OVERVIEW OF GAMMA SPECTROMETRY MEASUREMENT DEVICES DEVELOPED BY ENVINET a.s.

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This paper demonstrates the development and usage of the devices designed for non-destructive radiological characterization of radioactive waste. All systems are based on gamma-spectrometry and are divided into two categories – stable and mobile.

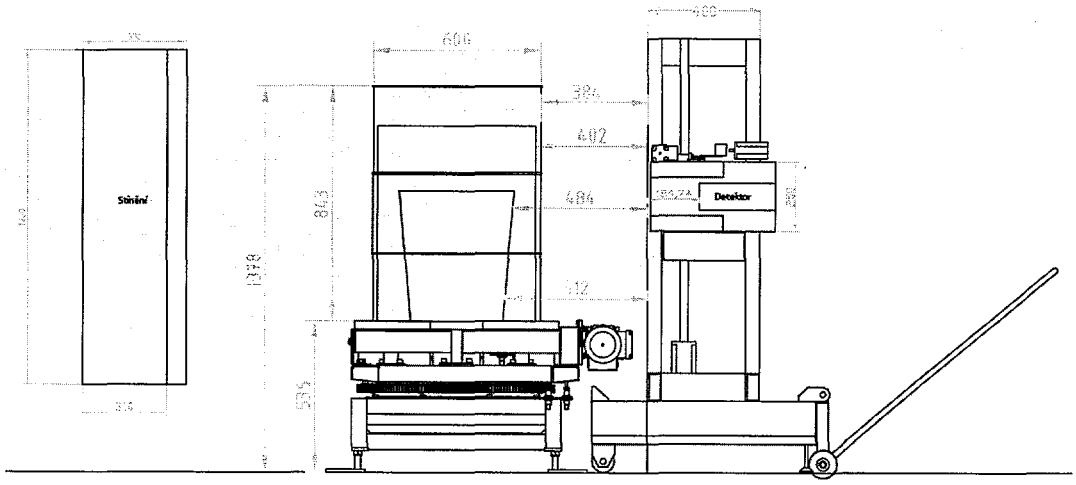
Stable ones involve only measurement in fixed detector – package configuration. They are used for assessment of packaged waste, mainly in drums.
Mobile ones are flexible and allow measurement of a wide range of objects from various positions and can be also transported to arbitrary location. The calibration of such systems is performed by means of appropriate software which allows computation of full-energy peak efficiency in various configurations.

RADRUS_S1 DESCRIPTION

RADRUS_S1 was developed within the project called "Assistance to NPO RADON dealing with radioactive waste in Moscow region." The device assesses activity of radioactive waste in various types of containers. Operator must only load packages with waste on a conveyer and then start measuring process. As a result all drums will be characterized and stored on delivery part of the conveyer

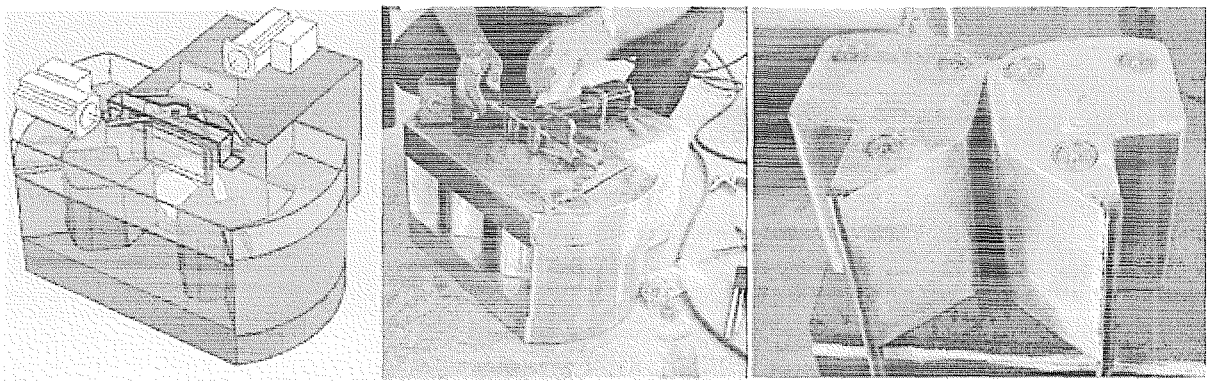
The device contains one ORTEC® GEM HPGe detector of 40% relative efficiency mounted in the collimator. The collimator with the detector is fixed on moveable head which allows vertical motion. The package is scanned in three positions in order to determine vertical inhomogeneities of intensity of radiation. The package is rotated during the acquisition. Schematic view of the device is in the Fig. 1.

