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Scrapmetals and NORM

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The Netherlands

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Summary

In this paper the consequences are discussed of the increasing occurrence and import of scrapmetals contaminated with radioactive substances in the Netherlands. Workers and members of the public have been exposed to radiation and the environment sometimes was contaminated. The Dutch Inspectorate for the Environment, responsible for the enforcement of the legislation for radioactive materials, has been one of the initiators of a number of actions over the last five years in order to reduce the trade in contaminated scrapmetal. Since 1994 a still increasing number of traders and owners of scrap yards have installed large detectors to detect radioactivity in complete loads of scrap. A guideline has been published by the Inspectorate this year, to prevent exposure of workers and environment as much as possible and thereby reducing the chance of liability claims for industry. The Inspectorate has given Dutch companies a warning or a official report when they are bringing contaminated scrapmetal that requires a permit on the market place. The Inspectorate also is working on an initiative to start a European program for the prevention and enforcement of the trade in radioactive scrapmetal.

1. Introduction

For about a few years it has been known that radioactive material may cause problems in the metal and scrap branch. Workers sometimes have been exposed to doses that were higher than allowed in legislation. Also in a number of cases sites were contaminated. Finally in terms of liability because products became radioactive this has resulted sometimes in major financial claims for the companies involved.

Most of the contaminated scrap metal comes into the Netherlands from countries in Eastern Europe, Africa and South America but also from industries in the Netherlands and countries of the European Union. The inspectorate found several types such as contaminations of naturally occurring radioactive material (NORM) on tubing from the oil and gas exploration industries, pipes, valves and heat-exchangers from the chemical and fertilizer industries. Further radioactive metals with a low specific activity due to melting of radioactive sources in the metal and several heavy industrial radioactive sources were found in loads of scrapmetal.

Therefore industry and government have combined forces to tackle the problem. Large scrap yards have installed monitoring devices such as detectors at the entrance of the yard or in the cranes that are used for unloading the ships to check the scrap and metal on radioactivity. The Dutch Inspectorate for the Environment together with industry elaborated on procedures on how to deal with (possible) radioactive contaminated loads of scrapmetal. The scrap branch also can be seen as a special case of Non-Nuclear Industry because it also deals with radioactivity as an unwanted byproduct of its activities.

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In this paper the relevant parts of legislation are given in chapter 2.

The physical data and the incidents in the Netherlands since 1990 with radioactive contaminated metal and scrap are given in chapter 3. In chapter 4 the consequences in terms of possible exposure, contamination of the environment and costs are discussed. Chapter 5 gives information about the control measures for industry, the procedures agreed between Inspectorate and industry to deal with the problem and the actions whom are and will be taken by the Inspectorate.

2. Legislation

Based on the Dutch Nuclear Energy Law the following activities regarding radioactive substances are prohibited in the Netherlands: to prepare, to have, to use, import, transport and dispose of radioactive substances, unless a permit has been granted or an exemption has been allowed in a directive based on of the law. European Community directives are implemented in the Dutch Nuclear Energy Law.

A permit is required in cases where the contamination exceeds a specific activity of 100 Bq/g and a total activity of 5 kBq respectively 50, 500 or 5000 kBq depending on the toxicity of the nuclides. This limit value focuses on the specific activity of the contamination and not on the specific activity of the total metal object.

The dose limit for individual members of the public is 1 mSv per year due to all source in the Netherlands. For one source a limit of one tenth of this dose limit is applied (e.g. 0,1 mSv per year). For workers nowadays the dose limit is 1 mSv per year. On top of that the Dutch Nuclear Energy Law makes the ALARA-principle (As Low As Reasonably Achievable) obligatory.

In the Netherlands COVRA (Central Organisation for Radioactive Waste) has been appointed as the only legal collector of radioactive waste. Consequently all radioactive waste is in the end going to one location in the Netherlands.

3. Incidents in the Netherlands and physical data

Since 1990 the number of incidents with radioactive scrapmetal, that were reported to the Inspectorate for the Environment, increased every year as a result of the increasing monitoring by the traders and owners of scrapmetal yards.

The first incidents involved NORM contaminated tubing welded on the outside edges of containers. These containers, which have an open top, are in use for the transport by lorries of several types of bulk materials like waste or agricultural products. The containers were produced in the Netherlands with tubing from several countries.

Later more incidents with contaminated tubing and other contaminated metal objects occurred. This metal objects for example includes screens, heatexchangers and valves, that are known to come, as far as can be determinated, from the "process" industry. A few times heavy radioactive sources where found in scrapmetal, like Cobalt, Plutonium, Cesium and Radium. Depleted and natural Uraniummetal has been found several times in scrapmetal as shielding in empty disposed source holders.

Table 1 gives an overview of the incidents with radioactivity in metal and scrapmetal reported in the Netherlands since 1990.

