TRIMARAN

MODEL TRIMARAN – H_2O

AUTOMATED FLOW THRU TRITIUM WATER MONITOR

WHEELED CART, TRUCK OR TRAILER MOUNT ALSO AVAILABLE

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MODEL TRIMARAN – H_2O

Features:
•Lowest level process monitor available from any vendor
•Eliminates the need for manual samples sent to the lab
•This automated system frees valuable and expensive personnel for other duties.

Application:
Monitoring changes in tritium concentration in primary and secondary coolant, entering or leaving the Recombiner, make-up pond or spent fuel pool, etc.

LOW END SENSITIVITIES

MDA 4hr	MDA 6hr	MDA 8hr	MDA 24hr	MDA 7 day	one month
500Bq/l	74Bq/l	33KBq/l	6Bq/L	2Bq/l	TBD
13,500pCi/l	2000pCi/l	900pCi/l	160pCi/l	50pCi/l	

- **TRIMARAN – TRITIUM – WATER PROCESS MONITOR AND LEAK DETECTOR**
- **LOW LEVEL REAL TIME TRITIUM-IN-WATER MONITOR**
- **SENSITIVITY OF 2000 pCi/l PER LITER IN 6 HOURS**
- **160 pCi/l - DETECTABLE IN 24 HOURS**

Tritium Water Monitors – Recent improvements and upgrades

1. Full on-board computing system for data analysis.
2. New **Picoflow®** system has 3 major benefits
   A. Factor of 10 less use of scintillation fluor
   B. Allows long sample counting for outstanding low end sensitivity.
   C. Measures only Tritium. Not affected by other Radioactivity Nuclides
3. Statistical significance lamp lets user know if measurement level exceeds ***MDA levels***.
4. All data is automatically logged and archived allowing later study.
5. Full ethernet compatibility and SCADA ready communications.

This monitor was originally designed for real time low-level detection of tritium in water in the industrial environment of nuclear power plants and has now been updated for improved sensitivity and communication. Low MDA, reliability, ruggedness and automatic operation is what sets this monitor apart from less durable laboratory type of the equipment.

The primary purpose of the Model 1925 predecessor system is to detect the leak of heavy water in nuclear power plants that utilize CANDU reactors; however, the MODEL – Trimaran H_2O has been redesigned, upgraded and is also used for other purposes such as monitoring changes in tritium content of process water, storm water, drain effluent, ground water, rivers, lakes or even ocean currents.

LOW MINIMUM DETECTABLE ACTIVITY (MDA)

The unit detects tritium decay with Photo Multiplier Tube (PMT) working in coincidence mode. Use of highly effective PMT's, specially designed sampling cell to minimize cosmic radiation and Chernkov effects and 1" lead shielding provide for low background noise of only One Count Per Second and enhanced sample counting efficiency

LOW LEVEL DETECTION TAKES TIME

As indicated on the "Sensitivities Chart" long count times are required to measure to these levels

REMOTE MONITORING AND ALARMING

The instrument is equipped with USB, Ethernet and 4-20mA output for remote monitoring as well as with 2 alarm outputs and malfunction outputs in the form of dry, fail-safe, relay contacts. Alarms are user adjustable. Malfunction alarms activate in case of electronics and/or mechanical failures in the system.

DATA RECORDING

The instrument is equipped with Serial Data Recorder that utilizes **Picodrive®** memory system to store up to five years worth of readings in daily files. This information is in text format that is easily extractable to Excel or other database for analysis and graphic presentation.

PRESSURE REGULATING EQUIPMENT

In applications where sample inlet line is under pressure, as when measuring H-3 in process piping, pressure of input sample streams can be up to 15psi. This pressure is immediately reduced to 2-3psi via Pressure Regulating Valves (PRV). Each PRV is associated with Pressure Relieve Valve set to open at 14.5psi, therefore, the pressure in the system can never be more than 14.5psi, which makes it safe to handle. This also makes the instrument a Class 6 Nuclear Device.

FULLY INTEGRATED PACKAGE

The Trimaran H_2O is a completely self-contained instrument for real time observation of tritium concentration in water. The instrument is mounted inside of the 7' tall steel enclosure with reinforced anchoring feet and locked access. Liquid scintillator is connected to the unit externally and it is stored inside of the polyurethane drum of 65 gallons. Currently this quantity of liquid scintillator is sufficient for 2 years of continuous, 24/7 operation.

