

reducing the risk from **RADIOACTIVE SOURCES** by Carolyn Mac Kenzie

Each year the IAEA receives reports of serious injuries or deaths due to misuse or accidents involving sealed radioactive sources. Sealed radioactive sources are used widely in medicine, industry, and agriculture – by doctors to treat cancer, by radiographers to check welds in pipelines, or by specialists to irradiate food to prevent it from spoiling, for example. If these sources are lost or improperly discarded, a serious accident may result. In addition, the security of sealed sources has become a growing concern, particularly the potential that such a source could be used as a radioactive dispersal device or “dirty bomb.” Preventing the loss or theft of sealed radioactive sources reduces both the risk of accidents and the risk that such sources could become an instrument of misuse.



In most countries, radioactive materials and activities that produce radiation are regulated. Those working with sealed radioactive sources are required not just to have proper credentials, but also the needed training and support to deal with unexpected circumstances that may arise when a source is used. Despite these measures, accidents involving sealed sources continue to be reported to the IAEA.

Among its many activities to improve the safety and security of sealed sources, the IAEA has been investigating the root causes of major accidents since the 1980s and publishing the findings so that others can learn from them. This information needs to be in the hands of those whose actions and decisions can reduce accidents by preventing a lost source from making its way into scrap metal. The IAEA has also developed an international catalogue of sealed radioactive sources, and provides assistance to countries to safely contain sources no longer in use.

To raise awareness, a Sealed Radioactive Sources Toolkit was issued that focuses on the long-term issues in safely and securely managing radioactive sealed sources.

The target audiences are government agencies, radioactive sealed source users in the medical, industrial and scrap yard industries and the public. These audiences may have the following interests:

Government Agencies

At the national level, several government agencies may be involved in the importation, use, transport, and disposal of sealed radioactive sources. Those working at such agencies and policy makers in general need to be aware of the safety and security issues that could arise from the use of sealed sources.

Medical Users

In medical settings, those using sealed radioactive sources need to be trained in and knowledgeable about radiation protection. They also must be aware of broader issues that can affect the safety and security of sources,

such as long-term management and appropriate disposal of sources. These users would also benefit from lessons learned from previous accidents.

Industrial Users

Users in industrial settings are the most diverse and may have varying levels of training regarding the safe use of sealed radioactive sources. To prevent accidents, users need information about good safety practices, as well as security issues and the potential implications should a source be lost. These users could also benefit from lessons learned from previous accidents.

Scrap Metal Industry

Because improperly managed sources have often ended up as scrap metal, those working in the scrap metal industry need to be informed of the potential risks, trained how to recognize the trefoil radiation symbol and trained in what to do if they should find a source.

General Public

Improperly managed sources pose a risk to members of the general public who may find them, but are unaware of the potential danger.

The toolkit serves as a starting point for information on safety and security of sealed radioactive sources and contains a variety of materials directed at different sectors and users providing a summary of relevant accidents and advising on best practices. It also contains handouts geared towards government agencies, which provide an overview of how to maintain effective control over sealed sources, as well as the long-term management challenges for government officials not necessarily familiar with the issue. A flyer for the general public provides an overview of what sealed radioactive sources are, information on radiation and advice on what to do should a source be found. A fact sheet on radiation and radioactive sources provides a gen-

Lessons Learned The Hard Way

Lapses in good practice, human error or lack of knowledge have resulted in serious injuries and deaths. A review of the root causes of these accidents reveals a worrying similarity.

Turkey

In 1993, in Ankara, Turkey, three disused cobalt-60 teletherapy sources were packaged for re-export to the United States. The sources were not exported immediately, but were stored without the permission of the regulatory authority at the company's premises. Over time, two of these packages were taken to Istanbul and eventually transferred to empty premises that were not secure. In November 1998, these premises were sold, and the new owners sold the packages as scrap metal to two brothers. By December 1998, the brothers had taken the packages to the family home and over a period of a few days began dismantling the protective containers, until they and others became ill with nausea and vomiting. At some point, pieces of the dismantled containers and at least one unshielded source were apparently left in a residential area before being taken to a local scrap yard.

