

# RELEVANT SAFETY ASPECTS FOR RADIOACTIVE TRACERS IN INDUSTRIAL PROCESS

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## INTRODUCTION

The use of radiotracers plays an important role to provide methods to optimize industrial process and improve product quality. An increase in the use of radiotracers investigations has been observed in Brazil, however, as there is no specific standard for the licensing of these facilities, generic radiation protection regulations have been used, but these are not comprehensive or technically suitable for this purpose.

In this work, an assessment of radiation protection aspects of radioactive tracers, not covered by generic regulations, is presented, with the aim of contributing to the future development of specific safety regulations in Brazil.

## METHODOLOGY

This study is based on an assessment of the licensing process of facilities using radioactive tracers in Brazil, as well as the experience of regulatory inspections carried out at facilities and a review of international standards, in order to point out relevant radiation safety aspects in the establishment of regulatory standards for working practices, procedures and protective measures before, during and after injections of radioactive tracers.

## RESULTS

Among the relevant key aspects and actions for radiological protection in radiotracer investigations, we can point out:

### Licensing

➤ Before implementing a radiotracer operation, a specific application for each study, presenting detailed information on radiological protection procedures, should be elaborated and submitted to the regulatory agency, in order to obtain the authorization of regulatory agency.

➤ The acquisition of tracers should be required to the regulatory agency.

### Control of Radioactive Source

➤ The selection of radioisotope to be used in each radiotracer study should consider the radioactive activity, the nature and energy of emitted radiation, the half-life and its radiotoxicity.

➤ Radiotracers are provided in transport containers taking into account the characteristics of the radioisotope, however, it should be recommended that the radiotracer could be provided ready for injection, avoiding the handling of the source to obtain aliquots for each tracer injection.

➤ When an aliquot is required, the handling of the source should be carried out, whenever possible, at the company's laboratory.

### Control Requirements for Occupationally Exposed Workers

➤ Each radiotracer company should have a radiation safety officer (RSO) certified by the national regulatory agency. The RSO is the person responsible for implementing the radiation protection programme in the facility. As a consequence of their responsibility, it is necessary that the RSO has independence and authority to stop an operation with radiotracers that they consider unsafe. Thus, the RSO should not be subordinate to maintenance or operation groups in the facility.

➤ Additional shielding should be used, whenever possible, in order to reduce the radiation worker's exposure.

➤ Protective clothing and equipment should be available during the tracer preparation stage and during the course of tracer injection.



Figure 1. (a) Transport of radiotracer. (b) Protective clothing during radiotracer operation.

## Control of Workplaces

➤ Survey tests should be performed in order to ensure successful decontamination in all areas that have been contaminated by radioactive material.

➤ Equipment that cannot be decontaminated at the jobsite should be properly packaged and sent to the company headquarter for further cleaning or storage.

➤ Calculations should also be made on the impacts of any possible discharge into the environment, identifying the exposure pathways in order to ensure agreement with authorized limits of national regulations.

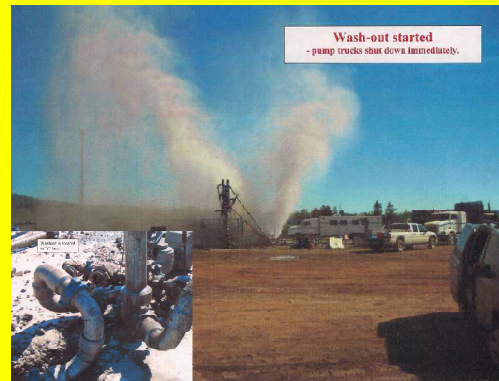


Figure 2 – Accident during radiotracer injection releasing radioisotope into the environment. (broken pipe).

## Control of Equipment

➤ The complete injection apparatus should be checked for proper functioning including pressure tests before tracer injection.

➤ A water injection through the injection apparatus and connected equipment should be performed for an extended period to clean out any contamination traces before disconnecting injection apparatus.

➤ Monitoring and decontamination equipment should be available at the jobsite.

➤ Personal alarm monitors should be mandatory for each radiotracer worker; for non-uniform exposures, it may be necessary to wear additional dosimeters for hands or fingers.

## Radiotracers Storage

➤ Radiotracer studies often may last for several days. In this way, a temporary storage location for radioactive sources should be available near the field of operation. Temporary storage of radiotracers usually demands the use of controlled areas.

➤ During radiotracers studies at offshore platforms it should be noted that the limited physical space on these jobsites represents a key consideration in radiation safety procedures. Generally the dimensions are not sufficient to provide adequate distances to reduce the dose rate to acceptable values in surrounding areas.

➤ The radiotracer facility must have a specific and exclusive location for the storage of radioactive waste in its headquarters.

## General Considerations

➤ There should be a clear definition of responsibilities between the radiotracer facility and its contractor, in order to ensure the availability of all necessary means for safe operation.

## CONCLUSIONS

The lack of a specific regulatory standard for the licensing of radioactive tracers operations in Brazil weakens the nuclear regulatory body in its aim of regulating and licensing the activity. In this study recommendations are presented concerning relevant aspects of radiation protection for radiotracer applications, discussing specific features that should be part of the future regulations, with the purpose of ensuring safety during radiotracer investigations.