The main subassemblies are:

1. Sample water input lines
2. External cooling loop input/output lines
3. Internal cooling loop complete with chiller, chiller pump and plumbing
4. Water purification system and micron filter
5. Sample water pump
6. Detection module
7. Data acquisition and analysis electronics module
8. System control module
9. Waste water output line, RV output line and sample bypass output lines.

COOLING SYSTEM

In order to have maximum efficiency of the photo-multiplier tubes and the liquid scintillator, solution that is tested inside of the sample cell is kept between 12°C and 20°C. This is achieved by internal cooling loop system, which is a closed loop cooling system with its own pump and chiller unit. If the unit operates in extreme temperatures (more than 45°C) external cooling loop is provided, where user can provide chilled water from its own source.

PLC CONTROL

Sampling of input lines and control of alarms and pumps is done by PLC unit placed inside of the System Control Module. There is an alarm provided in case of PLC failure as well as manual override so that the operation can be continued manually until PLC is replaced. Manual operation is a backup sys-tem; the unit normally operates in automatic mode.

ROUTINE MAINTENANCE

Scheduled maintenance of consumables is required. Liquid scintillator needs to be replenished every 2 years and sample water filters need to be re-placed. Also, periodic check of the efficiency and background is recommended if there is a possibility of increased background contamination and due to standard lifecycle of electronics components.

ANNUAL INSPECTION AND SERVICE

It is recommended that the instrument be inspected and serviced on an annual basis to ensure continuing trouble free operation. All components of the instrument should be inspected and instrument re-calibrated.

REPAIR

Equipment failures of a minor nature can be repaired under local supervision by the operator of the equipment. When necessary, the manufacturer (Overhoff Technology Corporation (OTC)) can dispatch service personnel for quick remediate action.

DOCUMENTATION

All OTC equipment is accompanied by complete documentation, which includes the following:

1. User and Maintenance Manual that contains:
   a. Theory of operation
   b. Installation instructions
   c. Operation instructions
   d. Calibration procedure
   e. Suggested maintenance
   f. Repair instructions
   g. Drawings, diagrams and schematics

Factory training will be provided by the manufacturer, free of charge. Assistance with commissioning is also available by the manufacturer (OTC) on-site for a reasonable fee.

MODEL –TRIMARAN H_2O - TECHNICAL SPECIFICATION

ELECTRONICS AND MEASUREMENT

MEASUREMENT RANGE:	0 -- 130kBq/L
SENSITIVITY:	See Chart
DETECTABLE LIMIT:	6Bq/L (in 24 hrs) at confidence level of 95%
DISPLAY:	7” Color LCD monitor
MEASUREMENT METHOD:	Liquid Scintillation Counting
DETECTOR:	Dual PMT coincidence counter surrounded by multi-element shielding
ON BOARD COMUTER	The on board computer provides data-analysis, storage and transmission, USB and ETHERNET ports are provided, systems is SCADA ready.
SIGNAL PROCESSING:	Electronic signal processing of coincident pulses for tritium specific wave shapes (height and duration)
MEASUREMENT ALARM SET POINT:	Can be manually adjusted
DATA RECORDING:	Up to 5 years daily record

SAMPLING SYSTEM

SAMPLING/MIXING SYSTEM:	Dual head, single shaft low flow rate pump providing flow of sample and liquid scintillator. Mixing is done at the T-joint and at the entrance on the sample cell.
SAMPLE CELL: WASTE	Stainless steel cell, volume 5cc with fused silica windows and Viton O-rings for sealing.
MANAGEMENT:	Waste water output lines with Swagelok® fittings are pro-vided, user to provide waste collection system. Nominal 80 gallons/year.

ENVIRONMENTAL

TEMPERATURE:	0º C to 50º C
HUMIDITY:	0 to 95 % R. H.
SEISMIC:	Withstands modest shock
GENERAL:	Equipment to be sheltered from exposure to raw elements.
ELECTRICAL:	Power 110/230VAC, 10A main power, +24VDC for 4-20mA and connections for the remote alarms and monitoring
MECHANICAL:	Self contained, mounted on a steel frame with lifting eyes for easy transport.
DIMENSIONS:	31.5in x 23.6in x 84.0in (800mm x 600mm x 2133mm)
WEIGHT:	1100 lb (~500 kg)

*** OPTIONS:**
Inlet water filtration systems, are available depending on the details of the impurities in the sample water

SENSITIVE ENOUGH TO DETECT RUNOFF CHANGES IN GROUNDWATER TRITIUM PLUMES