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Investigations of aged metal seals for transport package safety assessment

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Abstract. Acceptable limits for activity release from transport casks for high-level radioactive material specified in the IAEA regulations must be kept by the integrity of cask body and the cask sealing system. BAM – the German competent authority for mechanical, thermal and containment assessment of packages liable for approval – verifies the activity release compliance with the regulatory limits. One of the fundamental aspects in assessment is the specification of conservative package design leakage rates.

To ensure the required package tightness for both storage and transport of the cask before and after storage, usually metal seals of the HELICOFLEX® type are used. Due to long-term use, the seal behaviour is influenced by temperature and time. The mechanical and thermal loadings associated with the routine, normal and accident conditions of transport specified in the regulations can have a significant effect on the leak tightness of the sealing system. Whereas the safety for application of new, non-aged HELICOFLEX® seals is verified sufficiently, there are still technical data gaps concerning the efficiency of aged HELICOFLEX® seals.

BAM performed experiments to learn more about the sealing efficiency of aged HELICOFLEX® seals with aluminium and silver outer jackets. The seals were compressed in test flanges, and for artificial ageing the complete flange systems were stored in an oven for several months at a high temperature. During the compression and decompression tests after the ageing, load-deformation characteristics of the seals and leakage rates were measured. With these tests a load situation was simulated, which can occur in the regulatory drop test of the cask: under high-impact loads the bolted lid can lift a little for a short moment, allowing a little movement of the seal so that the contact area can change before compressing again.

The poster presentation will show details about test conditions and first results.

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