

# Radioactivity Characteristics and Safety Management of Steel Scarp

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## 1. Introduction

After the Fukushima nuclear accident in 2011 safety management of NORM (Naturally Occurring Radioactive Material) became one of the key issues of nuclear safety in Korea and ‘Safety Management Law of the NORM [1]’ has been implemented and enacted in 2012. Steel scrap is classified as inadvertent radioactive materials and under regulatory control by the “Safety Management Law of the NORM” To protect the radiation exposure of the general public as well as the field workers, steel industry in Korea installed and operates the radiation monitoring system at the entrance of the steel scrap trucks. In this study, the radiation characteristics of the steel scrap with inadvertent radiation detected recently has been analyzed and suggests some regulatory guides for the management, disposal and reuse as well as the safety management of the steel scrap after reviewing Ukrainian regulatory and safety management of the steel scrap since Chernobyl nuclear accident in 1986.

## 2. Radioactivity Characteristics of the Recent Inadvertently Detected Steel Scrap

According to the “Safety Management Law of the NORM” the steel scrap load in the truck should be passed through the radiation detection system installed at the truck entrance to the steel manufacturing industry. As shown in Table 1, measured radioactivity and nuclides have been measured for 8 times for 4 steel companies in Korea. It was shown in Table 1 that the radiation levels of the inadvertently detected radioactive steel scrap exceed the general public dose limit of 1 mSv/yr

recommended by IAEA. For the field detection, portable survey meter was used for the radiation measurement and radioactive nuclide identification. Detailed radiation analysis has been performed following the initial field detection and analysis. In Korea, domestic steel scrap is classified as imported steel scrap, NORM and orphan steel scrap. For the imported steel scrap, the inadvertently detected steel scrap is returned to its origin port. However, for the steel scrap with NORMs or the orphan steel scrap, it is difficult to trace back and identify the origin of the steel scrap due to various route of the transportation for the steel scrap.

Table 1. Steel Scrap Field Detection and Radiation Characteristics

	Dose (mSv/yr)	Nuclide
Company A 1st	10.51	Ra
Company A 2nd	35.04	Th
Company A 3rd	37.41	Co
Company A 4th	131.4	Co
Company B 1st	47.30	Th, Rn
Company B 2nd	120.01	-
Company C	3.066	-
Company D	118.26	Th, <sup>3</sup> H

## 3. Ukrainian Steel Scrap Regulation and Safety Management

Ukrainian government implemented the radiation safety management regulation for the steel scrap industry since the Chernobyl nuclear accident in 1986 [2]. By the regulatory guides, steel scrap dealers should take the radiation safety and regulation training for the Radiological

Certificate from the government. In Ukraine, there are almost 2,400 certified steel scrap dealers. Ukrainian regulation for the Radiological Certificate classifies the sale of the steel scrap in three categories based on the radiation level at 1m above the steel scrap surface; domestic use and export, only domestic use, and no use even in Ukraine. Ukraine also established multi-barrier system to control steel scrap; steel scrap dealers, border and Exclusive Zone (Chernobyl) and export consignment. The licensing through the certificate and supervision extend to the steel scrap dealers for regulation of the raw materials and products, periodic monitoring of the work place and storage facility, and also the steel scrap export and sales control by issuing Radiological Certificate.

#### **4. Conclusion**

Currently, the inadvertent radiation detections of the steel scrap is increasing in Korea. However there is no regulatory clearance level for the artificial nuclides of the steel scrap in the “Safety Management Law of the NORM” Therefore, for the safety control and management of the steel scrap, the criteria of clearance level as well as the regulatory guides for the management, disposal and reuse of the steel scrap should be established through reviewing international safety standards and criteria of the steel scrap. Fixed radiation monitoring system is also required for the small and medium steel scrap dealers to trace and identify the origin of the inadvertently detected steel scrap. Regulatory initiative is needed to establish regulatory guides in dilution and disposal such as permanent disposal storage for the NORM and inadvertently detected steel scrap.

#### **REFERENCES**

- [1] Safety Management Law of the Naturally Occurring Radioactive Materials, 2012.
- [2] Prevention, Detection and Response System for Inadvertent Radioactive Material in the Scrap Metal in Ukraine. 2008.