similar irradiators witch have the same problem in other countries. And also was a real application of nuclear security system installed in the facility and during the transport of cobalt 60,

Phase 1
Preparation of the site and the irradiator

Installation of the temporary water pool

When the cavity in the ceiling of the bunker is open, The bunker will be emptied and the water pool will be installed. The stainless steel wall thickness of the pool will be 4 mm that will allow an easy and safe welding procedure to be carried out by supplier's qualified welder. The completed pool is checked then filled with demineralized water.

Romoval of roof Cover and plug

Removal of SV-68 container

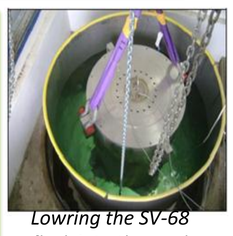
Checking the container Plug

Then the Existing sources from the SV-68 irradiation will be unloaded allowing technical check up on. The SV-68 storage flask is located in the center line of the bunker exactly under the round-shape roof plug. The roof plug is a single item of one piece. The thickness of the ceiling and the roof plug is 1.3 meter.

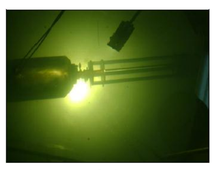
When the water pool is installed and proved as leak-proof, the SV-68 irradiator flask is placed into the pool. Prior to taking the flask into the pool the old sources in the flask will be checked for contamination. For this reason a certain small volume of deionized water is filled into the SV-68 flask then the water is released through the drain plug of the flask for radiation measurement

Removing the source drawer from the SV-68 flask

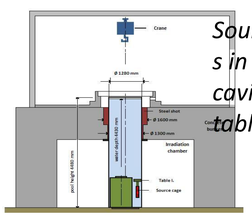
When the SV68 flask is inside the pool, its top plug (source drawer) will be removed carefully ,. Since it holds the existing two sources, this part is carefully placed to the cavity of Table I. in the pool .



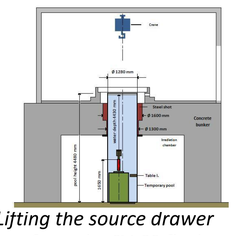
Lowring the SV-68 flask into the pool



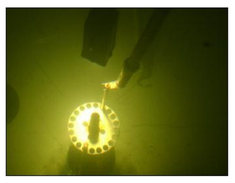
Manipulation of the source basket (holder)



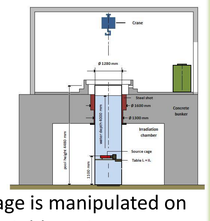
Source s in to cavity table I



Lifting the source drawer out from the SV-68 flask



] Removal of sources from the open basket



Source cage is manipulated on the entire table system

Removing the SV-68 flask from the pool and manipulation of the sources

As soon as the source drawer holding the source cage is safely and firmly located on Table I., the SV-68 flask is carefully removed from the pool. When the SV-68 flask is off, a second part of the table system is installed. These two tables together will completely cover the surface of the pool, and will provide stabile and properly horizontal surface for source manipulation. The sources will be manipulated from the top of the pool with bars and remote tongs

The sources is removed from the cage (source holder) and placed in the cavity of Table I specially designed for this purpose. Then source cage (holder) of SV-68, free from radioactive material, is taken out from the pool for investigation. At the same time the two old sources are placed in a new, temporary source holder provided. Then Table II is removed and the SV-68 flask placed back into the pool again. The two old sources are placed into the SV-68 flask then the flask is closed with its own top plug. The SV-68 flask will be removed from the pool and left on the top of the bunker in the technical room until Phase 2 begins. The water is removed from the pool depending on the expected arrival time of the new sources.

Phase 2
Loading the new sources in the irradiator

When the two supplier transport containers arrive to Morocco Casablanca airport they have been transported by road under security and escort of Gendarmerie royal and National security and the control of National center of radioprotection to the INRA site in Tangier, they have been lifted to the technical room one by one.

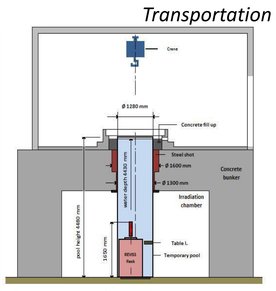
B(U) Type Transport packaging at the airport

Transportation of the sources to Tangier

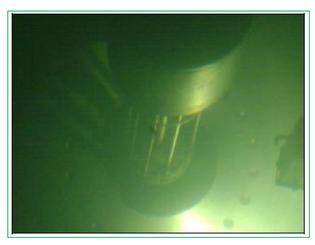
B(U) Type Package dismantling

A smear test on the external surface and a leak test on the content done on both packages to prove that neither external contamination nor leakage of the sources occurred. Then the temporary pool will be re-checked, filled with water. The water level and quality will be maintained precisely. one of the supplier containers will be lowered into the pool .

The proper water level maintained during the sinking process. The top plug of the supplier transport container removed and the new 3 source pencils removed from the cavity of the transport container. The sources moved with their own source cage provided by SUPPLIER The sources placed into the cavity of Table I. The same procedure will be rotated with the second supplier transport container either.

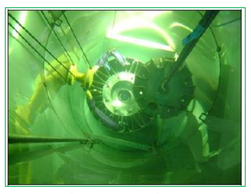


Removal of the fresh sources from supplier transport container



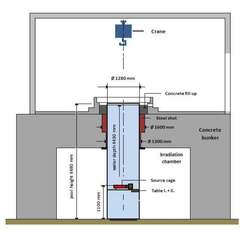
Source Assembly is placed into the cavity ofSV-68

When all the sources are installed in the source holder of the SV68 irradiator, and the holder is fixed to the top plug of SV-68, the plug + holder assembly will be placed in the cavity of Table I. Then Table II will be removed from the pool and the SV68 flask will be put back into the pool. Then the source holder will be taken back into the SV68 irradiator flask.

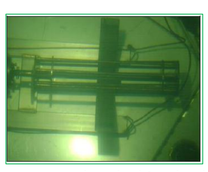


Unloading sources from supplier container

As soon as all 6 new sources are loaded in the pool, the SV-68 flask placed into the pool. The two old sources taken out and put on the cavity of Table I. all the 8 sources are collected on Table I., Table II will be installed and the source cage of the SV-68 irradiator placed onto the table system



Source loading is carried out on the table system inside the pool



All the 8 sources are loaded in the basket

Interior of the irradiator

Removal of the temporary pool and reconstruction of the original configuration

Following the successful loading of all the sources in the SV-68 flask, is removed from the pool then the water, checked for contamination. The clear water pumped out from the pool then the pool removed from the cavity of the bunker.

The SV-69 flask placed in its original position and all equipment installed as in original situation and checked for proper operation.

Radiation protection considerations and dose assessment done in accordance with regulation involved in the job

All licenses for importation and transport has been prepared with all authority

Conclusion

This operation has been done with success and also the supplier empty container has been returned within one week with great assistance of National center of radioprotection and the National security department and Gendarmerie royal for the transport and during the operation. It has been considered a success story of the year 2014 during the general conference of IAEA.

This operation opened the door to similar irradiators witch have the same problem in other countries. And also was a real application of nuclear security system installed in the facility and during the transport of cobalt 60.