

NORM II – RESULTS OF THE SECOND INTERNATIONAL SYMPOSIUM

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ABSTRACT

From November 10 – 13, 1998, the Second International Symposium on Naturally Occurring Radioactive Materials (NORM) was held in Krefeld/Germany. This was the follow-up conference to a meeting held in Amsterdam the year before.

More than 200 experts from 24 nations – especially from the area of the European community – met in Krefeld to discuss alternatives on how to proceed. Basis for this discussion was the Basic Safety Standard 96/29 EURATOM of May 13, 1996⁽¹⁾. Chapter 7 of this Standard stipulates a reduction of the dose rate to the public to a limit below 1 mSv/a, if it is caused by natural radioactivity at the workplaces in non-nuclear industries and for the population in total.

A special problem for the member states of the European Community is that there is no other way than to transfer the BSS to national law until May 2000. The content of BSS is outlined in Table I.

Table I: Criteria according to BSS96/29/EURATOM

Article 3 (2) a)	Radioactive materials above the release levels of Appendix I
Appendix I	Release levels for (examples): Ra226: 10^4 Bq or 10 Bq/g U238: 10^4 Bq or 10 Bq/g Pb210: 10^4 Bq or 10 Bq/g
Article 13 (2)	Limit for the effective dose is 1 mSv/a
Appendix I – Criteria (3)	The limits for release levels can be exceeded, if ... the single person of the population probably yields a dose below 10 μ Sv/a

INTRODUCTION

On May 13, 1996, the Basic Safety Standard 96/29 EURATOM was laid down. The complete title is “The basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation”. The new directive differs from earlier versions with regard to special provisions that have been laid down concerning exposure to natural radiation sources. Such exposure was not explicitly dealt with before even though it was implicit within the scope of the standards; introduction of the new provisions may bring about significant changes in national legislation.

Title VII - “Significantly Higher Exposure Caused by Natural Radiation Sources” – is of relevance for persons at work places or for any members of the population exposed to radiation

caused by natural radioactive sources, if this dose rate is too significant to be neglected. As a value for “significance”, the limit was set at 1 mSv/a.

Article 55, entitled “Implementation in Member States Law”, finally demands that this directive has to be transferred to national law by March 13, 2000.

BRANCHES CONCERNED

It took three years before the branches concerned realised that they are facing a problem regarding the radiation protection measures to be taken due to the new regulations. It was especially the uncertainty which job in particular had to be regarded and which radiation protection measures may possibly have to be taken.

The German ministry for Environmental Protection ordered a study to clarify which branches may have to be regarded in detail. The result of this study showed that, in general, 19 different branches are concerned, but some of them are specially surveyed as it is well known that the limits of BSS are drastically exceeded. Today, we know that the following branches have to be considered:

- crude gas and mineral oil
- phosphate production/fertilizers
- zirconia industry
- steel industry.

THE FIRST CONFERENCE

The first conference was held in Amsterdam on September 8 – 10, 1997. It was a special effort of KEMA-group, the Netherlands research institute of the utilities, to organise this meeting. The objectives in those days were defined by J.H. Blom, the executive director of KEMA. This was the first conference where natural radioactivity in non-nuclear industry was discussed with involvement of the industries concerned. Approx. 100 participants from more than 10 countries discussed the subject especially under the point of view of experience in industry. It was the first time that the non-nuclear industry developed scenarios how to handle the material and how to treat the waste.

As a conclusion of this conference, it was agreed upon that the existing regulations are not understood by the industries concerned and that a new publication should explain this in some more detail. As a consequence, “Radiation Protection 88” was published by the European Commission ⁽²⁾.

THE SECOND SYMPOSIUM

The Second Symposium in Krefeld was initiated by Siempelkamp Nuklear- und Umwelttechnik in Krefeld, seeing the necessity that the discussion started in Amsterdam should be continued for further clarification. 220 participants from 24 nations followed the invitation and discussed the

matter during the four-day-conference in Krefeld in November. The Symposium was split into five sessions and a panel discussion. The sessions dealt with the following topics:

1. Monitoring
2. Assessment of public and occupational exposure
3. Experience in industry
4. Waste management
5. Legislation and regulatory aspects.

