

Actions adopted by the Spanish competent authority to improve the radiological protection in industrial radiography series

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Abstract

Industrial radiography facilities have presented in Spain the highest operational doses and the highest number of overexposure and incidents. Regarding these problems, after a detailed analyse of causes based on the experience in the control of these installations, the Subdirection of Radioactive Facilities of the Nuclear Safety Council decided to implement in 1993 a plan to improve the radiological protection conditions in industrial radiography activities.

The basic objectives of the plan were to improve the operational and emergency procedures together with the periodical revisions of gammagraphy equipment and its accessories and to audit the main facilities.

After the plan of action was executed new information and conclusions were reached. Those conclusions led us to adopt measures which are in their final phase of development.

1 Introduction

In Spain having or using a radioactive source or equipment is considered as having a “*radioactive facility*” (except for all those which are defined as nuclear facilities). Every radioactive facility in order to start functioning needs a previous licence or authorisation issued by the Ministry of Industry and Energy after a safety report of the Nuclear Safety Council, which is the competent authority in nuclear safety and radiological protection.

The personnel who handle a radioactive source or equipment needs a licence called Operator licence and those who manage the radioactive facility and are consequently called Supervisor need a licence too. Both licences are issued by the Nuclear Safety Council.

The licence of a radioactive facility establishes a series of working conditions, including radiological protection specifications. Those conditions can refer to the general requirements in regulations or could be specific conditions for every kind of facility, for instance: number of persons with licence to operate radioactive equipment; minimum number of radiation monitoring; type of personnel radiological surveillance; periodical inspections of radioactive equipment, contents of operation registers (official records), periodical reports to the competent authority, incident notifications, etc...

At present in Spain there are about 900 industrial and research radioactive facilities and about 130 of them are in the industrial radiography field. We are going to consider as industrial radiography installations those which use X-ray machines and/or gammagraphy equipment (gammacameras). Those radioactive equipments could work in enclosure installations or on site.

Facilities with gammagraphy equipments are the most problematic. There are 55 facilities using gammacameras, about the 40% of the total of industrial radiography installations. The most usual radionuclide in gammacameras is Iridium-192 with a maximum activity of 3,7 TBq (100 Ci), although no more than 3 TBq (80 Ci) are generally used. Cobalt -60 is used to a lower degree (it is used fundamentally in enclosure installations) and only two facilities are handling Ytterbium-169 at present.

Historically, this type of facilities have presented the highest risk in the industrial radioactive field, particularly when they use mobile gammagraphy equipments. So these show the highest operational doses and the highest number of overexposure and incidents. Regarding these facts the Subdirection of Radioactive Facilities of the Nuclear Safety Council decided to implement in 1993 a plan to improve the radiological protection conditions in industrial radiography activities after an analyse of causes was conducted.

2 Causes analyse

Considering experience in control of industrial radiography installations (failures frequently observed, incident analyses, periodical report of facilities...) the first step was to try to identify the fundamental causes of high doses and operational incidents.

This previous analyse showed as possible causes:

- Inappropriate operational procedures or an insufficient application of such procedures, that is to say, many incidents were due to not using radiation monitors to confirm the retrieval of source or to the insufficient revision of the radioactive equipment and accessories (crank and tube guide) and radiation monitor before the operations.
- Inappropriate emergency procedures or insufficient application.
- Personnel without an operation licence used the radioactive equipments frequently. Many workers working as radiographer assistant (without operation licence) received high doses, in some cases higher than operators with licence.
- Incorrect use and storage of personal dosimeters (TLD) and insufficient periodical revisions of radiation monitors.
- ALARA objective was not considered and very few installations had established investigation dose levels. So, supervisors did not follow properly how operators worked. There were not a sufficient pressure of competent authority respect to this subject.
- In many occasions the crank and guide-tubes were not periodically revised. This requirement was not very clearly specified among the conditions stated in the authorisation, which spoke in general terms about periodical revisions of the gammagraphy equipment. In many occasions incidents were due to a bad state of these components.
- Lack of uniformity in procedures of companies licensed to do periodical inspections of gammagraphy equipments. There was not a model of revision certificate..
- Companies did not have a clear idea about what type of incidents had to be notified to the competent authority.
- Deficient register of operations and incidents in official records of the facilities.