ABSTRACT

The Environmental Protection Agency (EPA) is concerned about the unnecessary risk that could be imposed on the general public from radioactively contaminated metals that may be incorporated into a variety of consumer products. As the number of reports of radioactive contamination in metal become more frequent, the potential for exposing the public increases. Since the mid-1990's EPA has been studying the risk involved with the recycling of slightly radioactive metals from Department of Energy (DOE) facilities and Nuclear Regulatory Commission (NRC) licensees. Our studies demonstrated that the greatest threat to the human health was not from the recycling of contaminated metal from DOE and NRC activities but from lost (orphaned) radiation sources and the import of contaminated metals from foreign countries. As a result of these risk assessments, EPA has decided to apply its limited resources toward solving the orphan source problem and preventing the import of highly contaminated metal. The EPA’s combined efforts are called the Clean Metals Program. The overall goal of the program is to ensure that the levels of radioactivity in the nation’s supply of metal do not present an unacceptable level of risk to the general public or the industry. EPA is working cooperatively with state and Federal governments, national and international representatives of the metal industry, and internationally recognized radiation protection organizations to achieve this goal.

INTRODUCTION

The United States is the largest user of metal in the world. Table I below provides an indication of the quantity of various metals consumed by US industries. Almost one-half of this metal is in the form of recycled metals. Because of the international scope of our economy, the US is both an importer and exporter of metal scrap, semi-finished metal (rolls, bars, etc.) and finished metal products. As the number of suppliers of metal increases, so does the potential for contamination.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Total Metal Consumed (tons)</th>
<th>Scrap Metal Consumed (tons)</th>
<th>Percentage Scrap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron and Steel</td>
<td>138,100,000</td>
<td>56,000,000</td>
<td>41%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>10,883,000</td>
<td>4,685,000</td>
<td>43%</td>
</tr>
<tr>
<td>Copper</td>
<td>4,856,000</td>
<td>1,653,000</td>
<td>34%</td>
</tr>
<tr>
<td>Nickel and Stainless</td>
<td>2,050,000</td>
<td>735,000</td>
<td>36%</td>
</tr>
<tr>
<td>Lead</td>
<td>1,783,000</td>
<td>1,224,000</td>
<td>69%</td>
</tr>
<tr>
<td>Zinc</td>
<td>1,430,000</td>
<td>214,000</td>
<td>15%</td>
</tr>
</tbody>
</table>

Radioactive contamination can enter the metal supply in three ways:

Sealed radioactive sources may fall out of regulatory control mechanisms when they become lost, stolen or simply unwanted. These devices are used in manufacturing processes and for medical purposes. An example of this loss of control occurs when a radioactive source becomes mixed with scrap metal during remodeling at a manufacturing plant.
Metal can be imported into the country either as scrap metal, semi-finished or finished products. There has been an increasing trend of contaminated metal originating from countries that lack a regulatory infrastructure comparable to that of the United States. As a result, contaminated metal may be imported through foreign trade.

Metal can be released from Department of Energy operations and facilities licensed by the Nuclear Regulatory Commission. Much of the metal at DOE facilities and NRC licensed sites is not contaminated, and can be released without a problem. DOE and NRC also maintain criteria for determining contamination levels for any material released, and therefore the likelihood of dangerously contaminated metal being released is very small. In addition, EPA found that the amount of scrap metal being generated by DOE and NRC facilities only accounted for 0.1% of the annual supply of metal used in the US.(2)

The Clean Metals Program consists of three components, including the Orphaned Source Initiative, the Foreign Trade and Imports Initiative and the Domestic Standards Initiative. Each one of these three program components, discussed below, addresses one of the potential origins of contamination.

**ORPHANED SOURCE INITIATIVE**

During a technical study on the release of radioactive metal into the general commerce, either for reuse or recycle, a much more serious problem was brought to EPA attention - that of abandoned radioactive sources entering the public domain. Since 1994 over 2,500 incidents of radioactive material found by the metal and recycling industries have been reported. Since 1995 there have been about 50 sealed sources found annually in the US by members of the public. In order to address this problem, EPA funded a cooperative “orphaned” source initiative with the Conference of Radiation Control Program Directors (CRCPD), a group of state radiation officials. This initiative is designed to bring unwanted or abandoned sources under control and to provide for the safe and cost-effective disposal or reuse of the source. These activities will reduce the potential for unnecessary exposure to workers, the public and the environment. Other government agencies and the steel and recycling industries are cooperating on this initiative to make it a success.

Basically, the goal of the Orphaned Source Initiative is to find new owners for unwanted sources or safe disposal for those that cannot be reused. The first step in the program, which was initiated in October of 1997, was to form a committee of state and federal personnel to develop a streamlined approach to disposition of orphaned or unwanted sources through legal reuse, recycle or disposal. A survey was conducted to identify all known abandoned sealed sources in the custody of the states or known to be surplus to the individual owner’s needs. The CRCPD developed a web site (www.crccpd.org look under What’s New) that includes access to extensive information (books, videos, and a toll-free number) on the identification and disposal of unwanted radioactive materials. A listing of licensed waste brokers and disposal companies was compiled and made available to the public through a variety of mechanisms. The toll-free number (1-800-594-6129) was set up by CRCPD to encourage sealed source owners to obtain information on reuse or disposal options. A clearinghouse of information was coordinated to allow those wishing to get rid of a source find those who wanted to obtain a source. By working with the holders of the unwanted material and the waste brokers, the process of disposal has been simplified and in many cases made more economical through the bulking of materials. Work is being conducted on the development of a database to track lost, stolen or abandoned sources as well as those that have been found out of regulatory control, making this information available, in a secure manner, through the Internet. Both state information and the Nuclear Regulatory Commission’s Nuclear Materials Events Database (NMED) information are being coordinated in this effort.