The final conclusion of the results of the discussions on the previous days of the conference was drawn in a panel session on Friday, November 13. This panel discussion was of major importance, regarding that there were statements from Gordon Linsley (International Atomic Energy Agency), Augustin Janssens (European Commission), Shelly Mobbs (United Kingdom Ministry for Environmental Protection), Ciska Zuur (Netherland Ministry of Housing, Spatial Planning and Environment), and Dietmar Bröcking (German Ministry for the Environment, Nature Conservation and Nuclear Safety).

In addition to these statements, representatives of various industries presented their conclusions.

THE PRESENTATIONS - RESULTS OF THE SESSIONS

1. Monitoring

Eleven contributions were made on the subject of monitoring, four of them dealing with measurement techniques, seven with investigation methods.

It was pointed out by the speakers that standard solutions were not available because materials are different, the geometries are different, and the radionuclides are different. In many cases, a splitting of the nuclides due to chemical or physical processes has happened. Scale from crude gas shows only the nuclide Ra226 plus daughters, not the previous nuclides in the row. It was further stated that the nuclides Ra226, Pb240 and Bi214 can be detected very easily by gamma-spectroscopy. The question whether the material is defined as NORM if the nuclides are not in the natural equilibrium is answered differently in different countries.

Phosphate industry in Belgium found Rn222 in concentrations above 400 Bq/m³ at work places. In crude gas from Netherlands fields, Rn222 concentrations between 0.005 and 200 kBq/m³ resp. Pb210 concentrations of 0.005 to 0.02 Bq/m³ and Po210 concentrations of 0.002 to 0.08 Bq/m³ were found. Enrichment of these nuclides in tube systems led to dose rates up to 10 µSv/h, at peaks up to 200 µSv/h in pump systems. The following conclusions can be drawn:

- guidelines on monitoring are being developed on the basis of “learning by doing”
- if many data are available, a systematic approach for baseline surveys can be developed
- no consensus on the meaning of “natural” in the current clearance criteria
- no consensus on the calculation method for specific activities

- BSS fails in achieving this goal, thus obliging the member states to find national and thus different solutions.

2. Assessment of public and occupational exposure

Seven papers dealt with this topic during the NORM II-meeting. One of the papers dealt with the dose rates coming from the production of gypsum plates with a specific of 3 to 10 Bq/kg Ra226, and 3 Bq/kg Ra228. The estimate showed an effective dose rate of 20 μ Sv/a (this is reasonably below the value of 1 mSv/a according to BSS regulations).

In the United Kingdom, estimations led to dose rates between 2 and 20 μ Sv/a during sintering processes in the steel industry for the critical groups of the population in the surrounding of the facilities.

The highest dose rates were measured in dwellings by inhaling Rn220 and Rn222; the effective dose comes up to 250 μ Sv/a. The conclusions of this session are:

- models for calculating the dose rates are needed to come to comparable results
- often, the dose rate calculations are based on conservative assumptions which leads to unrealistically high results
- the meaning of “trivial dose” is not regulated; the specific situation has to be defined and the degree of regulation about NORM too low
- the industrial party fears that - if regulations are passed – they will increase the production costs which might lead to a loss of competitiveness regarding other countries
- participants missed practical aspects like ranges/averages for the defined limits.

3. Experience in industry

The session was dedicated to the experience in industry in treatment, processing and management of naturally occurring radioactive materials. Papers were presented ranging from the oil and gas industry, chemical production and scrap processing to examples from the non-nuclear industry in the US and Australia.

All the presentations confirmed a growing awareness of industry to NORM in their processes. The presentations also addressed the concern industry has on the impact that NORM might have when not managed in a realistic way.

Industry demonstrated their commitment to minimize their impact on the environment and to reduce the exposure of the public in performing risk assessments and addressing corrective actions.

There was a generic concern on inconsistent regulations, national interpretation of limits and norms and on missing standards to measure and to qualify not being harmonized internationally.

There is a need for an internationally agreed policy on how to process the large volumes of contaminated industrial waste and scrap.

It was demonstrated that

- exposure to workers and public is normally low or can be controlled to levels far below the dose limits;
- emission of NORM to the air or surface waters need special attention but can be controlled in an effective way;
- public perception might obstruct granted applications even when neglectable dose effects can be demonstrated;
- public perception on radioactivity and contaminated waste rejects application of realistic industrial approaches. Open discussion with the public is essential to influence that attitude.