By the time doctors suspected exposure to radiation, and not food poisoning, was the cause of the illnesses, a total of 18 persons were admitted to hospital. Ten of these persons had symptoms of severe radiation syndrome. Five of these had to be hospitalized for 45 days. Authorities recovered one source at the scrap yard before it was melted down. The second source, reported to be in one of the packages, has not been recovered to this day. Inadequate security over the sources and inadequate periodic inventory checks of the waste packages were the main contributing factors that allowed the unauthorized sale to take place.

Lack of recognition of the trefoil symbol on the source by those trying to dismantle the source was also an important factor in the number of persons affected by this accident. Improper waste management of the sources once they become disused was the root cause of the problem. ♦

eral overview of radiation and radioactive sources and is intended for the media, general public or workers in the scrap metal industry.

These elements may be used as the basis for a presentation or training session or simply given out to these groups. The toolkit provides only an introduction to the wealth of information available from the IAEA to assist its Member States to improve the safety and security of sealed radioactive sources.

The toolkit is available in English, Arabic, Spanish, Russian, Chinese and French. For more information, check the publications section of the IAEA website at www.iaea.org.

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Credit: CNEV/Brazil.

Brazil has been among countries where accidents have happened involving radioactive sources. Shown here is decontamination work in Goiânia in 1987.

France/China

In November 2000, a worker set off a radiation detector on his way into work at a French nuclear power plant. Fearing that the worker might have somehow been contaminated at the plant, a thorough check for contamination was made. The results sparked concern not just in France, but also around the world. The worker himself was not contaminated, but parts of the metal bracelet of his watch were found to be radioactive. Further analysis revealed that the steel pins in the bracelet were contaminated with traces of cobalt-60, a radioactive form of cobalt.

The watches had been imported from Hong Kong, where they had been assembled. The source of the contamination was later traced to a small plant in China that had provided the steel for the bracelet pins. It is thought that a teletherapy head, a device used in radiation treatment of cancer patients, had been inadvertently melted down as scrap at this plant. In France, the watches were sold through a large multinational, department store, raising fears that the watches could also have been on sale in Europe, Asia, and South America.

Fortunately, an investigation by nuclear regulatory authorities around the globe did not find any similar watches in distribution. But had one contaminated watch not been detected at a French nuclear plant, many people might have been exposed to low doses of radiation. The one hundred kilograms of contaminated steel found at the plant in China might never have been discovered and could have been used to make other consumer products. ♦

Thailand

In February 2000, a serious accident in Samut Prakarn, Thailand resulted in death, injury, and widespread concern. A disused cobalt-60 teletherapy source was being stored, apparently without knowledge or permission of the regulatory authority, in insecure outdoor premises normally used for storing new cars. Two local scrap collectors allegedly bought some scrap including the source and took it home to dismantle and resell. They later took the partially dismantled teletherapy head to a junkyard where an employee cut open the protective shielding with an oxyacetylene torch. Those who had been nearby when the protective shielding was cut began to experience nausea and vomiting. Those who had touched some parts of the exposed metal began to suffer burn-like injuries. The symptoms worsened over a period of days.

It was not until about ten days later that some began to seek medical treatment for their symptoms. By the time medical authorities reported their suspicions about a radiation accident, approximately 17 days had passed. This accident resulted in radiation injuries to ten people of whom three died within the first two months despite medical treatment. Approximately 1,870 individuals living within 100 meters of the junkyard were exposed, with many seeking medical attention. The Ministry of Health is monitoring about 258 of these individuals who live within 50 meters of the junkyard for long-term health effects from the accident. An investigation revealed that the root cause of the accident was the failure of the party responsible for the disused source to keep it securely stored.

Had those who acquired the teletherapy head recognized the radiation symbol (trefoil), they might not have tried to dismantle it and would have not been exposed to radiation. ♦