OSART Good Practices

RADIATION PROTECTION

Radiation protection instrumentation, protective clothing and facilities

St. Laurent, France

Mission Date; 27 Nov.-14 Dec., 2006

Management of radioactive source control was improved by implementation of new software.

The management has delegated to a competent person appointed by the plant manager. His qualifications are defined by the regulations. He has access to the software tool MANON which is a unified programme accessible to all EDF nuclear plants, as well as to the regulator. In this way he monitors the inventory, activity and movements of all sealed and non-sealed radioactive sources, including spare parts containing radioactive sources. The software automatically generates alerts for overruns of activity, dates for leak tightness or inventory checks, etc.

The competent person coordinates a network of responsible persons in the different departments related to control of local storage areas.

Several types of check are done on radioactive sources: radiation protection checks at the arrival or departure of a radioactive source, annual technical checks, periodic checks carried out by those responsible for managing rooms, monthly surveys of rooms and storage safes, annual regulatory checks of storage room protection equipment. A binder with photos of sources has been compiled.

Sources are carried in special cases marked with a trefoil. At the acquisition of a radioactive source, the analysis of the need is traced in a standard form and approved by the holder of the authorization or a delegated person. Sources entering or leaving the site as well as movements on site are tracked on specific forms.

Fessenheim, France

Mission Date; 23 Mar.-8 Apr., 2009

Use of a special monitoring device (CORAMAT) to perform a final check of large objects leaving the site.

Fixed measurement instrumentation is used to detect radioactive contamination on long and cumbersome items like scaffolding tubes, equipment with a ventilation system, tools, neon tubes, etc. Large detectors on both sides and the top of a conveyor belt allow high precision monitoring. These gamma detectors allow the detection of radioactive particles inside the equipment, which might have entered during use inside the radiation controlled area. This device facilitates the work of staff responsible for performing final checks in the sense of guaranteeing the quality of the checks, thus improving performance. In addition, the time to perform these control checks is reduced which results in less exposure for workers. This effort in improving contamination checks is achieving the expected results. Site detectors have not been triggered since this monitoring device has been put into use.

South Ukraine, Ukraine

Mission Date; 2-9 Nov., 2009

Handling of personal dosimeters (TLD’s) and identifying the workers in the controlled area supports the implementation of several useful concepts.

There is an automatic dose accounting and personnel control system in the radiation controlled area which provide the following functions:

1) Individual TLDs storage;
2) Individual admission to TLDs on the results of worker identification bar code. This function prevents of unauthorized access to the somebody else's dosimeter;
3) Automatic accounting of workers staying in the radiation controlled area. This function is used for conducting of individual dosimetric control on SU NPP. According to system data, the personnel that did not attend the controlled area during the definite monitoring period the individual exposure dose equal to zero is assigned;
4) Control of individual access to the cells of individual dosimetry storage facilities. This function allows to block the access to the dosimeter (at the achievement of controlled and permissible level of the individual exposure dose, when medical contraindications for works with the ionizing exposure sources is detected, in absence of passed exams on radioactive protection regulations etc.);
5) Automatic accounting of personnel staying in the controlled area. This function allows to detect the amount of personnel staying in the controlled area at the exact moment and during the period you are interested in.
6) The detection of the condition of the individual dosimetry storage facilities cells. This function allows to detect cells defects, unauthorized access to the dosimeter, dosimeter availability in the cell, is this cell used before, who and when done the last access to the dosimeter.
7) Remote control of the individual dosimetry storage facilities cell. This function allows to open and to close the cell from the working place of the operator and administrator of the system with the different authorization accesses (in case of necessity of emergency dosimeter distribution in bar code absence).

Ringhals 3/4, Sweden

Mission Date; 1-18 Mar., 2010

Use of low-power mobile telephones in the controlled area

Mobile telephones are used to improve communications during work activities. The system is also used to automatically alert personnel in the event of a building evacuation alarm.

