Training and Retraining of Radiation Protection Technicians

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Abstract

A new training programme for health physics technicians has been based on a textbook on health physics (700 pages in Danish). Two technicians have been trained according to the programme. Following this an extensive programme was initiated for the retraining of all technicians. Both programmes consists of lectures, theoretical problems and practical exercises.

Introduction

Risø National Laboratory was founded in 1956 and in the following years several nuclear facilities were build. Today, two reactors, several nuclear laboratories and a nuclear waste treatment plant are in operation.

A section for applied health physics is responsible for radiation protection at the nuclear facilities and at other laboratories at Risø, where radioactive materials, ionizing radiation and lasers are used. The section consists of four health physicists (HPs) and 13 radiation protection technicians (RPTs). A few of the technicians have been with the section for about 30 years.

New comprehensive programmes for both basic training and retraining of RPTs have been made. All training is done by the HPs and senior RPTs. The main part of the teaching is based on the first draft of a textbook on health physics (approximately 700 pages in Danish). The book has been tailor-made for the RPTs. It is comprehensive and self-contained; a good basic school education is needed to read the textbook. The textbook is suitable as a handbook in the daily radiation protection work for both the HPs and RPTs. The authors of the book are the HPs (also authors of this paper), and the retired senior RPT who previously was in charge of training of the RPTs.

Basic training

The basic training takes 8 months. Trainees are recruited among people with a technical background such as laboratory assistants or mechanical technicians. The basic training consists of lectures (400 h), theoretical problems and laboratory exercises (200 h) and on-the-job training (400 h). The lectures give the theoretical basis of radiation protection and cover the subjects of the textbook, such as: atomic physics, interaction of ionizing radiation with matter, dosimetry, radiation biology, radiation protection philosophy, legislation and local rules. Further the various nuclear installations at Risø are described with emphasis on radiation protection matters. The laboratory exercises introduce measuring techniques and data analysis. The lectures are given by the HPs, who also formulate the theoretical problems, while senior RPTs are in charge of the laboratory exercises and the on-the-job training. The training is not identical for all new trainees, but it is adjusted slightly to fit the educational background of the individual.

The aim of the basic training is to reach a level of education that enable the RPT to act independently and:

- give advice in work-situations both on-line and in the planning phase
- perform standard analysis on samples (γ-spectrometry, gross α- and β-counting)
- report results and evaluations in writing
- present problems for the HPs
- answer questions on radioactivity and radiation protection from the staff of the installations
- handle emergency situations.

The trainees are evaluated by a written (4 h) and an oral (1-2 h) examination. The man-power required for running a basic training programme including preparatory work is approximately 1000 HP hours and 500 senior RPT hours.

Retraining.

An extensive retraining programme was initiated for the first time in 1990 and will run for a period of two years. It is an assembly of teaching sessions, and each session has three parts:

- two double lectures on separate subjects, lasting a morning (3 hours),
- a set of theoretical problems
- a practical exercise.

The programme has about 20 sessions in total (one session a month). Most subjects are dealt with in several sessions (months) depending on their importance. During the programme the technicians will become familiar with the different chapters of the health physics textbook.

The two set of lectures are always dealing with two separate subjects and they are given by two different teachers. The level of the teaching is set rather high and is higher than needed for the RPT's daily work.

With each lecture follows a set of theoretical problems to be solved and the answers to be handed in before the next lecture. An example is the calculation of the internal dose, the tritium concentration in the body as well as the concentration in the urine at different times after two separate intakes of tritiated water.

The practical problems aim at making the technicians familiar with all health physics instrumentation available at the health physics laboratories. This is among others, survey instruments, γ-spectrometers, α- and β-counters. The problems chosen for the practical exercises are specifically selected to be closely related to the daily use of the instruments. An example of a practical exercise is calibration of an air-monitor for a specific radionuclide. When the RPTs have made the measurements they have to write a report. The report should present the purpose of the exercise and describe the work carried out together with the measured data, the calculations and a discussion of the results. The report should be written in a manner that can readily be understood by their colleagues. Also this report should be handed in before the next session.

From reading and correcting the problems and reports handed in, it is easy for the teachers continuously to get an impression of the educational level of the technicians.

Experience - Results.

The training programme has been used once for two new RPTs and has proved very effective, although some minor corrections were needed. The new RPTs have now been working for two years and accomplish their work satisfactorily. During the teaching period parts of the draft of the health physics textbook were written in parallel with the teaching which helped to make the content directly aimed at the RPTs.

The extensive retraining programme runs for the first time and we are now about half-way through the programme. All the RPTs have expressed a need for retraining before the programme was initiated and they appreciates the information they are presented with. The two "youngest" RPTs do also participate in the retraining programme. Although it is only two years ago they finished their basic training, they find the repetition usefull. The practical experience they have gained in these two years have clearified for them some of the theoretical aspects in the training programme.

The educational level of the "old" RPTs has increased considerably. They are now able to make better use of the different instruments in the laboratories. Measurements and observations during important operations are being very well documented. This is essential both for record keeping and for communication to and from the RPTs working in shifts and in reports to the HPs. The RPTs find themselves with a better background for their advice to those workers, they supervise.

The teaching has been done in an informal way, and the enthusiasm of the teachers(!) seems to have spread to the RPTs. During the lectures the RPTs have contributed with practical examples from their local working area. This helps linking the theoretical subjects with the practical work and it is a good exchange of information among the different working places. This also makes it more easy for the RPTs to help their colleagues at other installations. During the teaching sessions and the following discussions the HPs and the RPTs have got to know each other better and the HPs have now a much better knowledge of the capabilities of the individual RPT.

The teachers have also benefitted both from writing the book and from the teaching itself. As always, teachers gain a deeper knowledge of a subject when they have to teach it.

So far the retraining seems to be so much a success that it is being discussed to let it continue in a less intensive manner.