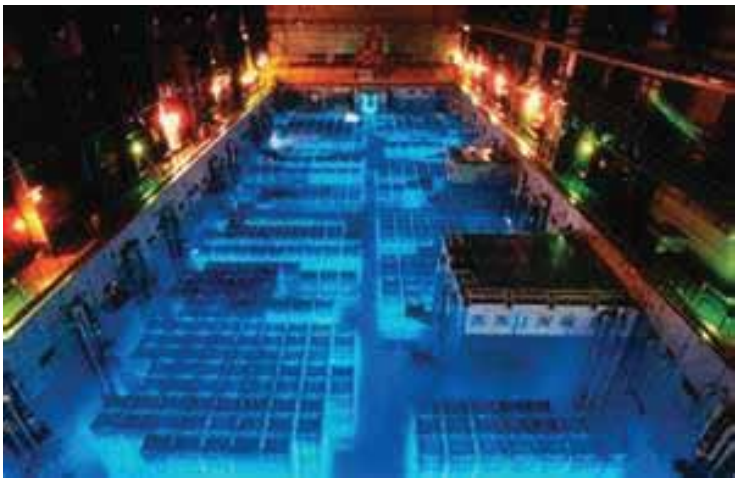
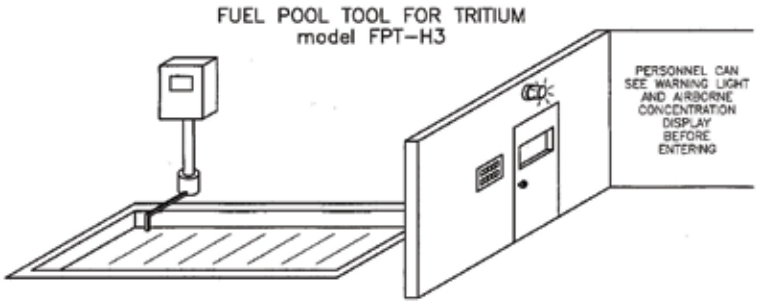


Fuel Pool Tool

FPT-H3 Tritium Only (Air and Water)

FPT-H3-ABG (Tritium and Alpha-Beta-Gamma - Water)



Features

- Detects Tritium Concentration in Pool Water and Air
- Real Time Continuous In-Line Instrumentation
- No Waste Stream
- Easy Calibration
- Full Scada Compatability and Control Room Integration
- User Friendly Cleaning and Decontamination
- **TA Smartpeak Software**
- Data Storage / Historical Retrieval System
- Optional – Alpha-Beta-Gamma Detectors for Water
- **Detectors: IP67**
- **Electronics: IP64**

Application

- Monitor nuclear power plant fuel pool: water, and air condensation for Tritium and other radioactive agents.
- Control room monitoring of spent fuel pool conditions: water level, temperature, radiation.
- Real time data enables command and control to limit exposure or release on and off site.

Problem

New NRC rules will require close real-time monitoring of spent fuel pool status and parameters including control and active inventory of on site material including Tritium oxide.

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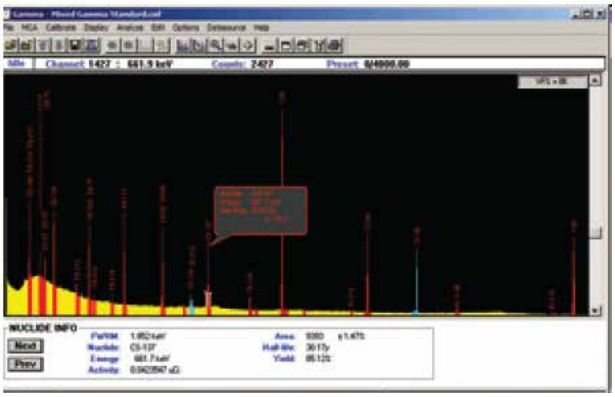
Solution

For the first time in a Continuous Real Time monitor the Model FPT-H3 solves this problem by continuous monitoring of the spent fuel pool water and air space using Tritium and optional Alpha, Beta and Gamma detectors. The information from these detectors is analyzed and displayed in units of picoCuries per liter. The calculations are updated every 2 minutes, every hour and every day. The longer update times correspond with greater precision and increased sensitivity. Please see attached chart of measurements.

