Background

In an effort to eliminate fuel failures, sites across the industry are paying closer attention to the condition of the fuel assemblies as they are removed from the reactor during refueling. Westinghouse offers the transfer canal four-face fuel assembly inspection/recording system (TC-FAIRS) to help maintain the integrity of reloaded fuel assemblies. The system consists of five cameras, a custom support frame and a video recording console.

Various four-faced systems exist in the industry, but the Westinghouse system is mounted around the spent fuel upender and is invisible to the off-load evolution. The system is designed with a custom support frame to adjust or remove individual cameras without affecting the remaining cameras in the system. This system also has the added feature of a fifth camera dedicated to collecting a view of the bottom nozzle.

Description

The TC-FAIRS consists of five cameras deployed on individual poles and located at specific positions around an upender. The system is typically deployed around the spent fuel pool upender, but can be deployed around the containment upender if desired. Four of the cameras are focused on the sides of the fuel assembly, with a fifth camera dedicated to a direct view of the bottom surface of the bottom nozzle. The cameras contain integral LED lighting and each one has zoom, focus and exposure adjustments.

The cameras are deployed on separate poles that have position, height and rotation adjustments to allow a clear picture of each face of the fuel assembly. The cameras are deployed prior to the off-load; the deployment can occur in parallel with or prior to reactor disassembly.

An upgraded version of the new Westinghouse refueling digital video recorder (DVR) is used to record video. The typical refueling DVR uses a network-enabled four-channel recorder. When connected to a network, the DVR can be accessed from any computer or table, enabling the viewer to stream live video, play back prior recordings or record locally outside of the radiologically controlled area. The upgraded four-face model uses two eight-channel DVRs for added redundancy and a quad-splitter to capture four faces in one video file. Both models allow text overlay and audio using the included microphone. The DVR can be controlled using a remote control or a USB mouse. Video is downloaded from the DVR using a USB drive on the front face of the console. Video format is generic and playable with most media players including VLC® and Windows® Media Player.
Benefits

- No impact on off-load evolution
  - System deployment during reactor disassembly
  - No added motion or time during fuel move
  - Video can be reviewed during off-load, between assembly movements
- Independent camera adjustment/deployment
- Direct view of bottom nozzle in addition to recording each face of the fuel assembly
- Custom support frame can be adjusted for plant-specific mounting requirements
- Files are archived in off-load sequence for quick retrieval
- Real-time remote viewing and playback available via local area network
- Audio overlay available for each video recording
- Video download to DVD or USB storage device
- System design with foreign material exclusion considerations