

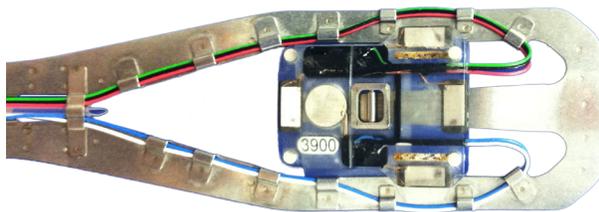
Reactor Vessel Head Penetration Inspection

Background

Operators of pressurized water reactors are required to examine their reactor vessel head (RVH) penetrations on a periodic basis. Once a baseline inspection has been performed, subsequent plant-specific examination intervals are based on susceptibility of the penetration material to crack initiation and the potential for crack propagation.

Since primary water stress corrosion cracking was first identified in vessel head penetrations, Westinghouse has been in the forefront in developing and qualifying inspection and repair technologies necessary to meet industry requirements.

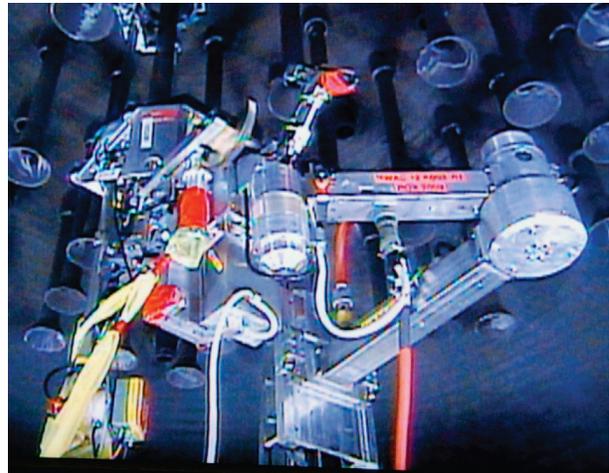
Westinghouse was the first to qualify examination procedures in accordance with the Electric Power Research Institute protocol, first to offer a blade probe with circumferentially as well as axially oriented time-of-flight diffraction (TOFD) probes, and first to offer the less invasive embedded flaw-repair methodology.



Combo 2 blade probe for inspection of penetration tubes containing thermal sleeves

Description

The Westinghouse RVH penetration examination program is designed to meet the provisions of the American Society of Mechanical Engineers Code Case N-729-1, as modified by 10CFR50.55a, September 10, 2008. Westinghouse provides various ultrasonic and eddy current techniques and tooling for under-the-head inspection of reactor vessel penetrations. Westinghouse's remotely operated DERI and ROSA™ manipulators are used to deliver a variety of end effectors, depending on the head type, penetration configuration and specific inspection requirements.



DERI manipulator

- The GapsScanner end effector is used for inspection of penetration tubes containing thermal sleeves. Westinghouse's Combo 2 blade probe, containing TOFD transducers oriented in the axial and circumferential directions and a leak-path inspection transducer, is delivered into the annulus between the penetration tube and the thermal sleeve for inspection of the required volume. Eddy current blade probes are also available for supplementary investigations, if necessary.
- The open housing scanner end effector is used to inspect penetrations without thermal sleeves. TOFD transducers oriented in the axial and circumferential directions and a leak path inspection transducer provide inspection coverage of the required volume. An eddy current coil is built into the probe to collect supplementary surface examination data.
- The Grooveman™ end effector is available for eddy current examination of the surface of the J-groove weld, and the accessible penetration outside diameter surface when necessary.
- Eddy current probes and ultrasonic transducers are available to inspect the vent line. The vent line J-groove weld surface is typically examined using eddy current techniques.
- IntraSpect™ software is used for acquisition and analysis.

In addition to the under-the-head inspection of reactor vessel penetrations, Westinghouse also provides the latest technology to meet visual examination requirements for the top of the RVH.

Benefits

- Fast, accurate and reliable inspection capabilities using visual, eddy current and ultrasonic techniques
- Equipment, procedures and personnel qualified in accordance with MRP-311 protocol
- Demonstrated leak-path identification capability
- Inspection tooling provides the lowest dose for both customer and Westinghouse personnel
- Access to resources for engineering support and repair implementation

Experience

Westinghouse's global RVH service team combines state-of-the-art equipment and technology with highly trained and qualified personnel who, since 2001, have performed the majority of the RVH penetration inspections in the United States and over 70 percent of inspections worldwide. Repair efforts have been implemented at numerous plant sites, both in the United States and worldwide, and have included both inside diameter and outside diameter repairs.

WesDyne is the nondestructive inspection branch of Westinghouse and a leading supplier of mechanized nondestructive examination (NDE) products for all inspection needs worldwide providing turnkey and one-off-type solutions with a focus on the nuclear market. WesDyne's expertise spans all aspects of remote and mechanized inspections, from problem analysis and solutions generation to development and manufacturing to field deployment of personnel and equipment. Inspection capabilities cover all key NDE areas such as ultrasonic, visual, eddy current, magnetic particle, dye penetrant and X-ray.

WesDyne is a trademark or registered trademark of Westinghouse Electric Company LLC, its affiliates and/or its subsidiaries in the United States of America and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited. Other names may be trademarks of their respective owners.

WesDyne International
680 Waltz Mill Road
Madison, PA 15663

www.wesdyne.com
www.westinghouse**nuclear**.com

April 2016 NS-FS-0074

©2016 Westinghouse Electric Company LLC. All Rights Reserved