

A Treasure is Hidden in Every Nuclear Power Plant



What Can We Do With It?

- Improve reliability, availability, and productivity
 - Identify problems in plant equipment and processes
 - Predict when equipment may fail

All These Can Be Done Passively, Remotely, and While the Plant is Operating

What Happens When You Go To The Doctor

Instrumentation

Visual Inspection

Acoustic Monitoring



Diagnostics and Corrective Action

Calibration









Feeling Good

Normal

Back at Work

Predictive Maintenance

- Radiography
- Vibration Analysis
- Oil Analysis (tribology)





Prognostics



What is the Treasure?



Where is it ?



How to Get It ?



Sensing Line Blockages Can Be Dangerous (OLM Can Help)



Slide 11

Venturi Fouling is Detectable and Quantifiable by OLM



BWR Stability Measurements



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Instrument Tube Vibration in BWRs



Core Barrel Vibration





Results of The Testing



What if There are No Existing Sensors for Condition Monitoring? (Install Wireless Sensors)



Wireless Monitoring System - ASME Section XI (Safety Related)

(DOE Project at Comanche Peak Nuclear Power Plant, Texas)



Recent DOE Research Award (Phase III)

In-Containment (1) Application of Wireless Technology for Online Condition Monitoring



Wireless Data Collection System Implemented at Comanche Peak Nuclear Power Plant Under DOE Project



Wireless Data Collection System Heater Drain Pump Motor



Heater Drain Pump



AMS Accelerometer

Existing Triax Accelerometer

Existing Wireless Accelerometer

Do Not Forget Cables and Connectors



Recent Cable Connector Problem Added Two Weeks to the Outage of U.S. Nuclear Power Station







Melted Insulation Results in Forced Shutdown of U.S. Nuclear Power Station



How to Identify and Locate Problems in Cables



DOE Holistic Cable Condition Monitoring Project





Laboratory Research



Development of MicroSensors for Cable Condition Monitoring (DOE Project Jointly Performed by AMS and PAC: Ken Watkins)



Holistic Cable Diagnostic System



DOE SBIR PROJECTS

•	On-line Monitoring of Accuracy and Reliability of Instrumentation and Health of Nuclear Power Plants	Phase II+
•	Wireless Sensors for Equipment Health and Condition Monitoring in Nuclear Power Plants	Phase II+
•	Wireless Sensors for Predictive Maintenance of Rotating Equipment in DOE's Research Reactors	Phase II
•	Advanced Techniques for On-Line Condition Monitoring and Diagnostics of Digital Rod Position Indication Systems	Phase II
•	A Holistic Approach for In-Situ Cable Condition Monitoring	Phase I
•	Prognostic Methodologies for Condition Assessment and Predictive Maintenance of Power Plant Systems, Structures and Components	Phase I
•	Online Monitoring for BWRs	Phase III
•	In-Containment Application of Wireless Technology	Phase III



DRPI Diagnostic System Block Diagram



ATR at a Glance

ATR is launching a Life Extension Program (LEP) as well as a Reliability Centered Maintenance (RCM) program to improve reliability of rotating machinery and I&C systems





NASA Airspeed SBIR for Indication Fault Detection (Air France Flight Crash En Route from Rio de Janeiro to Paris)



NASA SBIR for Space Reactor OLM



Conclusions