It was also demonstrated that

- industry can offer realistic and acceptable solutions to clean contaminated facilities under operational conditions. But this does expect realistic solutions to manage the generated large volumes of secondary waste;
- controlled melting offers a practical and safe process to recycle NORM contaminated scrap and that this option offers an opportunity for decommissioning contaminated facilities;⁽³⁾
- managing the large volumes of low-level NORM waste expects an international agreed policy on how to recycle this kind of waste back to the environment where it originates from.

It was brought to our attention that

- NORM is a growing problem in scrap already representing the major part of identified sources;
- although NORM in scrap is no problem for a normal steel work or scrap yard, they nevertheless refuse radioactivity in what form or concentration ever.

Conclusions of the session are:

- waste management; processing large volumes of waste with low radioactive content,
- cleaning and decontamination for operational reasons;
- decommissioning and scrap management;
- public perception restricting normal operations;
- clear international harmonized legislation anticipating process industry.

4. Waste treatment

Six papers presented the problems regarding waste management. It was shown that NORM-contaminated waste has to be disposed of safely and economically. Radiological long-term behaviour must follow the "de minimis" concept. One of the papers stated in particular that the waste from mineral oil and crude gas industry to be led to the reservoirs has to be tested. In addition to that, different ways of disposal are being tested. Especially the problem of waste contaminated with mercury and radionuclides are not regulated and special rules have to be developed for this issue. The conclusions of this session are:

- request for waste depositories for combined materials
- authorities are setting levels without considering in a realistic way the need for the controllability
- the public should become more realistic, but authorities are following the public blindly instead of giving opposition
- authorities are doing too well; harmonisation will never be achieved if all countries are setting their own, slightly different models.

5. Legislation and regulatory aspects

In total, nine papers dealt with this subject, which again yielded eager and controversial discussions. The presentation of IAEA to "Exclusion, Exemption and Clearance" gave a survey of how to apply developed concepts to the nuclear side as well as to NORM. The IAEA concept is being reviewed right now, will be modernised to be adequate again for a continuously changing environment. The OECD point of view focused the interest on the discrepancies especially between the regime 10 $\mu\text{Sv/a}$ and 1 mSv/a .

The German representative especially reported about the efforts made to assess the actual radiological situation in Germany and the current status of the necessary changes to the regulatory framework. The limits in Germany are the same as mentioned by speakers from other countries: 1 mSv/a . In the UK, a flexible approach, based on dose levels, will be made, the advantages of which have been very well demonstrated. Nevertheless, the concerns of the industry are not solved by these proposals for regulation. Conclusions of this session:

- 1 ½ year before the implementation of BSS into national law
- there is no regulation fixed by now in any of the members states of the EC
- different countries have different concepts with different definitions and criteria, especially for treating NORM
- waste treatment regulations are not yet given.

CONCLUSIONS

The participants spent nearly four days together, talking about NORM, about fertilizers, crude gas and oil platforms. The participants learned about exemption levels, exclusion levels and release levels. They heard that it makes sense to equalise exclusion and release levels and that it does not make sense to unify them. They heard that the 1 mSv/a concept is acceptable, and that the 1 mSv limit is too low and should be revised.

It must be kept in mind that there are 18 months left to transfer BSS into national law. Considering the speed at which administrations usually works, this is tomorrow, and nobody seems to be worried about it.

Looking around, you will find that the expression "NORM" becomes popular. In Norway, Sweden and Denmark, annual "NORM"-meetings are held; in Knoxville there was one in September 1998 and in Rio de Janeiro, an international symposium will be held in September 1999. And yet, the member state governments still seem to sleep or to suppress the problem.

Last but not least – who will be the winner of this development? First of all: the software houses, educating radiation protection managers. Most industries concerned will be forced to answer questions of their authorities.

Secondly, the producers of measuring devices. If you know that there is a source, you must be prepared to answer the questions arising.

Thirdly, the producers of treatment facilities will be selling many of their water-jet cleaners. Some customers will hopefully decide to melt the metal scrap.

NORM II meeting will surely have cleared some misunderstandings, will have led to some better understandings of the different points of view, but still the basis for further discussions is given.

Literature:

- (1) EUROPEAN COMMISSION: Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of workers and the general public against the dangers arising from ionising radiation
- (2) EUROPEAN COMMISSION: Radiation Protection 88, 1997
- (3) Melting of NORM-contaminated equipment of an offshore oil platform
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