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Development of Advanced MOX Holdup Measurement Technology for Improvement of MC&A and Safeguards

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The Distributed Source-Term Analysis (DSTA) technique has been used in a variety of safeguards applications to determine location and quantity of material contained within large sample volumes. The DSTA method can provide user with knowledge of the location of neutron-producing materials and magnitude of the localized activity. By applying this method, JAEA developed two different neutron measurement techniques to improve own material accountancy and control (MC&A) in PCDF.

The first technique is a Glove Box Cleanout Assistance Tool (BCAT). It is used by operator during cleanout to increase recovered material, to decrease unmeasured inventory, and to perform the cleanout activity effectively. In order to identify holdup locations in a multiple gloveboxes qualitatively, we have designated 57 representative neutron measurement positions distributed individually throughout area of interest (53 areas). The BCAT is being introduced to the actual cleanout since 2011.

The second technique is a dynamic cross-talk correction (DCTC) method. The DCTC can obtain actual doubles signal cross-talk between multiple gloveboxes. In order to improve own MC&A in the holdup, it was necessary for operator to improve the current holdup measurement system (HBAS; passive neutron-coincidence based NDA). Because we had historically used a simple fixed-value for cross-talk correction although holdup amount varies according to the facility operation. After introduction of DCTC, by using a response matrix (6 x 6) between each detector position and glovebox determined from MCNPX model, cross-talk corrected doubles rates which is equivalent to the holdup amount can get correctly. We implemented an improved HBAS system using DCTC at the 2011PIT with authorization by inspectorate. The DCTC improves own MC&A by eliminating the double-counting of material that stems from cross-talk in the holdup assay data and eliminates this source of bias in the assay results.

Country or International Organization

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