Fig. 1: Schematic view of the RADRUS_S1.



HPGe detector is mounted in a unique collimator with adjustable field of view. The collimator is made of lead 10 cm thick and the field of view is automatically set by the operating software if overloading of the detector is found.

Fig. 2: RADRUS_S1 modular collimator. It has an adjustable 30° and 90° angles of view and 0 – 100 mm aperture to improve the detection function.



The above decribed measurement unit stands next to the roller conveyor–which contains a balance. This conveyor is unique because up to 25 packages can be loaded on. The measurement can be therefore performed without assistance of any operator. The conveyor is shown in Fig. 3

Fig. 3: Automatic roller conveyor

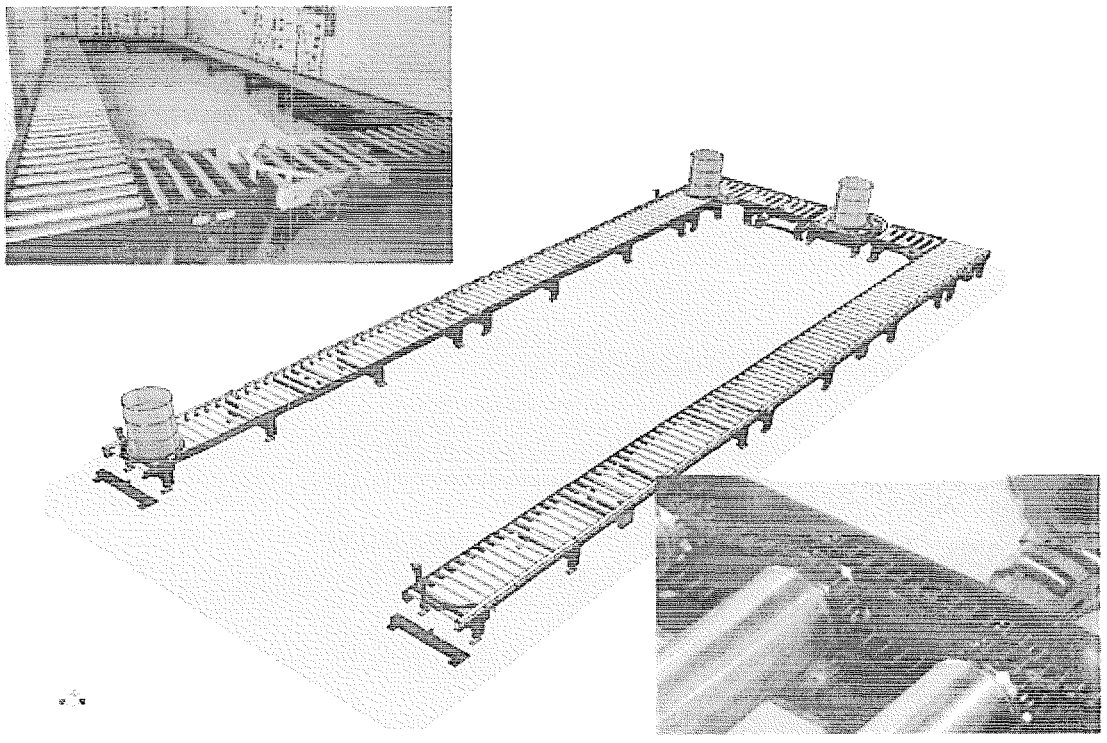
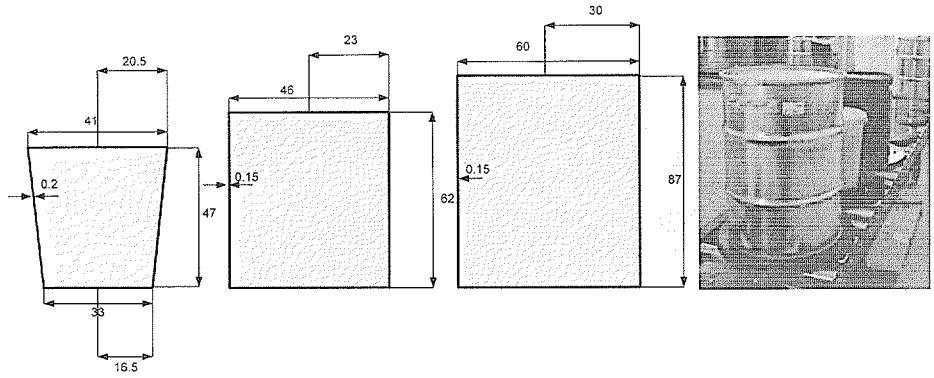


