



Implementation of Gamma Monitoring systems for Temelin and Dukovany nuclear power plants (Czech Rep.)

INTRODUCTION

In the year 2015, Saphymo was awarded with the delivery, installation and commissioning of a new sophisticated environmental and emergency radiation monitoring system for two nuclear power plants in Czech Republic: Temelin (2 VVER reactors, 2.000 MW capacity) and Dukovany (4 VVER reactors, 2.000 MW capacity). Both monitoring systems are fully operational since october 2016.

CONTEXT AND PROJECT REQUIREMENT

Considering previous nuclear disasters in the last thirty years (Chernobyl, Fukushima), authorities had to realize, that there was very low knowledge about the actual level and dispersion of radiation. Most of the measurement infrastructures were destroyed and data communication was disturbed by non-functioning public communication infrastructures.

Consequently after those events, many nuclear power plants had to upgrade and strengthen their measurement networks to comply with similar catastrophe scenario. That was also valid for the two Czech nuclear plants in Temelin and Dukovany.

The tender requirements specified for each nuclear plant a set of fixed and mobile monitoring stations which will be able to provide radiological and meteorological data from fixed and mobile stations. The architecture and specifications for both nuclear plants are equivalent. An area of 30 km around the nuclear power plants should be covered using an emergency proof radio communication technology.

A central data management system with a fixed and a mobile control center should automatically perform data acquisition and processing from all instruments. Automatic warning in case of radiological or technical alarms was required, as well as advanced software for visualization, data analysis, reporting and export to the customers host system.



Dukovany Nuclear Power Plant in Czech Republic



Temelin Nuclear Power Plant in Czech Republic

FROM ENVIRONMENTAL AND RING MONITORING TO EMERGENCY MANAGEMENT



GammaTRACER XL2

MiniTRACE S10R

Combined with external weather sensors, the GammaTRACER XL2 probe fulfilled perfectly all tender requirements. The electronic and mechanical design of the probe is specially optimized for both applications: cost efficient routine surveillance and reliable operation at emergency conditions. The following features make especially the system superior versus its competitors:

- due to the very low power consumption of less than 1 mW the GammaTRACER XL2 can operate with the built-in battery for several years, avoiding costs for external power supply or solar panel
- all sensitive electronic parts like GM tubes, datalogger, GPS and data transmission are located inside the hermetically sealed enclosure, providing long term reliability
- due to the low weight, compact dimensions and built-in battery, the instrument can be used very flexible in stationary or mobile applications, e.g. to quickly extend the fixed network in case of emergency.

In addition to the 24 GammaTRACER XL2 stations, each nuclear power plant was equipped with 10 handheld MiniTRACE S10R dose rate meters which will be used by the emergency staff. Besides the measurement of actual dose rate, the Minitrace provides the GPS coordinate and send all data to the central data management system using the SkyLINK radio channel. This allows to monitor and control the radiation exposition of the workers, increasing work safety and health protection.

REDUNDANCY AND SAFETY



SkyLINK Receiver

For redundancy and safety reasons, all measurement data have to be transmitted to two locations:

- the nuclear power plant's control room
- a mobile control center located in an emergency vehicle

The emergency vehicle is fully equipped with a mobile SkyLINK receiver station. When operating from an adequate location, the system is able to receive data of all installed monitors.

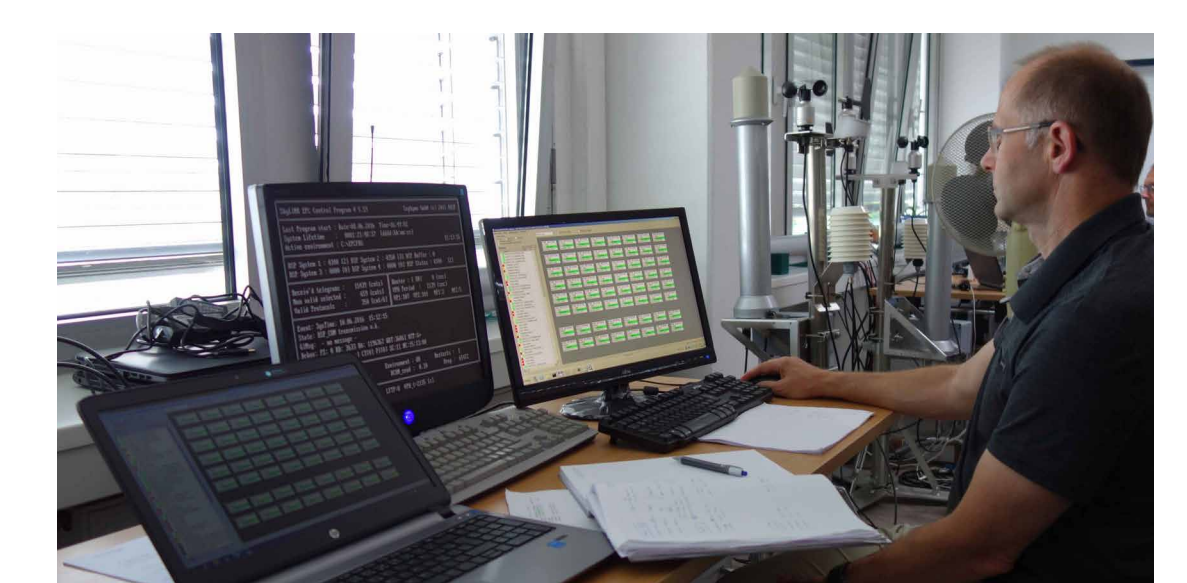
Both, the nuclear power plant control room and the mobile emergency vehicle have independent database servers and are fully equipped with software for data reception, processing and alarm management. The DataEXPERT software package provides all necessary functions for fast reaction (visualization, analysis and export).

With a reception signal to noise ratio of -143 dB, Saphymo's proprietary radio transmission system is the only worldwide system which can cover large area as required in the tender. Due to the use of specific licensed frequencies, the data transmission will reliably work even at catastrophe scenario, when public communication frequencies and infrastructure is down or crowded.

CONCLUSION

Bertin Instruments, with the expertise of Saphymo, was glad to provide convenient and efficient environmental monitoring systems to Temelin and Dukovany nuclear power plants. Implementation was done by VF, a.s, our local partner in Czech Republic. Both nuclear power plants can now take advantage of Saphymo products:

- strong reliability of GammaTRACER probes, proved with more than 3.000 devices worldwide
- redundancy data communication on a large monitoring area with our proprietary radio transmission system (SkyLINK)
- more than 30 years experience in radiation monitoring field for Saphymo GmbH
- robustness of the MiniTRACE handled devices, already in operation in France for EDF in 19 nuclear power plants.



Factory acceptance tests

CERTIFICATIONS



All parts of the system had to withstand seismic conditions according to IEC 980 and EN 60068-2. Therefore all delivered equipment were tested and certified in a test bench of Czech military facilities.

Moreover, all radiation sensors had to be type tested and certified by Czech metrological institute (CMI) according to IEC 60532 and IEC 60845:2009 norms. All tests were successful.