Since introducing the system, radiation protection supervisors have noticed more frequent and higher quality communications with the radiation protection technicians working in plant areas. This system has helped remove barriers to prompt and open communications, enhancing the quality of radiation protection coverage to work parties. This also allows supervisors to be informed immediately of any events, and to deploy promptly their technicians.

St. Alban, France

Mission Date; 20 Sep.-6 Oct., 2010

A sophisticated key cabinet allows specific users to access only keys which unlock areas containing radioactive sources which they have authorization to handle.

The plant uses a “Keymaster” system which is a locked cabinet containing keys to discrete locations where radioactive sources are stored. The keys inside the cabinet are electronically locked such that when the cabinet is open it is not possible to access all of the keys. In order to unlock a key for use, the user must enter a user code and also a key code which he has been provided to allow him access to a specific source location. When the user enters both these codes, then the key to the specific source location is released for use. The source location then only contains sources which he is authorized to use. This system enables the plant to authorize individuals to use only specific sources that they are authorized to use and then restricts them physically from being able to access any other sources or any other areas containing sources which he is not authorized to use. This is a simple, but practical system which allows effective, physical control over access to radioactive sources.

Gravelines, France

Mission Date; 12-29 Nov., 2012

The plant uses a system which ensures that dose rate measurements are carried out at a precise distance from the source.

The usual practice is that RP technicians in charge of dose rate monitoring estimate the distance from the source to the radiometer by mean of personal judgment. This addresses situations where the measurement is carried out at 0.4 or 0.6 metres, for instance, and not at 0.5 metres.

Dose rate frequently has to be monitored at a precise distance from the radioactive source. This is the case for:

- sensitive measurements, like radioactive material transport off the site.
- measurements used for further calculation, such as activity assessment based on dose rate in a radioactive waste package.
- or measurements that have to be cross-compared and therefore have to be reproducible measurements, such as for the assessment of hotspot changes under reduction treatment.

The plant has set up a mechanical system which connects a dose rate meter to a remote laser reader for accurate positioning of the device measuring the source.

The mechanical system is easy to manufacture and laser meters are currently inexpensive.

This system was put in place for the transportation of radioactive materials and since its implementation, the plant has not experienced any transport events.

Flamanville, France

Mission Date; 6-23 Oct., 2014

Automatic radiation instrumentation dispensers

The plant has installed dispensers called "Radiabox" for small objects in dedicated places. The dispensers provide dose rate meters to the workers even outside the radiation controlled areas (RCA) that save the working time for the workers. Workers are not obliged to go to the RCA to pick up the RP instruments or return them if the work is performed out of the RCA. The other advantage is that radiation instruments are available 24 hours a day. Oxygen analysers and other small items of equipment will eventually also be available.

The plant assessed saving in time of around 15% to 25%. Interviews with the workers confirmed their satisfaction concerning the added value of this system.

Paks, Hungary

Mission Date; 27 Oct.-13 Nov., 2014

Installed Radiation Monitoring System

The Radiation Protection Monitoring System (RMS) consist of Release and Environmental Monitoring Subsystem, Workplace and Technological Monitoring Subsystem, Meteorological tower, Dosimetry Control Room with video-graphic panel display.

The system has measuring- and sampling devices, data collectors and central data processing system which complies with the latest functional requirements, the state-of-art technical implementation and the new SCADA data processing system.

The Radiation Protection Monitoring System reconstruction was completed in 2011 with the aim to improve measurement, sentinel, handling and display of radiation protection related data.

The system is manned in the dosimetry control room on a 24/7 basis, so it is a sentinel for all radiation protection data, alarms and trends.

Important benefits of the RMS system are:

- State-of-art Control Room with video-graphic panel;
- New measuring systems, more measuring information;
- Wide measuring range of detectors;
- New air/water sampling system, gas blowers, pumps;
- User friendly data display;
- Redundant data processing;
- Local values, acoustic and light signals for Workplace measurements;
- For aerosol measuring devices: alpha activity-concentration measurement;
- Uninterrupted Power Supply;
- PLC based control (gas blowers, sampling valves, hermetic doors).

