Development of Safeguards System for Advanced Spent Fuel Conditioning Process

Tae-Hoon Lee, Dae-Yong Song, Won-Il Ko, Ho-Dong Kim, Ki-Jeong Jeong, and Seong-Won Park

Korea Atomic Energy Research Institute, 150 Dukjin-dong Yuseong-gu, Daejon

typhoon@kaeri.re.kr

Abstract

Advanced Spent Fuel Conditioning Process (ACP) is a pyrochemical process in which the spent fuel of PWR is transformed into the uranic metal ingot. Through this process, which has been developed in KAERI since 1998 the radioactivity, the radiotoxicity, the heat and the volume of the PWR spent fuel are reduced by a quarter of the original. To demonstrate a lab-scale process and extract the data for the later pilot-scale process, a demonstration facility of ACP (ACPF) is under construction and the lab-scale demonstration is slated for 2006. To establish the safeguardability of ACPF, a safeguards system including a neutron counter based on non-destructive assay, which is named as ACP Safeguards Neutron Counter (ASNC), the ACP Safeguards Surveillance System (ASSS) which consists of two neutron monitors and five IAEA cameras, and Laser Induced Breakdown System (LIBS) have been developed and are ready to be installed at ACPF. The target materials of ACP to assay with ASNC are categorized into three types among which the first is the uranic metal ingot, the second is the salt waste and the last is UO_2 and U_3O_8 powders, rod cuts and hulls. The Pu content of process nuclear materials can be accounted with ASNC. The ASSS is integrated in the ACP Intelligent Surveillance Software (AISS) in which the IAEA camera images and background signals at the rear doors of ACPF are displayed. The composition of special nuclear materials of ACP can be measured with LIBS which can be a supporting measurement tool for ASNC. The conceptual picture of safeguards system of ACPF is shown in Fig. 1.
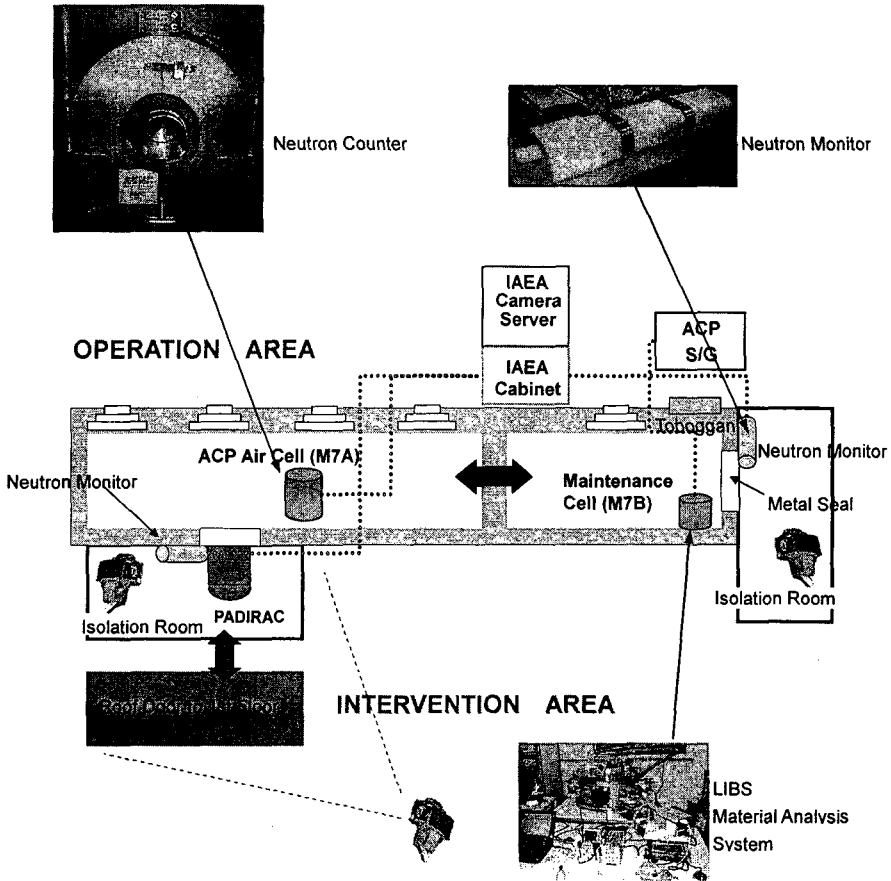
Fig. 1. Safeguards system of ACPF including one neutron counter (ASNC), two neutron monitors (ASNM), five IAEA cameras and LIBS.