

Radiation safety guide

Naturally Occurring Radioactive Material (NORM)



Introduction

Throughout Australia, awareness of NORM has been increasing. By definition, NORM is associated with uranium mining, milling and exploration activities, with various procedures in place to ensure it is handled safely. However, NORM is occasionally found in the oil and gas industry. In fact, any process involving large quantities of solids, liquids or gases being extracted from the ground have the potential to concentrate radionuclides sufficiently to become classified as NORM.

NORM is usually an undesirable by-product. NORM can also represent a safety issue to workers and the environment. It therefore has the potential to adversely impact a company's real or perceived level of corporate responsibility. By conducting a NORM survey, companies can start to get NORM risk under control.

This document provides a basic overview of NORM. For information regarding NORM specific to your business, please contact SA Radiation.

Regulation of NORM

As NORM is radioactive, its storage, handling, transport and disposal is regulated. The regulatory requirements vary depending on the State or Territory you are in. Once NORM is identified (see below), the owner of NORM has legal obligations they need to comply with. The following document published by ARPANSA provides a broad overview of NORM management, and is sometimes referenced by State and Territory regulators.

<https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series/guides-and-recommendations/rps15>

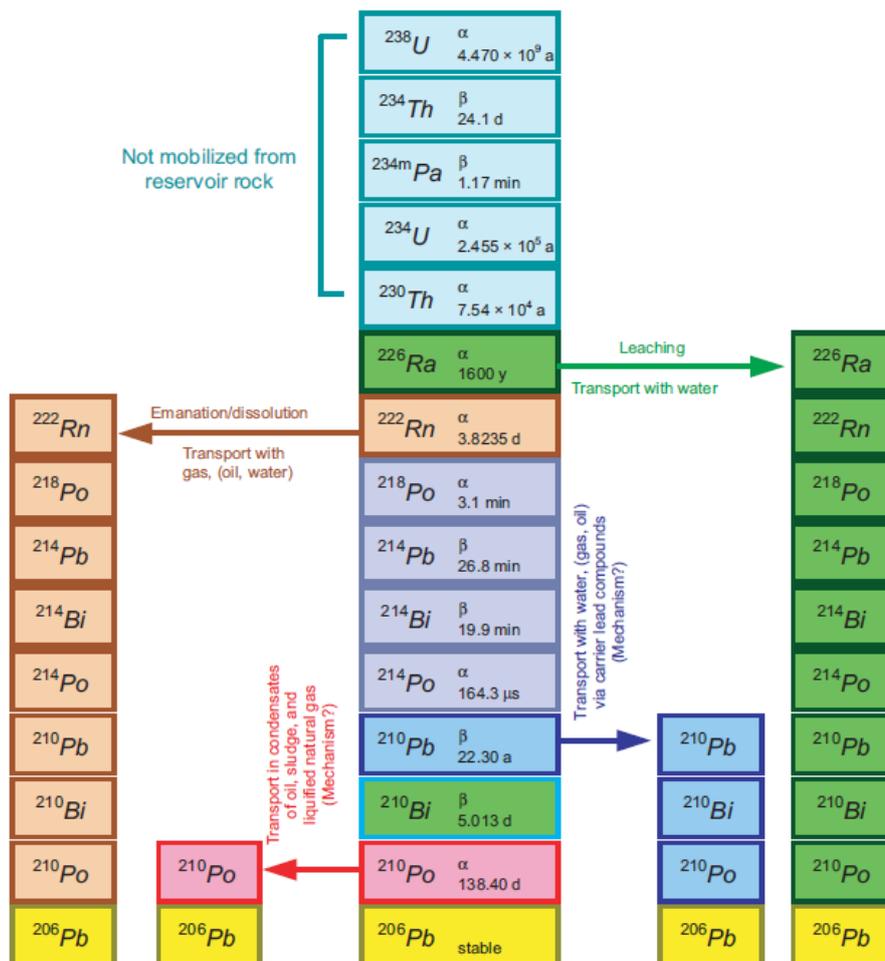
NORM surveys

A NORM survey is designed to determine whether NORM is present, and if it is, the quantities involved, and the concentrations, and the radionuclides present. A NORM survey needs to be planned so that resources are initially directed to the most likely points where NORM would accumulate. If NORM is not detected in these locations, the likelihood of NORM being present is diminished and the NORM survey can be concluded. If NORM is detected, the results will inform the next stage of the NORM survey.

