Regulation of radioactively contaminated scrap metal recycling

National Nuclear Regulator, South Africa

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Talk Outline

1. Introduction -Why regulating radioactive scrap material

2. Authorisation (COR) conditions

3. Regulatory approach to scrap management

4. Conclusion - Regulatory Challenges

Why regulate radioactive scrap material

- There has been movement of radioactive scrap prior to the promulgation of NNR Act, Act 47 of 1999.
- This practice led to most sites radioactively contaminated unknowingly (38 sites)
- In 1993 radioactive scrap material was exported to UK where the presence of radiological contamination was confirmed

Authorisation (COR) Conditions

- Scope
- Operational Radiation protection programme
- Radioactive waste management
- Transportation
- Physical Security
- Accidents and Incidents
- Quality Management

SCOPE

- Map of the authorised site with GPS coordinates
- Authorised activities:
  - To handle and load radioactively contaminated scrap metal onto trucks from mines (ferrous and non-ferrous).
  - To convey the radioactively contaminated scrap metal from the mines to their authorised site.
  - To offload the radioactively contaminated scrap metal and store them at their site.
  - To monitor, screen and decontaminate the radioactively contaminated scrap metal.

Operational Radiation Protection Programme

- The holder must notify the NNR of the appointments:
  - Radiation Protection Specialist (RPS)
  - Radiation Protection Officer (RPO) or Radiation Protection Monitor RPM).
  - Responsible Person and an alternate.
- The Responsible Person must ensure compliance with the conditions of this authorisation.
- The NNR must be informed immediately of any change of personnel by the Responsible Person

ORPP continues

- Personnel carrying out actions in the area must wear gloves, boots and overalls that may not be removed from the authorised site.
- The holder must submit to the NNR, for approval, a programme to provide reasonable assurance that skin contamination on persons leaving the area, and prior to them eating, drinking and smoking, is removed to levels below the following limits:
  - Alpha emitters : 0.04 $Bq.cm^{-2}$
  - Beta and gamma emitters : 0.4 $Bq.cm^{-2}$

  (averaging over 300 cm^2 is permitted when monitoring for such contamination).

ORPP Continues

- The areas must be suitably demarcated and appropriate warning signs must be displayed at the access points to the areas.
- Personnel whose duties require access to the areas must be designated as occupationally exposed person. Such personnel must:
  - be eighteen years of age or older,
  - be given instruction in the nature of radiation hazards, the principles of radiation protection and appropriate facility procedures controlling radiation hazards
  - be medically examined in accordance with an approved protocol
  - have their personal radiation doses assessed.
- A Radiation Dose Register which records the dose to occupationally exposed persons must be maintained. This register must be retained by the holder for a period of fifty years from the date of the last entry, unless otherwise directed by the NNR.

ORPP continues

- On an annual basis, the RPM must conduct an open-probe, beta-gamma, on-contact survey of the areas on a 5 m^2 grid with a surface contamination monitor.
- Records of these surveillances must be maintained and kept.
- The holder must submit to the NNR for approval, a surveillance programme for the purpose of individual dose assessment.
- The holder must submit to the NNR for approval, a procedure to be followed in the event of the specified set-point of the drive-through gamma dose-rate monitor or other appropriate monitoring device being triggered, as well as all documentation related to the calibration and operation of the monitoring device.

Radioactive waste management programme

- The identification of wastes with a specific alpha (U-238, U-234, Th-230, Ra-226, Po-210, Th-232 and Th-228) activity concentration above and below 1000 Bq/g;
- The collection, segregation, classification, categorisation, storage and/or disposal of the radioactive waste;
- A system of record keeping which details the content of all packages of radioactive waste, the nature of the packaging material as well as the location of storage and/or disposal.

Waste Type and Typical Waste Description	Categorisation	Limits	Management Options
Homogenous Process Waste Slimes material Calcine Pyrite Badelyite	**Category I**	Specific α activity: Not > 100 Bq/g	• May be released to a authorized facility • May be stored on site • May be placed directly on slimes dams/waste rock piles etc
	Category II	Specific α activity: >100 Bq/g but Not > 1000 Bq/g	• May be released to a authorized facility • May be stored on site • May be placed on slimes dams/waste rock piles etc following a process of dilution of at least 1:10
	Category III	Specific α activity: > 1000 Bq/g	• Must be stored on a authorized site in approved storage facility