Using **TA/OTC Tried and True** sample collection and measurement technology these detectors measure Alpha, Beta and Gamma from any radioactive liquids. Measurements of radiation concentration and total discharge are logged 24 hours/day, 7 days/week.

GAMMA-MCA ISOTOPE INDENTIFIER



Description: The FPT-H3 is a multi-detector for real-time continuous monitoring of Tritium in fuel pool water and in the fuel pool building breathing zone air. A built-in microprocessor controller with color LCD display, user friendly housing for maintenance and decontamination, pre-amp plug-in modules allow for function modification, and a wide range of pump capacities create a system designed for new requirements and site specific needs.

Standard Radiation Detectors:
Tritium in Water – NEX-Tritium Monitor
(2) Choices for Tritium in Air

- Model 357 – range of 1-20,000 uCi/ m^3
- Model 411 – an accident range monitor, 0.01-2,000 mCi/ m^3

Dual Range (auto ranging) monitor with a remote, single 2L chamber. A wire grid chamber minimizes plate-out of HTO.

See Measurement Chart for water level and other optional sensors.

Optional Detectors – Model FPT-H3-ABG
FPT-H3-ABG incorporates Alpha, Beta, and Gamma detectors for water.

IC-25-HT is a pressurized ion chamber designed for hostile radiation, high temperature environments, and LOCA conditions. It is closely suspended above the water surface of fuel or reactor pools.

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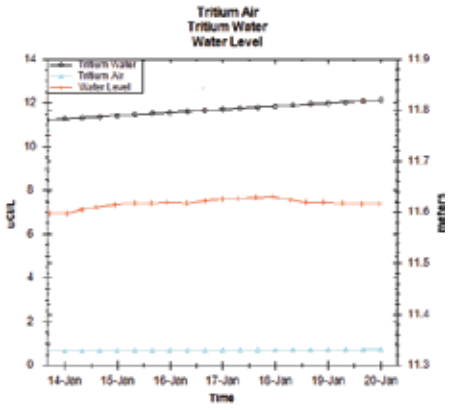
Beta Scintillation detector with 1,100cm^2 sensitive area. **The Alpha, Beta pulse analysis portion** of this system conditions and analyzes the output from the photo-multiplier tubes by pulse height, duration and coincidence; eliminating most background and noise counts. Sensitivity is enhanced by the use of stochastic resonance plus high gain, low noise PM tubes and pre-amps.

Gamma Detector: Gamma emitter content is measured using an MCA analyzer with greater than 1,000 channels with a user settable energy range. For example the MCA can be set for Gamma energy of 10 KeV to 3 MeV.

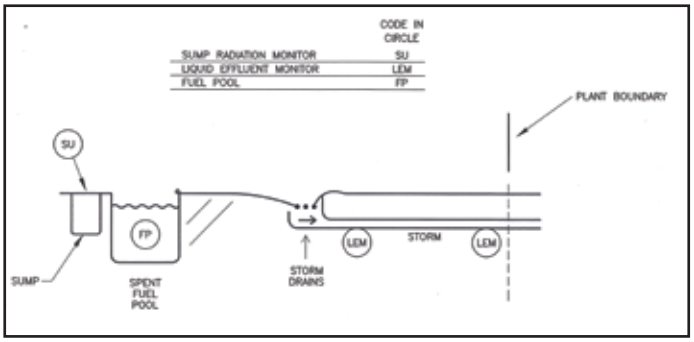
Optional: Isotope Identification System – TA SMART-PEAK™ Software detects even low gamma concentrations. The isotope identifier specifies and displays radioactive nuclides in water. Radon rejection is standard for airborne measurement and optional for water.