Fig. 4: Types of packages

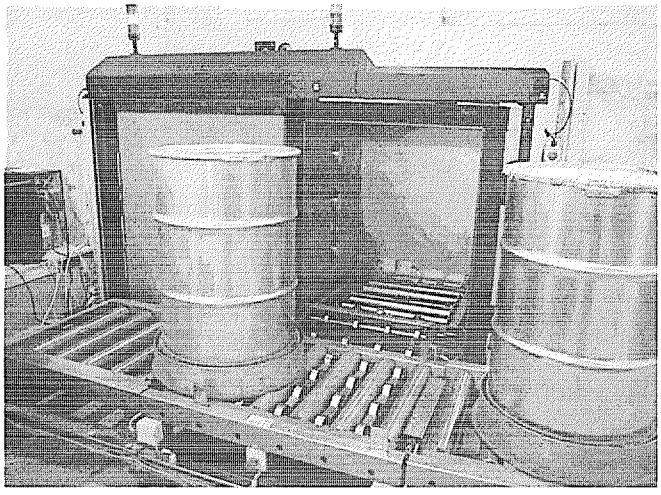


The system has been calibrated by means of MCNP software and the calibration has been performed for each type of package, for various matrices and for each opening angle.

EDRUS DESCRIPTION

Edrus is a device developed for free release measurement of waste packaged in 200 l drums. It contains shielded chamber made of 10 cm steel with 3 HPGe detectors of 60 % relative efficiency inside it. The drum is rotated during spectra acquisition. The chamber stands in front of the roller conveyer where 2 drums can be loaded. After the measurement starts, the motion of the drums and activity assessment are fully automated.

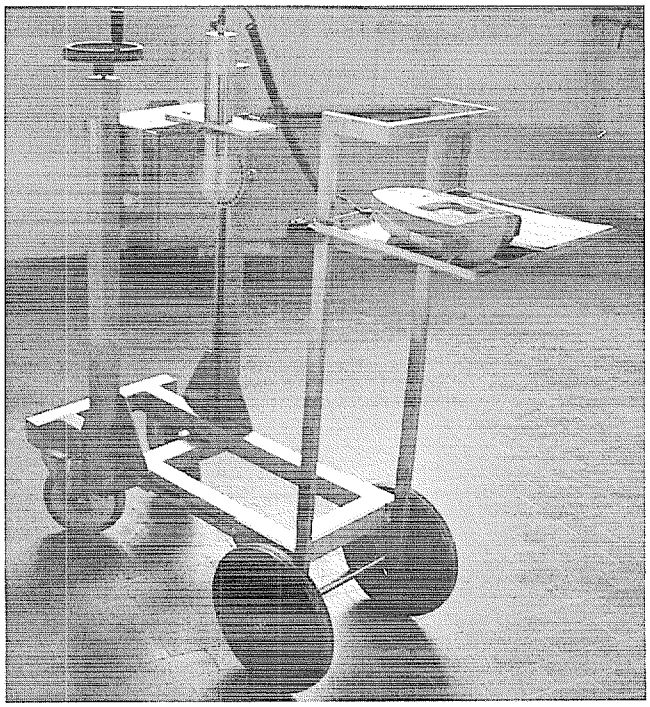
Fig. 5: EDRUS



MOBILE GAMMA MEASUREMENT SYSTEMS

These systems have standard design. They consist of mobile cart, notebook with appropriate software, HPGe detector, collimator and MCA. They operate under ORTEC ISOTOPIC software which allows efficiency calibration for various types of arrangements. Only efficiency calibration with a point source in the 30 cm distance has to be performed. Efficiencies in other arrangements are numerically calculated.

Fig. 5: Photo of a mobile cart used in mobile spectrometry



CONCLUSION

Above described devices were supplied to customers within a complex orders which contained usually both the stable and mobile device. The data from devices are collected and stored by RAOS software based on ORACLE database. This software also regularly checks a stability of the devices in order to assure a quality of results. The whole system works together as a powerful instrument for waste characterization in a wide range of waste shapes and waste materials and they are able to measure wide range of activity.