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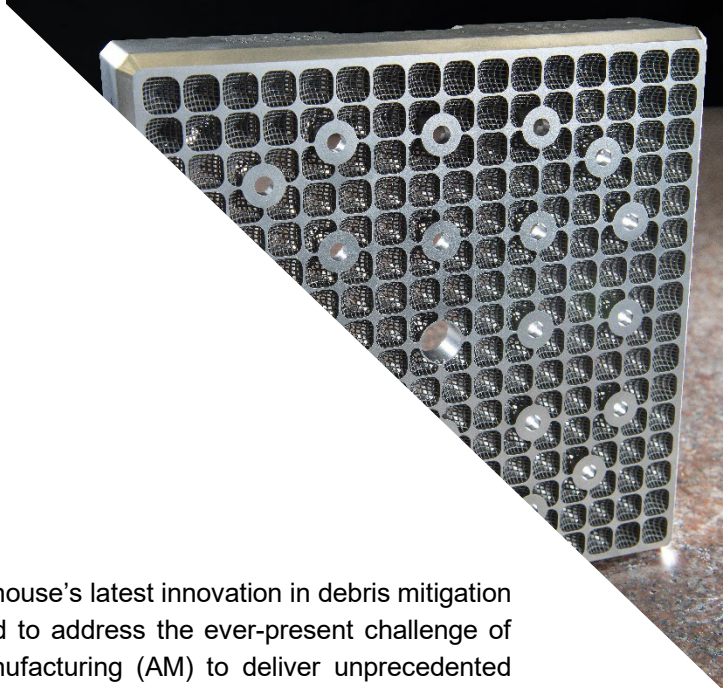

Additively Manufactured Bottom Nozzle (AMBN)

Debris Mitigation Solution

The Westinghouse Solution

The Additively Manufactured Bottom Nozzle (AMBN) is Westinghouse's latest innovation in debris mitigation for pressurized water reactor (PWR) fuel assemblies. Designed to address the ever-present challenge of debris-fretting fuel failures, the AMBN leverages additive manufacturing (AM) to deliver unprecedented filtering performance, structural integrity, and operational reliability. It builds on the success of the Advanced Debris Filter Bottom Nozzle (ADFBN) and PRIME™ designs, incorporating proprietary AM techniques and high-performance materials to achieve up to 13X improvement in debris resistance.

Customer Benefits

- **Advanced Debris Barriers**: Enhances prevention of debris related fuel failures with comprehensive set of advanced barriers.
- **Leverages Operating Experience:** Builds upon successful features and experience from proven nozzle designs.
- **Unprecedented PWR Debris Filtration**: Proprietary design features and performance only achieved through additive manufacturing.

Key Features and Innovations

- **Material Upgrade**: Transition from 304 SS to Alloy 718 enables innovative filter features while meeting strict mechanical performance criteria.
- **Dual-Mesh Filtering**: Complex 3-D mesh capable of filtering particles up to 13X smaller.
- **Skirt Optimization**: Maintains lowered side skirt feature which further enhances debris resistance.

Performance Metrics

- **Debris Resistance**: Increased from 65% to 96% based on rigorous testing using small debris
- **Wire-Like Debris**: Extremely effective against debris down to the size of pencil lead.
- **Pressure Drop**: Maintains equivalency with existing bottom nozzle designs, enabling ease of implementation.

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Additive Manufactured Bottom Nozzle (AMBN)

"*Our additive manufacturing technology is allowing us to achieve breakthrough performance with an immediate positive impact for our customers. This significant technology innovation for PWR reactors mitigates the risk of leakage in the fuel rods due to the accumulation of debris, strengthening the safety and efficiency of our customers' operations.*" - Tarik Choho, Westinghouse President of Nuclear Fuel.

Testing and Validation

- **Mechanical & Hydraulic Testing:** Validated strength, fatigue, corrosion resistance, and pressure drop.
- **Industry-First Irradiation Testing:** AM Alloy 718 specimens irradiated at the MIT reactor with Post-Irradiation Exams (PIE) at Churchill.

Deployment Milestones

- First in-reactor operation with Lead Use Assemblies (LUAs) in spring 2024.
- Total of eight (8x) LUAs delivered for two (2) U.S. utilities and operating in reactor.
- Successful PIE performed on 4 LUAs in fall 2025 – LUAs reinserted for continued operation.
- Target region-quantity reload readiness by 2028.

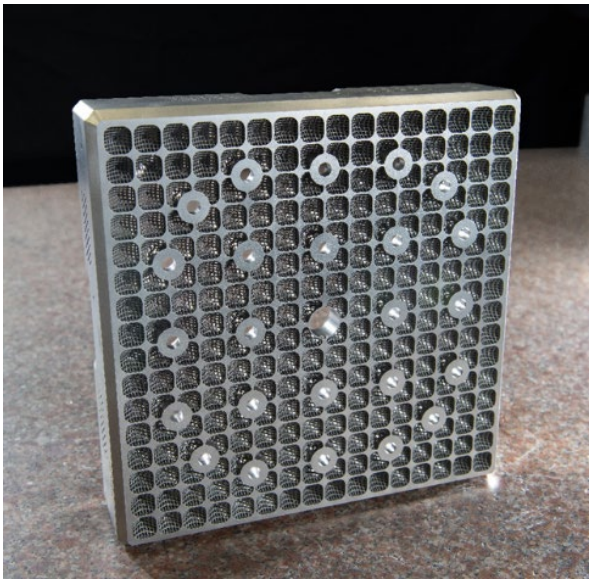
Licensing & Compliance

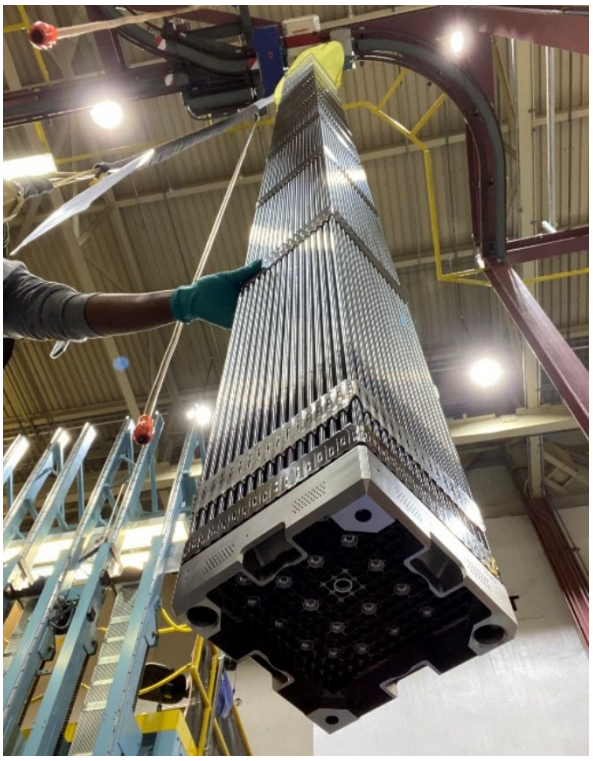
- Implementation under 10CFR 50.59
- Compliant with NRC Advanced Manufacturing Technologies guidelines

Contact Us

- Website:

  www.westinghousenuclear.com
- Enquiries:
  https://westinghousenuclear.com/contact-us/





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