Measurement Charts



Measurements/Displays	Water	Air
Tritium Concentration	uCi/L	uCi/
Gamma Ion Chamber Surface Detector	Suspended above Reactor or Fuel Pools	
Temperature	°F / °C	°F / °C
Humidity		RH%
Dew Point		Optional
Water Level	Optional	NA
Alpha-Beta-Gamma Content	Optional	Optional
Turbidity PH Conductivity	Optional Optional Optional	NA NA NA
Warning/Alarm Settings	Yes	Yes
Remote Readouts	Optional	Optional

FPT Detector Placement »



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Data: Analysis, Display, Hard Copy, DVD, ROM Archive

In each peak or area of interest, the net counts are automatically converted to concentration units, of picoCuries/liter (using the detector efficiencies automatically measured and stored previously by **FPT-H3** semi-automatic self-calibration procedure).

The concentration and total activity released and MDA levels are continuously calculated and recorded. This real time information will alert the notification system. All data is saved to the hard drive in spreadsheet format. Historical data is easily displayed on-screen (and/or printed out on the included graphics printer) in tabular or graphical format, showing quantitative information as well as trends. Data is recorded frequently so time-resolution is excellent.

DVD drive, Ethernet and USB ports (with security) make it easy to archive and further analyze data.

Continuous, Reliable Data – YES, False Alarms – NO

Our newest systems have multiple layers of protections and redundancy in both the software and the physical act of reporting an alarm, prevent false alarms. This includes an alarm voting system so that alarms will come on only if all the data is consistent and conclusive. Data is continuously recorded to allow human interpretation.

Each alarm activates fail-safe relays. Relay contacts are available to user.

Triggered Aliquot: This feature automatically collects and stores a small water sample for independent analysis whenever an alarm or event of interest occurs.

UV Lamp: Used on inlet as algae-cide.

3 GHz Computer Includes:

- 3 GHz Processor, 600 G Hard Drive, 4G Ram
- 15" LCD Monitor, Keyboard, Mouse
- DVD Drive creates DVD's for Data Archive
- 10 Channel Data Acquisition Board, All Cables
- Full Graphics Printer, Color plus B/W
- Ethernet for hook up to your LAN
- Windows Specific Software for Alpha, Beta, Gamma Counting
- Software is easily customized by user for special needs
- Data from the 1024 channel MCA-multi-channel analyzer is accessed via a USB or Ethernet Port
- Full SCADA compatibility
- Optional MODBUS or DNP3 or other protocols

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Detect	PAG Level	Lower Limit of Sensitivity	Top of Range	Sensor/Method Used		Maintenance
Standard FPT-H3					**Time**	**Action**
Tritium in Water		20,000 pCi/l	1 x 10^6 pCi/l	Bed of Crushed Scintillation Crystals	3 mos	Replace Filter Cartridge
Tritium in Air		0.1mCi/m^3 2,000 mCi/m^3	1 x 10^6 pCi/l	Single 2L Wire Grid Ion Chamber	3 mos	Replace HEPA Filter
FPT-H3-ABG						
ALPHA	U-238 3,000 pCi/l			5" dia. Bed of Crushed Scintillation Crystals	3 mos	Replace Particulate Filter Cartridge
30 min. 24 hr		25,000 pCi/l 3,000 pCi/l	2 x 10^7 pCi/l			
BETA	K-40 30,000 pCi/l			5" dia. Dual PM Tube 1,000 ml Chamber	3-6 mos	Replace Particulate Filter Cartridge
30 min. 24 hr		30,000 pCi/l 10,000 pCi/l	2 x 10^7 pCi/l	1100 cm^2 Beta Scintillator		
GAMMA	Co-58			MultiChannel Analyzer, Smart-Peak Detection Software	3-6 mos	Simple MCA Check
30 min. 24 hr		20,000 pCi/l 5,000 pCi/l	2 x 10^7 pCi/l	75 75 mm NaI(Tl) Crystal		
GAMMA IC-25--HT						
0.5 – 3 Sec at 5 Decades	All Gammas	1 µG/h	0.1 G/h **Optional** 1 G/h	Ion Chamber mineral Insulated	6-12 mos	Clean Exterior if Necessary
RADON		100 pCi/l	2,000 pCi/l		1-3 mos	Clean or Replace Vapor Trap
Pre-Condition						
Expel Radon					1-3 mos	Clean or Replace Vapor Trap