The most recent developments include the initiation of a round-up of unwanted cesium-137 sources to insure their proper disposal and to reduce the cost of the disposal. Based on the initial survey conducted by CRCPD under the Orphan Source Initiative, it was determined that the greatest number of unwanted sources were cesium-137 gauge sources. A pilot round-up is being developed to retrieve, collect and economically dispose of the unwanted sources in bulk form, reducing the opportunity for these sources to end up in scrap yards or in the hands of the public. Based on the lessons learned during this pilot program, a nationwide program may be designed.

One of the most recent success stories of the EPA Orphan Source Initiative is the securing of very large cesium sources located in schools throughout the country. Research revealed that instruments called Gammator Cs-137
irradiators, each containing a source of approximately 300 curies were located in academic institutions throughout the United States, with many of the instruments no longer in use. These 1,800 lb. research instruments were given to the institutions in the 1960s through an Atomic Energy Commission grant. Of the 60 instruments known to exist, 25 have already been recycled. Institutional knowledge of these instruments is fading and it is important to maintain control of these large sources, many of which have not been used in years. Through the program set up by EPA’s Orphan Source Initiative, many of the owners of these instruments have been contacted. Those that wish to dispose of their irradiator are having the disposal coordinated through a licensed firm that is discounting the price for pickup. The firm is able to do this by coordinating the pickup of numerous instruments during one transportation run. The firm is then repackaging and recycling the cesium-137 for use in other instruments.

Although strictly a domestic program at this time, it is anticipated that this program will be considered for use on a global scale. Therefore, the work being conducted with the Orphan Source Initiative is being coordinated with the Department of State and the International Atomic Energy Agency (IAEA).

FOREIGN TRADE AND IMPORTS INITIATIVE

This initiative aims to protect domestic markets from radioactively contaminated metals originating outside the U.S. through the development of consistent international standards for metal products. During the past two years, EPA has also participated in a series of meetings with senior staff members of the European Commission (EC) and IAEA. These exchanges pertained to the need for a consistent international clearance standard due to potential trade implications from inconsistent standards. These discussions stimulated the intended revision and updating of IAEA TECDOC-855 entitled “Clearance Levels for Radionuclides in Solid Material (Application of Exemption Principles - Interim Report for Comment)”, published in 1996, which contains interim international clearance levels for solid waste materials containing radioactive material. A meeting to discuss establishing international clearance levels was held at IAEA headquarters in Vienna in April 1999. The objective of the meeting was to formulate plans and develop an approach for updating the information presented with the eventual intention of issuing the information as part of an IAEA Safety Guide.

As part of this effort, EPA is assessing the economic consequences and benefits of creating an international standard for allowable levels of radioactivity in traded metals. The analysis is broader in scope than the previous EPA economic analysis related to developing standards for U.S. contaminated scrap metal, and includes U.S. border practices as well as the practices currently used by other countries. This new study addresses the economic effects of radioactivity in imports and exports caused by sealed sources, naturally occurring radioactive material (NORM) and scrap metal from nuclear facilities. In order to implement an international standard, monitoring and detection capabilities at international borders and ports of entry need to be upgraded. Whether an international standard will reduce the number of accidental incidents (involving the release of radiation) is not clear at this time. It will reduce the likelihood of these contaminated materials moving across international borders.

DOMESTIC STANDARDS INITIATIVE

This Initiative is currently suspended pending the completion of the Orphaned Sources and Foreign Trade and Imports Initiative. The Office of Radiation and Indoor Air (ORIA) of the U.S. Environmental Protection Agency (EPA) is evaluating a broad range of technical and regulatory issues associated with the disposition of scrap metal from nuclear facilities by means other than disposal at a licensed low-level radioactive waste disposal facility or otherwise maintaining the material under regulatory control.

To date EPA has developed doses/risks from one year of exposure, normalized to unit specific activities (i.e., pCi/g) of each separate radionuclide or combination in the free-release of scrap for carbon steel, aluminum and copper. In addition to individual doses, a population assessment (collective impacts) was conducted for collective doses (person-rem) or increased cancer morbidity, normalized to unit activity (e.g., curie) in scrap for carbon steel. A cost/benefit analysis was also performed for different disposal options for carbon steel.

In March 1997 EPA produced a draft report entitled “Technical Support Document (TSD) : Evaluation of the Potential for Recycling of Scrap Metals from Nuclear Facilities” (3). The purpose of that report was to evaluate the
potential public health impacts associated with the free release and recycling of scrap metal from nuclear facilities as an alternative to disposal at a licensed low level radioactive waste disposal facility. The report was also intended as part of the technical basis for determining the need for regulatory action to ensure that recycle of scrap metal from nuclear facilities does not endanger public health and safety. It had the following additional goals:

1. Characterize the potential sources of scrap metal that may be affected by an EPA rule addressing the free release of scrap metal from nuclear facilities.

2. Estimate the normalized collective dose and normalized collective risk to the exposed population associated with the free release of scrap metal.

3. Estimate the minimum detectable concentration (MDC) of radionuclides contained within or on the surface of scrap metal.

The Draft TSD has been revised to address many of the questions and concerns raised during the review process and to incorporate a great deal of new information acquired since that report was issued. The new report contains an expanded and revised assessment of the potential impacts of the free release of scrap metal from nuclear facilities on exposed individuals. The revised TSD includes radiological assessments of the recycling of aluminum and copper scrap, as well as a revised analysis of carbon steel scrap (the only metal analyzed in detail in EPA’s prior studies). The 1997 TSD and Cost/Benefit Analysis documents and other information on the EPA Clean Metals Program can be found at the following web site: (www.epa.gov/radiation/cleanmetals)

REFERENCES

