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Experience on an incident with a spent sealed radioactive source melted in a metal recycling facility

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TM on Radiation Safety in the Scrap metal and Recycling industry

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Experience on an incident with a spent sealed source in a metal recycling facility

A mining enterprise, missed a spent sealed radioactive source in the moment they were checked by regulatory authority.

Initial activity :
3,700 [GBq]
year : 1992.

The bookkeeping indicated that it could have been sent among metallic waste material to a re-use and recycling industry

There were 2 recycling facilities in the neighborhood, they became suspected

- Radioactive material specialists were notified after one year, to initiate the search.
- Measurements made by using a detector (Szintomat and others) at the metal recycling factories, helped to individualize one of them, and to suspect that the source could have been melted there among recycling metallic material.

- Once the factory was identified, measurements were done outdoors, indoors, offices, operational areas for cutting, blast furnace, yards and sites where metallic material was joined.

- Inside the factory, dose radiation registered from 80 to 100 [nSv/h] at offices and operational areas of the factory

Dust from ventilation system

- The highest radiation dose was found in the yard, where the dust from the ventilation system of the blast furnace was stored to be managed as industrial waste.

- The dose radiation found at this yard was 200 till 350.000 [nSv/h] where a total of 3000 drums were kept containing the dust from the filter of the ventilation system

Drums containing waste (dust from the furnace ventilation system)

- After four years of the event, the radioactive waste management specialists were required to find a solution, the source should have an activity of 2,809[GBq].
- The radioactive material had been confined into drums making a total of 29 containers in the yard, whose dose radiation level was higher than natural background level.

Radioactive waste management

- Radioactive waste management addressed to segregate and minimize the amount of radioactive dust.
- It was programmed between the Quality and Environmental Managers of the two involved enterprises and Radioactive Waste Management Specialists

Deployed activities for Waste Management

Aspect of segregated drums with high Dose radiation to the contact

- **Antecedents evaluation**
- **“In situ” equipment used**
- **Foundry workers training**
- **“In situ” waste evaluation**
- **Sample from Segregated containers**
- **Waste classification**
- **Radioactive waste :**
  >, = 74Bq/g, filter dusts to be transported to RWM laboratory

Transferring from corroded drums

Advertisement tapes, personal dosimeters and protection elements were also taken to the place.

- To take dust samples from 200 [l] drums, an earth borer was used with a piston rod long enough to extract the necessary quantity of material, which was about a 10 % of the total amount contained in the drum.
- A detector, Radiation Alert for Gamma radiation, with measurement range between 0 – 500.000 [nSv/h] was used to determine the first step in the quantification of Cs-137.

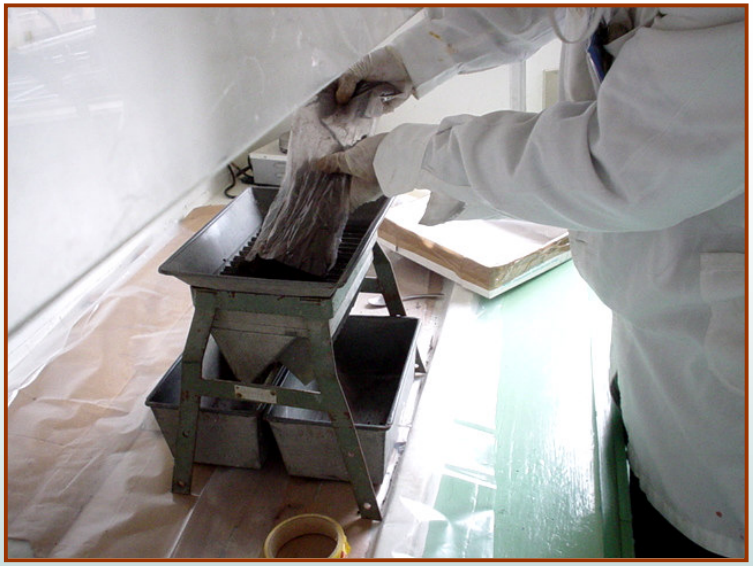
Sample from Segregated containers

- **Primary Selection**
- Material was drawn out drum in three portion: the top, middle and bottom portion, making separated and identified primary samples to be analyzed. Every portion was about 180 [Kg] (app 40 [l])

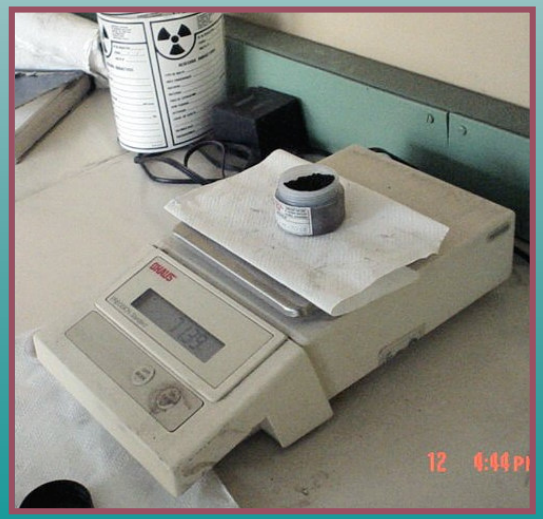
- **Homogenizatio**n
- The material was agglomerated and very hard to be handled at laboratory. An homogenization was applied to every separated portion of powder. Material was displayed on a tray, to apply the quarter method for sampling.

Samples treatment

- **Consecutive selection**
- Once homogenized, a quarter part of the powder was chosen from the displayed slag on the tray, to be introduced into a selector device, as shown in Fig. 2 “Preparing the representative sample to be analyzed”.
- **Sample obtainment**
- Material was segregated successively every 1500[g], till finally to get a sample of 150[g] from which app. 75[g] mass sample was obtained, and put into a vessel of 40 [cc] with the calibration geometry shape to be measured at a gamma spectrometer Oxford Prospector.



A quarter amount of each tray was put in the selector, where material was consecutively separated to obtain a representative sample to measure the activity concentration in Cs-137



Volume minimization

- Following the agreement of managing as radioactive waste solely the filter dust classifying as radioactive material, the mixture of portions with similar activities concentration was made and a total amount of 1500 Kg of filter dust with an activity of 512,4 KBq was selected to be treated as radioactive waste.

Conclusion

- A good registry of radioactive material and related matters, is the key to follow the trace when an incident with this SSRS occurs.
- The delay in reporting and decisions making since the incident occurred, is a fact that remain present in the event reported:
  - Radioactive waste management was focused to the dust filter from furnace ventilation system contained, after 4 years.

- So, the purpose was to minimize the quantity of dust to be treated as radioactive waste.
- The segregation of radioactive dust, activity quantification and mixing the material that presented equal or similar activities gave as result to reduce volume to a 20%.
- The recommendation of installing a radiation detector at the entrance of the metal recycling facilities is being adopted by some enterprises.
- An effective control form the regulatory body helps to diminish this threat.