

USABILITY EXTENSION OF THE ŠKODA VPVR/M CASK FOR TRANSPORTING IRRADIATED FUEL ASSEMBLIES

In the ever-changing environment of nuclear fuel management, including issues related to nuclear non-proliferation efforts, the safe transportation of various spent or irradiated fuel elements, especially those containing highly enriched uranium (HEU) fuel, continues to pose critical technical and regulatory challenges. The technical challenges, primarily driven by security and pragmatic considerations, are focused mainly on transport technologies, which would prefer in many cases the use of the transport technology based on the ŠKODA VPVR/M cask which has good references and is well-established in terms of service and can also be used for those fuel elements for which the transport technology (i.e. the transport cask) is not yet licensed. This paper introduces the ŠKODA VPVR/M cask and then highlights its flexibility by describing the internal basket adaptations that have been implemented, which have proven versatile for these needs.

As is known, the Russian Research Reactor Fuel Return (RRRFR) programme, since its inception, has continuously utilized the ŠKODA VPVR/M cask fleet, designed for the repatriation of spent nuclear fuel. As the programme progressed from a shutdown and a quasi-abandoned reactor, and as it began to include fuels of different countries of origin, new challenges emerged for the transport cask. These new challenges presented fuel types that had not yet been licensed for the ŠKODA VPVR/M cask. Although these requirements did not arise during the design of the ŠKODA VPVR/M cask, a retrospective analysis has revealed the adaptability of its internal basket construction to accommodate additional fuel types. In response to user demand, various internal basket constructions have been designed and manufactured over the years, and then successfully used as new internal baskets tailored to accommodate specific fuel elements in the ŠKODA VPVR/M cask.

Section 1 of the paper briefly introduces the ŠKODA VPVR/M cask, which holds a B(U) type license issued by the licensing nuclear authority of the country of the cask's origin (the Czech Republic). The licensed Russian origin research reactor fuel types are also specified, as are the licensed types for transportation.

Section 2 describes, almost in a list-like manner, the previously developed internal basket types with which various fuel elements, let's call them exotic HEU irradiated fuel types, were successfully returned to the country of fuel origin. These internal baskets are:

- ☒ TVR-S type internal basket for the removal of the irradiated HEU fuel assemblies from the RA research reactor (Vinča Institute of Nuclear Sciences, Belgrade, Serbia) — Section 2.1;

- ☒ Internal basket for liquid irradiated HEU fuel transport from the IIN-3M "Foton" Research Reactor (Tashkent, Uzbekistan) — Section 2.2;

- ☒ Internal basket for irradiated HEU MNSR core and fresh fuel pins transport — Section 2.3.

In Section 3, the most recently developed new internal basket type is presented in detail, which is designed to accommodate MTR-type or TRIGA-type irradiated fuel assemblies. This includes a detailed presentation of the design basis and the new MTR-TRIGA internal basket, as well as the licensing matters of the package under the name ŠKODA MTR-TRIGA cask, and the conformity test (dry- and wet-run) operations made to verify compliance with the internal basket.

Then, in Section 4, a summary of the usage record for the ŠKODA VPVR/M cask fleet is presented. Finally, the paper concludes (Section 5) with a consolidated overview of the experiences gained during the utilization of the cask fleet, emphasizing the high degree of cask flexibility ensured by the internal basket's construction. Based on the successful adaptations of the internal basket redesigned for new fuel element types so far, the paper concludes that the ŠKODA VPVR/M cask boasts a high degree of inherent adaptability due to its embedded construction architecture.

Country or International Organization

Instructions

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