Waste Type and Typical Waste Description	Categorisation	Limits	Management Options
	Restricted Waste	Activity concentration > 10 Bq/g	• Must be stored on a authorized site in an approved storage facility
Discrete Process Waste • Timber • Plastics • Rubber	Cleared waste	Specific α Contamination: Not > 0.04 Bq/cm^2 Specific β/γ contamination: Not > 0.4 Bq/cm^2	• May be released to an un-authorized facility • May be stored on site • May be released to a authorized site
	Conditionally Cleared Waste	Specific α Contamination: Not > 0.4 Bq/cm^2 Specific β/γ contamination: Not > 4.0 Bq/cm^2	• May be released to a authorized facility May be stored on site
	Restricted Waste	Specific α Contamination: > 0.4 Bq/cm^2 Specific β/γ contamination: > 4.0 Bq/cm^2	• Must be stored on a authorized site in an approved storage facility

Waste Type and Typical Waste Description	Categorisation	Limits	Management Options
Discrete Process Waste Scrap	Cleared waste	Specific α Contamination: Not > 0.04 Bq/cm^2 Specific β/γ contamination: Not > 0.4 Bq/cm^2 **They may be cleared to use by the members of the public**	• May be released to an un-authorized facility • May be stored on site • May be released to a authorized site
		Option 1:	
		Specific α Contamination: Not > 0.4 Bq/cm^2 Specific β/γ contamination: Not > 4.0 Bq/cm^2	• May NOT be released to an un-authorized facility • May be stored on site • May be released to a authorized site
		Option 2: Applicable to uranium contaminated scrap metal ONLY	
		Activity concentration prior to washing is less than 10 Bq per gram total activity	• May be released to a authorized facility or smelter • May be stored on site NOTE: Applies to uranium contaminated scrap metal ONLY

Transport

- Governed by the IAEA Transport regulations (TSR-1)
- Placarding
- Emergency situations
- Annual reports are submitted to the NNR including the number of consignments, radioactive content per consignment, nature of the packaging and the names of the consignees

Physical Security

- Protection of scrap material by:
  - Ensuring no authorised removal of radioactive material from the authorised site.
  - Fencing off of the authorised site
  - Presence of security personnel
  - Use of surveillance cameras

Accidents and incidents:

The NNR must be notified forthwith of the following:

- transport accidents involving radioactive material;
- triggering of the specified set-point of the alarm on the drive-through bulk gamma dose-rate monitor or equivalent monitoring device;
- personal injury involving equipment contaminated with radioactive material;

Quality Management

- Record keeping
- System of ensuring proper management and control of monitoring equipments
- Self Inspection

Regulatory approach – Scrap management

RADIOACTIVELY CONTAMINATED SCRAP AT NON AUTHORISED FACILITIES

- Identification by NNR Inspectors during inspection or from the members of the Public
  - ✓ Details of origin required for return, or
  - ✓ Dealer must lodge application to the NNR for Certificate of Registration, or
  - ✓ Procure the Services of Radiation Specialists to assists them with the removal of the scrap material from their site

RADIOACTIVELY CONTAMINATED SCRAP AT NON AUTHORISED SMELTERS WITH DRIVE-THROUGH MONITOR

- If the scrap is from an authorised facility, then the scrap to be returned to the sender.NNR notify immediately by the receiver and follow-up with the sender for the violation of COR conditions

RADIOACTIVELY CONTAMINATED SCRAP AT NON AUTHORISED SMELTERS WITH DRIVE-THROUGH MONITOR conti....

- If the sender is not authorised, and the level of contamination is not much above background (smelter to provide this info), then scrap to be forwarded to an authorised smelter. NNR to follow-up with the sender as to the origin, and with the authorised smelter to ensure that the scrap has been received and that their alarms were not triggered.

- If the sender is not authorised, and the level of contamination is suspected to be above the levels allowed to be accepted by an authorised smelter, then the contamination can also be due to an artificial source.

- Then NNR requests the truck to be retained and barricaded at the smelter site where the contamination was detected. The NNR then informs the DoH and also requests the smelter site to obtain the services of an RPS to investigate the truck load. The NNR will also trace the origin of the contamination. Sometimes via a number of providers and transporters and take appropriate enforcement actions .

- It must be noted that any report of radiation above alarm levels at a drive-through monitor, could be the result of a sealed source, which if melted and the shielding is destroyed, could lead contamination of the smelter, thus preferably all incidents of alarms should be investigated by DoH.

Regulatory Challenges

- Illegal mining
- Orphan “radioactive” sources normally found in the scrap material
- Trans-boundary movement of this material