

Safety Evaluation of the sealing performance of a metal cask subjected to vertical and horizontal impact load due to aircraft engine crash

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In Japan, there are plans for the first interim spent nuclear fuel storage facility away from a reactor site to go into commercial operation in around 2012, featuring the use of dual-purpose metal casks and in the northern Honsyu island and with a business license examination for safety design approval underway since March, 2007. To demonstrate the more scientific and rational implementation of safety regulation activities during each phase for the initial license procedure, CRIEPI executed demonstration tests with full scale casks, such as drop tests onto real targets without impact limiters and seismic tests subjected to strong earthquake motion.

Moreover, it is important to develop knowledge to ensure the inherent security of metal casks subjected to extreme mechanical impact, especially given the enhanced interest since the terrorist attacks of 11 September, 2001. To evaluate the potential damage to casks from an aircraft crashing at the storage facility, a numerical evaluation was performed for two impact scenarios, a vertical impact onto the lid structure and a horizontal impact hitting the cask.

Moreover, according to these scenarios, two impact tests by aircraft engine missiles onto the metal cask without impact limiters were executed, during which the leak rate from the metal gasket in the cask was also measured on impact.

This paper presents the dynamic mechanical behavior and confinement integrity of the metal cask lid closure system as obtained in the impact analyses and tests.