From: Wayne Schmidt
To: David Lew; Gregory Cranston
Date: Fri, Jun 23, 2000 4:24 PM
Subject: Re: IP2 Weekly Summary

Sorry don't know what happened - that was a word file - I converted it to WP -- see the attached

CC: Brian Holian; Wayne Lanning

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INDIAN POINT 2 STEAM GENERATOR TUBE FAILURE DEFINITION OF TERMS
Revision 0, 6/23/2000

TERM	DEFINITION	COMMENTS
Eddy current testing	Utilization of electromagnetic induction to detect flaws in SG tubing.	1. Probe produces a varying electromagnetic field about the coil. 2. This field induces an electrical (Eddy) current in the SG tube. 3. The eddy current induced in the SG tube produces its own electromagnetic field, which in turn induces a current back in the probe coil. 4. The electrical current induced in the SG tube is influenced by such characteristics as conductivity, permeability and geometry. 5. Changes in these characteristics cause variations in the induced current in the SG tube, which cause variations in the electromagnetic field generated by the current in the SG tube, which cause.variations in the current induced back to the probe, which cause variations in the signal received by the probe, which can translate into a flaw.
Bobbin Coil probe (BC)	Single coil probe inserted in SG tube and pulled through the tube to detect axial indications.	1. Bobbin coil wound in a plane perpendicular to tube axis. 2. Used for detecting axial tube indications. 3. Bobbin probe speeds up to 48 inches/second have acceptable detectability as long as the minimum digitization rate of 30 samples/axial-inch are met or exceeded.
Pancake Probe	Rotating, single coil probe inserted in SG tube and pushed or pulled through the tube to detect circumferential indications.	1. Pancake coil wound in a plane parallel to or perpendicular with tube axis. 2. Used for detecting either axial or circumferential tube indications, depending on how wound. 3. Probe rotates. 4. Acquisition speeds of probe up to 0.8 inches/second and 1200 RPM have acceptable detectability as long as the minimum digitization rate of 30 samples/inch circumferentially and 25 samples/inch axially are met or exceeded.
+ Point probe	Rotating probe with axial and circumferential wound coils to detect either axial or circumferential SG tube cracks/indications.	For +Point, probe speeds up to 0.2 inches/second and 300 RPM are acceptable.

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CECCO probe	Multiple coil , multiple array probe that can detect circumferential and axial indications. Each coil in the multiple array focuses on a segment of the tube. The combined inputs of all coils provide a full picture of the tube.	CECCO probe is qualified at speeds up to 12 inches/second.
High frequency probe	Insensitive to things on the tube outer surface, such as deposits and the tube sheet.	1. Most defects encountered in eddy current inspections are on the outer surface of the tubing. 2. Defects on the inner surface of the tubing are much easier to detect and size. 3. The higher the frequency the easier it is to detect defects on the tube OD. To get higher frequency the number of turns is decreased and the cable capacitance reduced as much as possible.
Noise	Distortion of signal	Can be caused by electronics, some external electrical interference or tube characteristics. Electronic noise: noise of electronic origin created by the eddy current instrument and associated equipment or noise due to probe electrical coil shorts, instrument or cable failure and due to electrical interference from other systems. Mechanical noise: introduced by the movement of coils through the tubing. Can be due to probe wear. Noise from unexpected objects: introduced by interfering signals related to tubing and/or structure, tube internal surface conditions, electrical and/or magnetic property variations, tube geometric variations, and/or structure signals.
Signal-to-Noise Ratio (S/N)	Strength of the signal from the probe compared to noise interfering with that signal.	S/N (dB) = 20 log A_s/A_n where A_s (volts) = signal amplitude and A_n (volts) = noise amplitude.
Probe Pusher	Electro-mechanical devices to remotely introduce probe into SG tube and bring it back.	
Digitization Rate (DR)	Number of samples/inch.	Quotient of the eddy current instrument sample rate (SR) and the probe speed (PS). One of the essential variables of the inspection. Defines the resolution of the technique applied and influences both the probability of detection (POD) and measurement uncertainties. DR = SR/PS

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Sample Rate (SR)	Number of samples/second by the probe.	
Probe Speed (PS)	How fast the probe moves through the tube, inches/second.	.
PWSCC	Primary water stress corrosion cracking.	A function of material, stress, and the environment. Occurs on the inside diameter of the tube.
ODSCC	Tube outside diameter stress corrosion cracking	Generally, occurs in the sludge pile area. The sludge pile area goes up about 10 inches from the top of the tube sheet.
Tube denting	Physical deformation or denting of the SG tube due to corrosion product buildup in the gap between the tube and the tube support plate in conjunction with SG heat-ups and cool-downs.	SG design has a gap between the tube and tube support plate to allow for thermal expansion when the SG is heated-up. Gap is open when SG is in shutdown/cooldown mode. Corrosion products build up in gap when it exists. When SG is heated-up, the lack of a gap (due to the corrosion product build-up) causes compressive forces resulting from thermal expansion to physically dent the tube inward. The next time the SG goes through a cooldown and heat-up cycle the process repeats.
Pitting	Corrosion of tube wall.	
Degradation Categories	Categories applicable to IP2 for SG tube degradation.	Denting at support plants. Pitting in sludge piles. Hot leg roll transition (RT) primary water stress corrosion cracking (RT-PWSCC). Intergranular corrosion at tube support plate dents. TS (tube sheet) crevice intergranular attack/stress corrosion cracking. PWSCC at U-bend. Wear at anti-vibration bars Miscellaneous
Hour-glassing	Deformation of the rectangular flow slots through the tube support plates that take the shape of an hourglass.	Caused in conjunction with denting of the SG tubes at the support plate. Cracking of support plate ligaments can also result.