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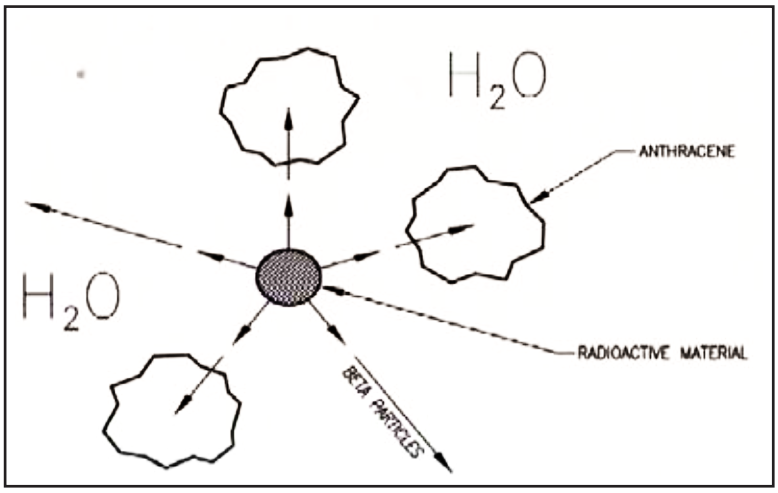
Flow Path:

- Water Inlet Port
- Pressure Relief Valve
- ISCO Sampler
- Particulate Filter (with Gamma Detector)
- Ultra Violet Sterilizer
- Gamma Spec Shield
- Main Gamma Detector with MCA
- Gross Beta Detector
- Mass Flow Meter
- Metering Pump for Alpha Detector Loop
- Alpha Detector Flow Cell (with Anthracene Crystals)
- Alpha Loop Flow Meter
- Tritium Beta Detector
- Ion Exchange with Gamma Detector
- Discharge Water is Clean and can be returned to Fuel Pool
- No Liquid Scintillant or Reagents are Used
- No Toxic or Radioactive Waste of any kind



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Warning Level Screen »

Specifications

System Flow Rate:	Standard: 100 to 1,000 ml/minute. Optional: Wide range of flow rates available.
Temperature:	Sample Standard: Up to 80˚ F Ambient Temperature: 65˚ - 100˚ F
Optional:	Higher Temperature Sample Range Wider Ambient Temperature Range Cooler model COOL-33 for detector and sample used in situations of higher sample or ambient temperatures.
Size and Weight	**One Cabinet:** 34" wide x 31" deep x 72" high including wheels. **Wheels:** 5" dia, high capacity, rugged wheels with lock and rubber tires. **Shipping Weight:** Standard unit – 380 kg, excluding shielding. (Lead Shot for shielding may be shipped separately. Overseas customers may want to purchase Lead Shot locally)

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References: Petition for Rulemaking to Revise the following;

- 10 CFR 50: Radionuclide Monitoring
- 10 CFR 20 and other applicable regulations as well as
- Regulatory Guides 1.21
- (2008), 4.16 (2010), 4.21 (2008), 8.25 (1992)
- NUREG-1400 (1993) and other applicable Regulatory Guides

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2011-0137scy, NRC, -- **Staff Assessment and Prioritization of NTTF Recommendations**, October 3, 2011

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ML091310141-Regulatory Guide 4.1 -- **Radiological Environmental Monitoring for Nuclear Power Plants**, November 2008

Radioactive Tritium Leaks Found at 48 Nuke Sites -- AP, Jeff Donn, 6/21/2011

10 CFR 20 Subpart B -- Radiation Protection Programs, § 20.1101 (c) Radiation Protection Programs. Source: 56 FR 23396, May 21, 1991, amended 63 FR 39482, July 23, 1998

10 CFR 50.109 -- Backfitting, amended Jan. 1, 2003

10 CFR Appendix A to Part 50 -- General Design Criteria for Nuclear Power Plants, amended 72 FR 49505, Aug. 28, 2007

10 CFR Appendix I to Part 50 -- Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents, amended 72 FR 49507, Aug. 28, 2007

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