

Refueling for PWR/BWR TELESCOPE Sipping™ Services

Background

Westinghouse offers fuel TELESCOPE Sipping™ Services for both pressurized water reactor (PWR) and boiling water reactor (BWR) nuclear power stations. These services use a proven process to detect leaking fuel assemblies accurately and quickly.

Description

The TELESCOPE Sipping technology is an evolutionary development from previous ABB Atom Systems used to perform more than 173 fuel-sipping campaigns on fuel from most major suppliers.

Gaseous fission products are released from a leaking fuel assembly as a result of a pressure reduction when the assembly is raised during normal fuel handling. Measurement of fission gas activity for radionuclides, in the sample water drawn through the fuel assembly such as Xe-133 and Kr-85, gives a direct, real-time indication of leaking fuel.

Equipment and Procedure

The TELESCOPE Sipping system requires that the refueling mast is configured for fuel sipping. Typically, a temporary modification is made for a BWR refueling grapple, and a permanent modification is made for PWR refueling masts. The system detects fission products that are released from a defective fuel rod as the fuel assembly is raised and transported during the offload or fuel shuffle.

Raising the fuel assembly creates a pressure differential across the fuel cladding; leaking fuel equalizes the pressure differential by releasing fission by-products through the cladding breach. The released fission by-products enter the water surrounding the fuel assembly and rise upwards.

Water containing the fission by-products is pumped from the top of the fuel assembly to a separation tank built into the sipping skid where the gases are separated from the water. The gases are circulated through a sensitive beta detector where its activity level is continuously measured and monitored. A specific block of time showing the rise in the count rate indicating a leaking fuel rod is recorded to an electronic file for each fuel assembly sipped.

Benefits

The Westinghouse TELESCOPE Sipping advantages include:

- Usable in both BWR and PWR cores
- One eight-hour shift setup
- Four-hour removal
- Refueling bridge setup
- Minimal mast or grapple modification
- Laptop computer operation
- Instant/real-time leaking fuel detection
- Little to no impact on fuel movement schedule
- Minimum space on refueling bridge 1.5 x 4 feet (6 square feet)
- Minimal service requirements: 115V/20 amp single phase, or 230V/10 amp, depending on country

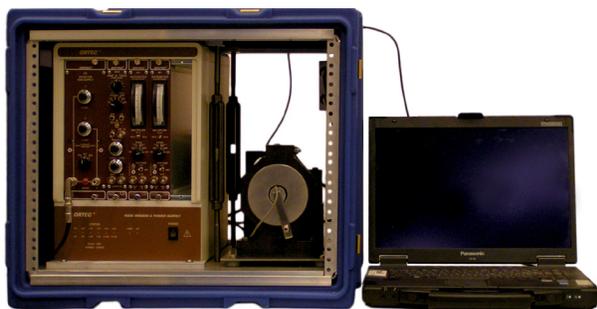
Experience

Westinghouse has performed TELESCOPE Sipping at 41 BWRs and 24 PWRs worldwide and tested over 90,559 fuel assemblies with a greater than 99.9 percent leak detection success rate. This service has also been provided in conjunction with ultrasonic testing to identify specific rods in leaking assemblies, allowing for repair and reinsertion into the core.

Westinghouse's extensive experience with this equipment in the field has allowed the opportunity for customers and operators to provide feedback for improvements. These inputs have been incorporated into an upgraded system that reduces setup time, minimizes dose and has improved operator interfaces to mitigate human performance errors. This system has already been built for the AP1000® plant, but maintains the same dimensions and power requirements as Westinghouse's existing system to allow it to be used at any site utilizing Westinghouse TELESCOPE Sipping services.



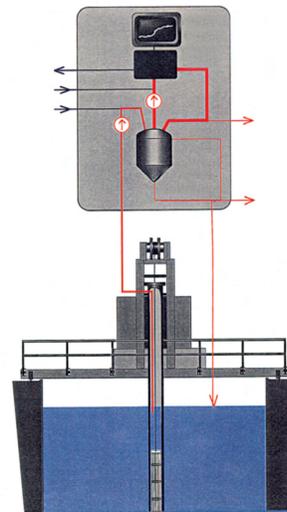
TELESCOPE Sipping system, European version



Repackaged sipping electronics for use with U.S. TELESCOPE Sipping systems



Upgraded TELESCOPE Sipping system built for **AP1000** and applicable for use at all U.S. PWR and BWR plants currently using TELESCOPE Sipping fuel inspection



TELESCOPE Sipping process

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