Most States use a radioactivity and radioactivity concentration to define the threshold between material that is considered NORM, and material that is not NORM.

To determine whether material is NORM, a sample needs to undergo laboratory analysis. This can take time to process, and can be expensive. With the adequate radiation equipment, assessments can be done in the field to determine whether material is likely to be NORM, or if the material is not NORM.

Radiation meters suitable for field screening of NORM need to be carefully selected, as the radiation given off by different NORMs vary greatly. The below graphic from the IAEA shows radionuclides from the uranium decay chain, and how they are separated into gas NORM and oil NORM.



NORM from the oil industry include radionuclides that produce a number of highly penetrating gamma rays. Gamma rays can be measured using most radiation meters. An accurate measurement must take into account the specifications of the meter, the geometry of the NORM, and the properties of the vessel in which NORM is contained. Oil NORM inside tanks and pipelines, if in sufficient concentrations, can be identified and quantified without needing to open the vessel or pipeline. Gamma meters can be incorporated in subsea monitoring systems, so that oil NORM can be assessed in situ.

NORM from the gas industry produce weakly penetrating radiation that generally requires the use of surface contamination meters to identify its presence. A large quantity of gas NORM can be present inside a vessel or pipeline and remain undetected as the radiation cannot escape. Gas NORMs can only be assessed when a sample is removed from vessels and pipelines and placed close to radiation meters.

Doses from NORM

Radiation workers are allowed to receive up to 20 mSv per year, while the public is limited to only 1 mSv per year. A few grams of NORM has the potential to deliver up to 20 mSv to a person, depending on the concentration of the NORM, and whether the NORM is inhaled or ingested.

To assess doses from exposure to NORM, laboratory analysis of NORM samples is required, as well as an assessment of the quantity of NORM people are inhaling or ingesting.

There are very few laboratories within Australia that can conduct analysis of NORM to the required resolution and minimum detection level.

Air sampling pumps can be placed in occupied areas, or attached to workers, so that airborne radionuclides are collected. Analysis of the radionuclides on the filters from these pumps, together with the laboratory analysis, provides information regarding the doses workers and the public receive from inhaled NORM.

NORM transport

If NORM requires transport, it will likely need to conform with the requirements of the ARPANSA Code for the Safe Transport of Radioactive Materials (2019), available here...

<https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series/codes-and-standards/rpsc-2>

Oil NORMs in small quantities, and gas NORMs in any quantity, can usually conform with the requirements of an 'Excepted Package'. Excepted packages can be transported with minimal requirements, such as no radiation labels on the package, and no radiation placards

on the vehicle. A number of States do not require the driver of the vehicle carrying an Excepted Package to have a radiation licence.

Oil NORMs in larger quantities will likely need to be transported as 'Radioactive-I' in an IP-1 package. These consignments require radiation labels and placards to be displayed.

Before shipping NORM via road, rail or inland waterway, you should consult the ARPANSA Code, or seek help from a radiation consultant or DG7 transport expert.

NORM disposal

Options for disposal of NORM depends on the State or Territory where the NORM is located. Some States permit the concentration to be blended down to below exempt levels, and then disposed without regard for the radionuclide content to waste facilities. Other States require material to be disposed overseas or to a disposal site outside of the State.

Depending on the State you are in, SA Radiation can arrange for your NORM to be disposed in a manner that is in accordance with the regulatory requirements of your jurisdiction.

Summary

If you are involved in the extraction, processing or transport of raw materials (oil, gas, water, coal, etc), a NORM survey may be worth considering. If NORM is identified,

- Your regulatory requirements regarding licensing, storage, transport and disposal will be determined by the State/Territory in which you operate
- laboratory analysis and environmental monitoring will determine the scope of your NORM issue, and
- your work practices may need to be modified.

SA Radiation operates across Australia, assisting businesses to identify if NORM exists, and to comply with regulatory requirements.

Last updated 25 April 2021.

Disclaimer: This document is based on information from radiation regulators and experience gained by SA Radiation. While every effort has been made to ensure the information reflects current regulatory requirements, SA Radiation takes no responsibility for the accuracy of the information. If in doubt, contact your radiation regulator.