Table 1:

Type of radioactive metal objects	Number of incidents reported since 1990	Country of origin of the objects			Specific activity [Bq/g] or activity [Bq]
		Netherlands	European Union	Other	
Tubing on containers	approx. 300	-	95%	5%	200 - 5000 Bq/g
Tubing	6 metaltraders	20%	30%	50%	100 - 2000 Bq/g
Other objects with NORM-scale	approx. 60	5%	10%	85%	50 - 2000 Bq/g
Rockwool	10	100%	-	-	90 - 150 Bq/g
Aluminium with Thorium (from jet-engines)	3	-	-	100%	800 - 1100 Bq/g
Objects from Nuclear Industry	5	-	10%	90%	50 - 2000 Bq/g
Radioactive sources and Uranium source-containers	10	10%	-	90%	0,5 MBq-20 GBq

4. Risks and costs

Employees of industries where contaminations (scales) of NORM occurs, may be exposed to radiation. The exposure may exceed the dose limit of 1 mSv per year. When parts of contaminated installations are opened, workers, members of the population and the environment may also be contaminated.

In the scrapmetal branch the chance of uncontrolled exposure to radioactivity is larger than in the above mentioned industries. This is caused by the heavy radioactive sources and by the large amount of open radioactive sources in between scrapmetal. The possibility of contamination of people and the environment is therefore also bigger in this branch.

The exposure level at 0,1 m from the surface of heavy sources found between scrapmetal in the Netherlands runs to 14 mSv/h.

The exposure level at 0,1 m from the surface of tubings on containers varied from 0,3 μ Sv/h to 30 μ Sv/h. An estimation has been made of the possible exposure of workers who handled, cut and welded these tubings during the manufacturing of the containers. This rough estimation gives a dose of more than 2 mSv per year, caused by inhalation, ingestion and radiation.

The specific activity of NORM contaminations may exceed 5 kBq/g. After inhalation of a few milligram of this high radioactive NORM it is possible that the effective year dose for workers and members of the public will be exceeded.

Whole sites of scrapmetal traders and industries may be contaminated if contaminated metal will be handled in an unprofessional way. About 10 m³ of soil had to be removed from a few sites where NORM contaminated metals had been shredded. The soil had to be sent to COVRA.

A rough estimate of the costs made until now for the removal of radioactive sources from loadings of scrapmetal, the investigation into the nature of nuclides, the decontamination of objects and soil and the storage of the radioactive waste at the COVRA amounts 10 million dutch guilders or more. Besides it also has cost a lot of working-hours from metal traders and inspectors of the government.

5 Control measures and actions

The oil- and gas exploration firms in the Netherlands and offshore in the Dutch Continental Shelf of the North sea have to deal with NORM. The Dutch Inspectorate for the Environment obliged these firms to get a license for handling and in case of the offshore-business bringing ashore radioactive contaminated tubing. All the firms got a license in the period 1991-1994. After that there are no reports of contaminated tubing from these Dutch firms.

As far as known by the Inspectorate the other Non-Nuclear-Industries in the Netherlands where NORM with a specific activity above 100 Bq/g occur, got a license in accordance with the Dutch Nuclear Energy law. In the licenses regulations for measurements, decontamination, removal of radioactive waste and limitation of risks for employees and environment are given.

Dutch companies who have brought contaminated metals (> 100 Bq/g) on the market got a warning from the Inspectorate or were officially reported.

Transport firms that use containers with possible contaminated tubing were informed and about 600 containers were checked. This resulted up to now in the decontamination of approximately 170 containers. Another 130 containers will soon be decontaminated.

The inspectorate has made a guideline for traders and owners of scrapmetal yards. This guide-line is based on experiences from the Inspectorate and the branch. It describes how the firms may prevent the trade in radioactive metal. A large part of the branch already have experts do measurements before accepting the scrapmetal. Also a part of the branch organize measurements in the originating countries before buying the metal and ask that the supplier guaranties that the metal is not contaminated.

When a trader detects a significant quantity of radioactivity the shipment is sent back to the supplier. This trader is obliged to inform the Inspectorate for the Environmental as soon as possible. When sending back is not possible or the radiation level is more than 5 μ Sv/h at the outside of the shipment a further inspection of the cargo is necessary. Such an investigation has to be done by a company with proven expertise, and under supervision of the Inspectorate. The radioactive materials will be decontaminated. The waste is disposed to COVRA. This investigation, decontamination and storage is at the expense of the owner of the metals.

To set up a structured plan on prevention and enforcement of the trade in radioactive scrapmetal the Inspectorate will start a project in European context. The participants of the project may be the scrapmetal branch, the Non-Nuclear-Industries, policy makers and enforcers.

6 Conclusions

Radioactive (contaminated) scrapmetal, originating from the Non-Nuclear Industries, is a cause for problems in the Netherlands. Most of the radioactive (contaminated) scrapmetal is of non-European origin.

A part of the scrapmetal branch has taken its responsibility and takes measures them self.

The Inspectorate has made a guideline for the scrapmetal branch how to handle the problem of radioactive materials in scrapmetal.

An international approach of the problem of radioactive scrapmetal is necessary. An initiative to start a European plan on prevention an enforcement of the trade in radioactive scrapmetal has been taken by the Inspectorate for the Environmental. International exchange of information between the various parties (authorities, industries) involved is necessary.

7 Recommendations

The Non-Nuclear-Industries have to check all possible radioactive contaminated scrapmetal. Contaminated scrapmetal has to be decontaminated or stored.

All over the world the Non-Nuclear-Industries should check and decontaminate all possible radioactive scrapmetal before it is introduced on the market.

8 References

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