Advantages of SCADA data processing system:

- System designed for industrial environment;
- Divided system structure;
- Server-client structure, data acquired from data collection (devices) are stored on Scada servers and could be inquired from displays any time;
- Online data acquisition, long term storage (2 years);
- Limit value monitoring, alarm, control delivery;
- Availability significantly increased due to dual-servers;
- Servers provided with redundant network and power supply;
- Windows base handling;
- Unlimited display workstation can be connected.

Golfech, France

Mission Date; 10-27 Oct., 2016

The plant developed an innovative system to remove contaminated particles with rotating brushes coupled to a HEPA filtered vacuum unit.

A shoe brush has been developed featuring a suction system to contain radioactive particles. Without causing damage to the shoe, this brush removes any contaminated particles that might have stuck to the sole.

Benefits:

- Prevents contamination from spreading outside contaminated work areas or outside the radiological controlled area.
- Contaminated shoes no longer have to be laundered, thus reducing the volume of liquid waste.
- Reduces the number of loaned shoes.
- Simplifies the shoe decontamination process

This shoe brush has proved very useful in improving radiation protection performance. The current result shows a reduction of contamination events picked up by C2 monitors and caused by shoe contamination.

Golfech, France

Mission Date; 10-27 Oct., 2016

The plant developed an innovative system with anemometer and small window with feathers to monitor the airflow coming from outside to inside a confined room or tent. This allows ensuring the working areas under negative pressure inside tents, preventing the contamination spread and complying with regulatory minimum airflow, by visual information on the anemometer and by checking the position of the feathers.

Main Benefits:

Radiation protection:

- Airborne contamination contained in vented tent.
- Very low costs involved to recreate this innovation.
- 20 devices installed on tents for the 2 units.
- Time required for sustainable implementation: less than a month.

Industrial safety:

- Can be used to calculate the allowable exposure time for heat stressing temperatures and control the inherent risks for working on environment at hot temperatures.

Approximately 300 kits have been ordered by French power plants.

Cernavoda, Romania

Mission Date; 7-24 Nov., 2016

Accurate heavy water leak rate determination through the use of the Tritium in Air Monitoring System (TAM)

The Tritium in Air Monitoring (TAM) System has multiple, distributed sample points, including many in inaccessible areas. Long term monitoring of noble gas activity have been performed to provide the most appropriate correction factor for noble gas compensation, which results in the ability to accurately correlate radiation levels to Tritiated water leak rates. This allows for a quick and accurate leak rate determination, and with the Radiation Monitoring System (RMS), the location of the leak can also be more rapidly identified.

The use of this system improves safety performance by providing:

1. Rapid and accurate identification of leak location;
2. Ability to differentiate varying tritium fields;
3. Reliable estimation and prediction of leak rate evolution;
4. Assessment of personnel exposure during corrective maintenance activities, as proven during the management of a Primary Heat Transport (PHT) heavy water leak from July to November 2016.

Fig. 4 – Evolution of tritium level (mSv/h) in 1R-501 and horizontal feeders cabinets, Unit 1, 2016 – TAM historical log file

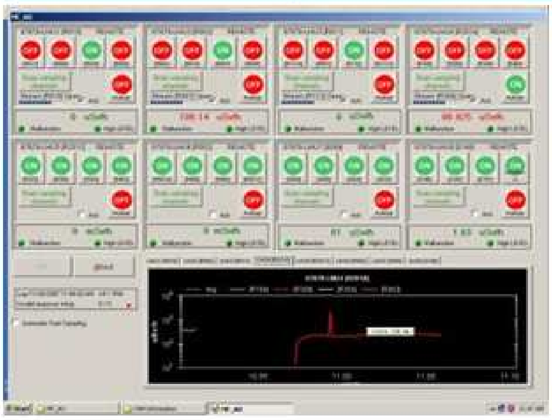

Fig. 5 – Typical display of TAM monitoring results (instantaneous and historical values) on remote PC