Nuclear Fuel/Fuel Engineering

SVEA-96 Optima3

Background

Our customers' number one challenge is to reduce the risk of fuel failures. This challenge became the main objective for the developers of the SVEA-96 Optima3 fuel assembly design, which combines debris resistance with a simplified mechanical design. This new product is a giant step towards flawless fuel performance.

Description

Smooth Spacer

Fuel failures in a BWR can cause significant disruptions to plant operations and could force a utility into an unplanned mid-cycle outage if the primary fuel failure leads to secondary degradation of the fuel cladding. Primary fuel failure statistics for Westinghouse 10x10 BWR fuel reveal that more than 90% of the failures are caused by debris fretting and points to the high level of

10x10 BWR protection against other fuel failure risks. To this end, efforts to achieve flawless performance have been focused on preventing debris from damaging the cladding.

Debris entering the fuel assembly has the potential to become trapped in the spacer and cause damaging fretting of the cladding. The new Westinghouse spacer is designed to minimize this risk. Smooth edges help prevent the debris from getting caught, and rounded corners guide the debris to areas that are distanced from the cladding.

Combined Debris Protection

The TripleWave debris filter was designed to protect the assembly by preventing debris from entering it as part of the coolant flow. The filter is a standard feature in the SVEA-96 Optima2 design, and has proven to be an effective means against debris above a certain size. Since debris tests have shown that the new SVEA-96 Optima3 spacer prevents debris from getting trapped, the combination of the new spacer and TripleWave is very effective in guarding against harmful debris of any size by either catching the larger debris in the TripleWave filter, or by allowing the smaller debris to pass through the bundle.

Westinghouse

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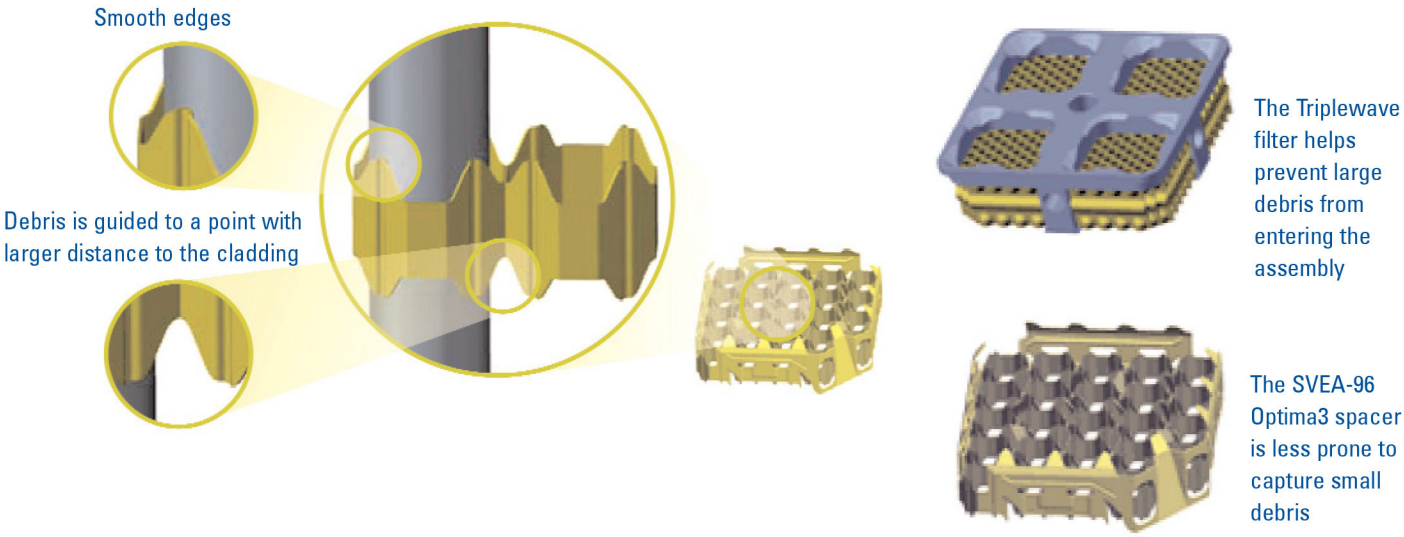

Simplified Mechanical Design

SVEA-96 Optima3 is based on the mechanical design that has been successfully demonstrated through extensive operating experience with SVEA-92 Optima2.

However, to better utilize the space within the assembly and to simplify the design, SVEA-96 Optima3 introduces a few new innovative mechanical design features.

- The traditional top tie plate is replaced by an additional spacer.
- There is short top plug relative to previous designs.
- The bottom tie plate design is simplified and enables free-standing rods.
- The plenum spring is replaced by a small clip.
- Twenty out of 28 nuts and all 8 external springs are eliminated.

Improved Fuel-Cycle Economy

These mechanical changes create more space within the assembly that can be utilized to improve the fuel-cycle economy by allowing more pellets or increased plenum volume in the fuel rods. In addition, the reduced material used in the assembly effectively reduces the parasitic neutron absorption.

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