

In-mast Sipping

Background

Westinghouse in-mast sipping (IMS) is a proven process for identifying leaking fuel assemblies by detecting gaseous fission products that have escaped from breached irradiated fuel rods. This process typically involves initiating the fission product migration by creating a pressure differential (gas or vacuum sipping) or by mechanical scrubbing (wet sipping). Our experience has shown the most accurate way of identifying leaking fuel assemblies is gas (vacuum) sipping, whereby the presence of xenon and/or krypton is used to indicate leaking fuel. Westinghouse offers the IMS series for pressurized water reactors (PWRs).

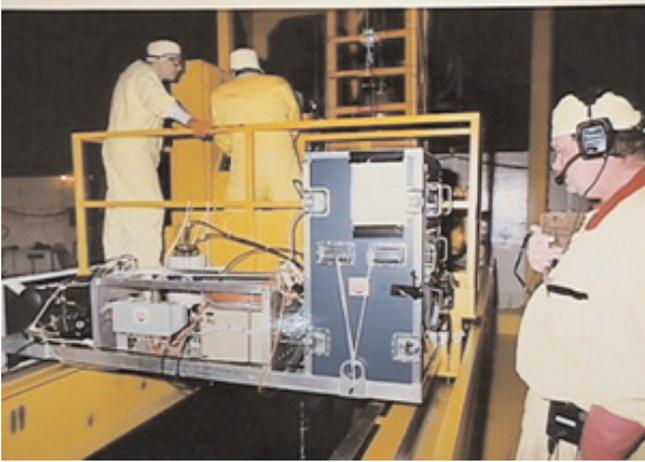
Description

The standard sipping sequence consists of five distinct steps that are initiated once the fuel assembly has been removed from the core and is in the mast-full-up position. Until that point, the sipping system is in a ready-state, defined as “standby.”

1. When the inner mast reaches full-up position, the sequence starts with the volume test step. During this step, an air sample is drawn from the mast and passed through the detector system.
2. The second step is the flow test, during which sampling from the mast continues while a stream of bubbles is injected into the bottom of the mast.
3. The third step is recirculation, where the sampled gases are rerouted back through the mast in a closed loop. If there is no indication of gas activity in either test or recirculation, the system returns to the standby mode ready for the next fuel assembly.
4. If a leak is detected; however, it is necessary to perform the purge step. This step allows for the introduction of clean instrument air to be circulated through the detector, pump, and valves in the sampling lines to purge any gases present.
5. The ratemeter indicates when sufficient purging has been performed to reduce background count to previous levels. The system then returns to standby, ready for the next assembly.

Benefits

With an increased emphasis on plant operation of a zero-leakage core, detecting fuel defects to be reloaded has become important. Sipping offers a high degree of accuracy with little or no impact on scheduling during refueling operations since it's performed while the core is being unloaded. This process has been developed for installation into any PWR refueling machine mast.



In-mast sipping consoles installed on fuel handling bridge trolley

Deliverables

Westinghouse works with the utility to pre-plan and coordinate the IMS series. Upon completion on selected fuel assemblies, we provide you with the following documentation:

- Written procedure for sipping
- Report of inspection results
- Copies of all data obtained, including charts