

—ABSTRACT—

**A NEW METHOD FOR MANUFACTURING  
DEPLETED URANIUM DIOXIDE–STEEL CERMET CASKS**

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**A NEW METHOD FOR MANUFACTURING  
DEPLETED URANIUM DIOXIDE–STEEL CERMET CASKS**

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Cermets using depleted uranium dioxide ( $\text{DUO}_2$ ) and other ceramics embedded in a steel matrix are being investigated as materials of construction for spent nuclear fuel (SNF) storage, transport, disposal, and multifunction cask bodies. Cermet cask performance (shielding thickness, resistance to assault, capacity for a given weight limit) has the potential to significantly exceed the performance of traditional materials. The principle viability issue is manufacturing costs. A new powder metallurgy method for fabricating large casks has been invented (patents applied for) that may result in low fabrication costs. Its favorable economics are a result of (1) a process that produces a near-final-form cask with a minimum number of processing steps and (2) the low cost of the starting materials.

The fabrication method (Fig. 1) involves construction of a preform that is slightly larger than the final annular cask body and is constructed of steel. It includes the inside, outside, and top surfaces of the cask body but excludes the cask bottom. The preform (upside down) is filled with a particulate mixture of  $\text{DUO}_2$ , other ceramics, and steel powder. The composition of the particulate mixture can be varied in the vertical and radial direction. After the preform is filled, the bottom annular ring of the cylindrical cask body is welded to the preform to create a loaded sealed annular structure. The preform is then evacuated while being heated. The preform is heated and compressed to (1) eliminate all void spaces within the preform and (2) weld the metal particles together to form a continuous, strong steel matrix containing various ceramic particulates. The compression can be performed using traditional or ring-rolling forging methods. The finishing operations include welding the bottom onto the cylindrical cask body and using a vertical boring mill to obtain final dimensions. The conditions during processing on a microscopic scale are similar to those encountered during the production of comparable cermets using traditional approaches.

C. W. Forsberg and V. Sikka, *A Method to Produce Annular Cermet Objects, Patent Application to the U.S. Patent Office* (October 2002)

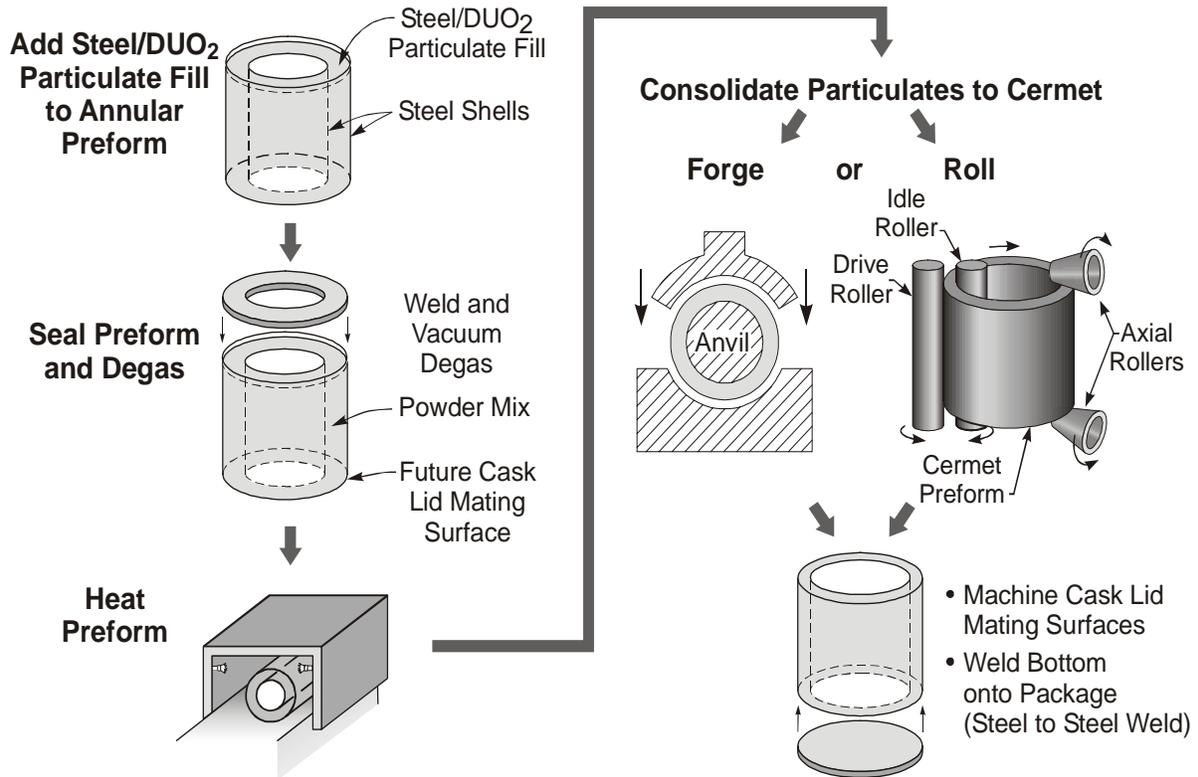


Fig. 1 New Method for Manufacture of Depleted Uranium Dioxide–Steel Spent Nuclear Fuel Cask