

FACTSHEET:

Wastes from industrial activities

Overview

Radioactive materials are used in industry for a wide range of purposes. Radioactive materials are typically used for the sterilisation of equipment, to examine metal welds and joints, to gauge the thickness of items and in various devices, such as smoke detectors. They can also be used as tracers to assess the behaviour of liquid effluents.

Most of these processes use radioactive sources, which are sealed within metal containers. The source then releases a controlled amount radiation through a small window in the container. They may also use radioactive gases or liquids, contained within glass tubes.

In industry, the amount of radioactive waste produced is small. This waste is generated primarily from the manufacture and handling of radioactive sources and from the disposal of these sources after they have been used.

Use of radioactive materials in industry

Gamma sterilisation

Radioactive sources are used for the sterilisation of equipment in the medical industry, particularly for items that would be damaged by heat sterilisation, such as syringes, gloves, clothing and fine instruments.

The food industry also uses gamma sterilisation, extending the shelf life of products and reducing the risk of food-borne diseases.

Gamma radiography

Similar to X-rays, gamma sources are used to penetrate solid objects to show their internal structure. This is called gamma radiography and can be used as part of quality checks in construction and component manufacturing processes, highlighting any flaws in metal casting or welded joints. Different sources are used for different material thicknesses.

Gauging

Radioactive sources are routinely used to measure the thickness of materials. A radioactive source is directed at the material and a detector placed on the other side. The thickness of the material can then be determined by how much radiation passes through the item. This is a common technique used in the manufacture of items such as plastic film and paper, to help with quality control assessments.

Smoke detectors

Many smoke detectors used in homes and offices are Ionisation Chamber Smoke Detectors (ICSDs). These devices contain a small ionisation chamber, in which the air between the electrodes is ionised by a radioactive source. A potential difference is applied between the electrodes, causing a small current to flow. If heavy smoke particles enter the detector, the flow of current reduces, triggering the alarm to sound.

The majority of modern ICSDs use the radioactive isotope americium-241. The amount of radioactive material used in these devices is very small and causes no danger to people. Smoke alarms can be safely disposed of with other household and office waste electrical items.

Tracers

Many different radioisotopes are used as tracers. The radioisotope used is selected on the basis that the half life is just long enough to obtain the required information and does not cause harm to people or the environment. An example is the tracing of sewage dispersion in sea outfalls and small leaks in fossil fuel power station heat exchangers.

Radioactive wastes produced by industrial activities

In industry, the amount of radioactive waste produced is small. This waste is generated primarily from the manufacture and use of radioactive sources and from the disposal of these sources after they have been used.

During the manufacture of radioactive sources, highly radioactive materials may need to be remotely handled and assembled in shielded glove boxes. Many thousands of sources can be manufactured in these glove boxes, leading to an accumulation of wastes contaminated by radioactivity, including equipment, metal shavings, glassware, rubber gloves and paper tissue.

Used sources are managed in a variety of ways. Lower activity redundant sources can often be safely incinerated. Higher activity sources are usually returned to the manufacturer for recycling or disposal.

Returned sources are often sealed in small steel cans, grouted into drums and stored as radioactive waste. This can present a challenge for managing the redundant sources, because grouping sources together could lead to high levels of radioactivity.

Some liquid radioactive wastes are also produced in industry, including mildly active wastes from washing protective clothing.