

BVS - NVS 28-10-2011

NORM legislation  
in the  
Dutch E&P practice



# NORM legislation in the Dutch E&P practice

## Introduction:

**Hans Struik:** General Radiation Expert for NAM BV.

**NAM:** Nederlandse Aardolie Maatschappij BV.

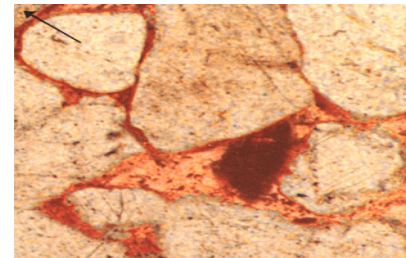
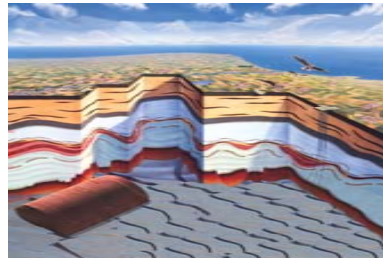
- Largest producer of natural gas and (recently) oil in the Netherlands;
- 81 facilities where NORM deposits (sludges / scales) are identified;
- Situation requires a permit within the Dutch legislation wrt. Nuclear energy (Kernenergiewet).
- Complex permit covers large number of facilities; requires specific organization for Radiation Protection including Expertise (level 2 / level 3) and adequate company regulations; Permit results in relative independency to manage radiation issues

# NORM legislation in the Dutch E&P practice

NORM: Naturally Occurring Radioactive Materials

LSA: Low Specific Activity

Origin:



Presence in the installation (example)



Small traces of natural radioactive materials migrate with the gas flow and settle in production tubing in wells or in process installations to measurable (MP or VP) concentrations.

# NORM legislation in the Dutch E&P practice

## How to find??

- Contamination checks (inside installations) according to monitoring program;
- Comparing actual count rate with local background count rate;
- Attention for changing production parameters; increasing liquid production.

## High count rate readings to be investigated by:

- Sampling of solids (scales or sludge) and liquids;
- Gamma spectrometric analysis by specialized laboratories; analysis results to be compared with limit values in Dutch legislation.

# NORM legislation in the Dutch E&P practice



← Contamination monitor  
RADOS Microcont H13422  
with NORM-1 probe (RPD-1)

Reading display in cps (counts/second)

Measurement of radiation level:  
indicative measurement



# NORM legislation in the Dutch E&P practice

## Dutch legislation

KEW / Besluit stralingsbescherming:

Table in appendix presents limit values for:

- Activity concentration per nuclide [Bq/g]
- Activity per nuclide [Bq]

For NORM there is an additional criterion:

- Meldingsplicht (Announcing requirement);  
see values in table as mentioned above.
- Vergunningplicht (Permit requirement) at the level of  
10x limit value for MP activity concentration

# NORM legislation in the Dutch E&P practice

## Overview relevant threshold values

Nuclide	MP [Bq/g] limit value	VP [Bq/g] limit value	Total activity [Bq]
$^{226}\text{Ra}$	1	10	10000
$^{210}\text{Pb}$	100	1000	10000
$^{228}\text{Ra}$	1	10	100000
$^{228}\text{Th}$	1	10	10000

NORM in the E&P industry → a combination of nuclides

How to define in case of a mixture of NORM-nuclides??

Formula for weighed sum value (G2-value) =

$$^{226}\text{Ra}_{\text{act.}} / ^{226}\text{Ra}_{\text{lim.}} + (^{210}\text{Pb}_{\text{act.}} - ^{226}\text{Ra}_{\text{act.}}) * / ^{210}\text{Pb}_{\text{lim.}} + (^{228}\text{Ra}_{\text{act.}} / ^{228}\text{Ra}_{\text{act.}})**$$

\* : if  $^{210}\text{Pb}_{\text{act.}} > ^{226}\text{Ra}_{\text{act.}}$  , else: 0

\*\* : if  $^{228}\text{Ra}_{\text{act.}} > ^{228}\text{Th}_{\text{act.}}$  , else:  $^{228}\text{Th}_{\text{act.}} / ^{228}\text{Th}_{\text{lim.}}$

# NORM legislation in the Dutch E&P practice

## How to deal with these values

- MP and VP: no difference in working procedures on site
- MP and VP: no difference in qualification of equipment as contaminated or not contaminated.

