

NORM Regulations: Practical Implementation in Industries

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| Verantwortung für Mensch und Umwelt |

Background

- Directive 96/29 EURATOM (European Basic Safety Standards)
- Systematic investigations to identify relevant processes & materials
- Radiological criterion: 1 mSv/a (in addition to natural background) to members of the public
- Results:
 - only re-use or disposal of particular industrial residues relevant (surface / underground disposal, road construction, landfilling ..)
 - Radionuclides: U-238 and Th-232 series (K- 40 not relevant)
- List of residues needing control - Radiation Protection Ordinance (RPO - 2001) - **Selectivity of protection**

Controlled Residues

(shortened)

- **Sludges and scales from oil and natural gas extraction,**
- **phosphogypsum; sludges, dust, slags from the production / processing of raw phosphate,**
- **waste rock, sludges, sands, slags and dusts from the extraction and preparation of bauxite, columbite, copper shale, tin, ...**
- **Dust and sludges from the off-gas cleaning of blast furnaces in raw iron and non-ferrous metal processing**

Exemptions:

- if used in the processes as raw material
- $C < 0.2 \text{ Bq/g}$

Control Limits

No control necessary if

$$C_{U238_{\max}} + C_{Th232_{\max}} \leq C$$

C - ,Control limits‘, depending on disposal or re-use option

Examples:

- C = 1 Bq/g as general control limit
- C = 0.5 Bq/g if > 5,000 t disposed of within the catchment area of an aquifer which can be used
- C = 5 Bq/g for underground disposal

Release from Control (1)

If $C_{U238_{\max}} + C_{Th232_{\max}} > C$ \Rightarrow Formal release from control !

Precondition: $D < 1\text{mSv/a}$ (members of the public)

site specific dose assessments (realistic scenarios, parameters, models)

paths:

- External exposure to gamma - radiation
- Inhalation of contaminated dust
- Ingestion of locally produced food (incl. drinking water)
- Direct ingestion of contaminated soil (children)
- Inhalation of radon and its decay products

Release from Control (2)

Simpler approach if disposed of together with other residues or wastes:

$$C_{U\ 238_{\max}}^M + C_{Th\ 232_{\max}}^M \leq C^M$$

Mean specific activities of all material disposed of within 12 months

C^M depends on characteristics of the disposal site

Examples:

- **0.05 Bq/g for surface disposal; A > 15 hectares**
- **5 Bq/g for underground disposal**

If $C > 10$ Bq/g: dose assessment obligatory!

Contents of the Regulations - Summary

- **Selectivity** of regulations – ‚positive list‘
- Concept mainly based on **self-control** of the industries – no authorisation required!
- Regulatory control only if control limits ‚C‘ are exceeded
- special paragraph: puts the authority in the position to order radiation protection measures also for other materials (if $D > 1 \text{ mSv/a}$)

Example: Scales from Oil & Gas

Residues from
oil & gas extraction



- Scales and sludges with $C_{\text{Ra-226}}$ up to 1,000 Bq/g
- In Germany: 10,000 t of scrap per year, containing 1,000 tons of scales
- $C \gg$ Control limits \rightarrow to be released from control!
- Different disposal options

Example: removal of scales, immobilisation (geopolymers)

$$\underline{D < 1 \text{ mSv/a}}$$

Experience with Self - Control

Normally, no personnel qualified in radiation protection

➔ assistance provided by consultants, authorities (guidelines etc.), industrial associations ..

➔ Industries can solve problems !

BGI 746

Umgang mit thoriumoxidhaltigen Wolframelektroden beim Wolfram-Inertgasschweißen (WIG)

(bisher ZH 1/522)

Vereinigung der Metall-Berufsgenossenschaften
2002



Vorwort

Die vorliegende BG-Information wurde mit Unterstützung des Arbeitskreises "Schadstoffe in der Schweißtechnik" im Fachausschuss "Metall und Oberflächenbehandlung" der Berufsgenossenschaftlichen Zentrale für Sicherheit und Gesundheit – BGZ des Hauptverbandes der gewerblichen Berufsgenossenschaften in Zusammenarbeit mit dem Fachbereich "Strahlenschutz" der Berufsgenossenschaft der Feinmechanik und Elektrotechnik aktualisiert und wird von der Vereinigung der Metall-Berufsgenossenschaften in neuer Fassung herausgegeben.

Die Aktualisierung des bisherigen Merkblattes "Umgang mit thoriumoxidhaltigen Wolframelektroden beim Wolfram-Inertgasschweißen (WIG)" (ZH 1/522) aus dem Jahre 1998 wurde aufgrund der Novellierung der Strahlenschutzverordnung erforderlich. Die Neufassung berücksichtigt die diesbezüglichen Forderungen aus der neuen Verordnung.

Diese BG-Information richtet sich in erster Linie an den Unternehmer und soll ihm Hilfestellung bei der Umsetzung seiner Pflichten aus staatlichen Arbeitsschutzvorschriften, Unfallverhütungsvorschriften und ggf. Regeln geben sowie Wege aufzeigen, wie Arbeitsunfälle, Berufskrankheiten und arbeitsbedingte Gesundheitsgefahren vermieden werden können.

Sie enthält Hinweise zum sicheren Umgang mit thoriumoxidhaltigen Wolframelektroden für das Wolfram-Inertgasschweißen und beschreibt die notwendigen Schutzmaßnahmen, die ergriffen werden müssen, um mögliche Gefährdungen beim Umgang mit diesen Elektroden auszuschließen oder auf ein vertretbares Maß zu minimieren.

Unintended effects

Increasing public awareness → even some industries not directly concerned with the regulations care about RP:

- **portal monitors at disposals**
- **fears of image loss**

Example: waterworks

Example: Gravel Filter from a Waterworks

- 20 tons gravel filter
- $C_{\text{Ra-226}} > 1 \text{ Bq/g}$

No controlled residue, but operator insisted on formal release (food supplier, fears of image loss)



Example: Use of Slags from Copper Shale Processing

Large dumps of slag in the Federal Land of Saxony - Anhalt

Traditional use: road construction

But: since known to be ,radioactive‘:

- authority would not allow use on the grounds of ,Optimization‘

Now (RPO of 2001): material can be used again (clear legal basis)

Experience with Selectivity

- **specification of residues to be controlled is suitable to confine regulatory and practical effort !**

Problem: changing industries, raw materials, processes

→ list not up to date! Need for updates !?

- **specification of residues partly not precise enough**

example:

‚residues from the extraction and processing of bauxite‘

Example: Residues from bauxite processing

Processing of bauxite
to aluminium oxide

→ red mud

— 630,000 t/a

— Ra-226 up to 1.6 Bq/g

But:

**Blast bauxite also
within the scope ?**



Some Problems

A variety of problems have been solved or at least reduced, e.g.:

- **Representative sampling of residues → recommendation of German Commission on Radiological Protection!**

Other questions still open, e.g.

- **Transboundary import / export (need for harmonization?)**
- **Control Limits tend to be considered as being independent of the ‘positive list’**

Summary

- **The concept of self – control of the industries works properly, but industry needed assistance (professional associations, consultants ..)**
- **Selected residues partly not up to date → more flexible approach?**
- **All in all NORM regulations form an important contribution to ensure adequate radiation protection of the public in this field**