

Operating Experience

Dr. Stefan Anton, Vice President of Engineering

Holtec International

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Overview

- Doses and Dose Rates
 - Crew Dose during loading; History and Trends
 - GTCC casks
- MPC Port Cap Operational Issues
- Ancillary Aging Management



Dose during loading

- Initial FSAR (~1998) calculated highly conservative values
 - Bounding loading conditions, all fuel design basis at limiting burnup/enrichment/cooling time
 - No loading experience: assumed short distances, high residence times.
 - Estimates Crew Dose 5 person-rem (5000 person-mrem) per cask loading!
- First casks loaded
 - 500 to 1000 person-mrem
- Since then, dose keeps going down
 - Currently 125 to 300 person-mrem



Dose during loading (cont.)

- Main reasons for ongoing reduction in dose
 - Better understanding of the real dose field around the cask
 - Temporary shielding around and on top of cask
 - > Make sure additional weight, insulation and flow blocking does not invalidate supporting analysis
 - Remote tools and use of cameras for remote monitoring
 - Fuel loading patterns within cask are designed for maximum dose reduction
- Equipment effects
 - Users of Holtec's system have the choice of two Transfer Casks [HI-TRAC 100 (100t); HI-TRAC 125 (125t)]
 - Calculated dose rates on the side of the cask differ by about a factor of 6 between those casks
 - Difference in loading dose are less than difference in surface dose rate
- Conclusion
 - Experience from large number of loading campaigns is an effective dose reduction tool

GTCC Casks – Dose Rates



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- Loading of GTCC cask systems showed higher dose rates above the annulus between the Canister and the Overpack and on the lid, compared to systems loaded with fuel.
- Background
 - PWR control components stored with fuel
 - BWR control blades need to be stored separately from assemblies as GTCC due to size
 - 10CFR72 allows GTCC storage casks on ISFSI
 - Holtec has a GTCC storage system (HI-SAFE) compatible with the HI-STORM system.
 - Outer surface dose rates in storage are comparable between those systems
- Detailed analyses showed this is the effect of the different radiation source (Co-60, different axial distribution)
- Permanent and Temporary shielding (internal shielding components and annulus filled with water during loading) resolved the issue.
- Conclusion: Careful when extrapolating dose rates from known to new systems

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Port Caps Field Issues

- “Port Caps” are temporary threaded valves in the MPC lid used and needed during closure operation of the MPC (drain, dry, backfill), but not part of final confinement system.
- Failures are infrequent (<10 port caps of over 1,100 caps closed ~ 1%)
- Failure of the cap (bad seal, stuck open, stuck closed) can result in significant delays to cask loading and to increased dose
- For each instance of a failure, a detailed investigation was performed, the (presumed) cause identified, and corrected.
- Identified causes
 - Material incompatibility (stainless on stainless)
 - Foreign material
 - Thermal expansion
- Port Caps have recently been re-designed with User input
 - Thread protection and sealing surface changes are key features
- Conclusion: Infrequent events that have occurred too often, but not often enough to allow a 100% clear identification of the reason for the event.

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Ancillary Aging Management



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- Dry storage is now considered a “mature” technology
- Storage systems are passive requiring minimal maintenance
- Each system uses a range of ancillaries, some important to safety, some not
 - Mating device, lift yokes, FHD
- Suppliers and Users need to work together to chart failures
 - Need to understand life expectancy of motors, pumps, etc.
 - What is impact from long term storage and infrequent use (corrosion, condensation, seals, etc.)
 - Replace before failure is key. Identify key components, potential failure modes, and critical spare requirements.
 - Spare parts inventory on site, staged and ready.

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Summary and Conclusions



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- Good
 - Crew doses keep going down, well below the initial expectations
- Needs attention
 - Infrequent problems are difficult to analyze and resolve
 - Mature technology, aging and maintenance of ancillaries

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