## NAM statement:

equipment is radioactively contaminated when  
measured count rate at surfaces:

(onshore) > 2x back ground count rate

(offshore) > 3x back ground count rate

These limit values contain enough reserve to cover:

electronic instability of measuring instruments;

quality of measurements;

internal shielding effects in the radioactive deposits;



# NORM legislation in the Dutch E&P practice

NAM policy:

No contaminated installation parts

or

contaminated (rest) materials like scales and sludges

to be transferred extern NAM unless involved contractor has:

- Accepted MR-NaBIS announcement
- or
- Valid permit

Any reputation damage caused by radiation related issues must be avoided!!

# NORM legislation in the Dutch E&P practice

## Contaminated installation parts options

- Re-use of the equipment in the same or in other (contaminated) installations;
- Decontamination by specialized and permitted service contractor (NRG – Petten);
- Melting of contaminated scrap (Siempelkamp Krefeld BRD).  
During melting process NORM components gather in the iron slag and can simply be separated from the iron.  
The slag can be disposed off in Germany under restrictions.  
The iron can be re-used without any restriction.

# NORM legislation in the Dutch E&P practice

## Contaminated installation parts examples



# NORM legislation in the Dutch E&P practice

## Contaminated rest materials like sludge's or scales

- Naturally Occurring Radioactive Materials;
- Rest materials contain normally certain amounts of CxHy;
- Varying concentrations of Mercury.

This composition restricts the options for end storage.

Preferred process for these rest materials:

- Vacuum distillation (sludge heating): all vaporous components including mercury are removed;  
the residue is inert and can be disposed at a land fill o.e.

For NORM the end storage site needs:

- Accepted MR-NaBIS announcement (for MP)
- Valid permit (for VP)

# NORM legislation in the Dutch E&P practice

Contaminated rest materials like sludge's

NORM sludge in drum before processing →



Residue of NORM sludge after processing →



# NORM legislation in the Dutch E&P practice

## Contaminated rest materials

NAM sludges are processed by DELA Essen, Germany;

DELA is authorized to process various categories of sludges

NL - categories: MP and VP sludges (see table values)

Germany -categories:

- not radioactive, concentration per nuclide < 0,2 Bq/g
- Notification required, concentration per nuclide  $0,2 < x < 5$  Bq/g
- $5 < x < 50$  Bq/g
- $> 50$  Bq/g (--)

Residues of this process return to the Netherlands for end storage.

Qualification MP or VP determines end storage site:

- Nauerna → MP
- A&G- Maasvlakte → MP and VP (G2-value < 100)
- COVRA Vlissingen → VP

# NORM legislation in the Dutch E&P practice

## Future modification of BSS

- All limit values at 1 Bq/g
- Individual countries can chose for exceptions, based on risk evaluations; impact of modification can be minimized.

Effects on way of working on site or working procedures will be minor;

- Difference between MP and VP to be maintained;?

Effects on operational costs:

- If limit values are lowered, more rest materials need to be processed as radioactive; this will raise operational costs.

# NORM legislation in the Dutch E&P practice

## Other wishes

- BSS in line with KeW and Besluit stralingsbescherming  
Europa wide limit values
- ADR in line with Euratom 2006/117  
Reintroduce NORM in Euratom 2006/117
- National legislation to be tuned within Europe;  
Dutch legislation (limits) vs. German legislation (limits) ect.



# NORM legislation in the Dutch E&P practice

