SENSITIVE ENOUGH TO DETECT RUNOFF CHANGES IN GROUNDWATER TRITIUM PLUMES

MODEL – 77
HEAVY WATER LEAK DETECTOR
(HWLD-77)

CONTINUOUS FLOW TRITIUM IN WATER SURVEY MONITOR

WHEELED CART, TRUCK OR TRAILER MOUNT ALSO AVAILABLE

OVERHOFF TECNOLOGY
overhoff.com
513-248-2400
Sales @ overhoff.com

TECHNICAL ASSOCIATES
tech-associates.com
818-883-7043
tagold @ nwc.net

- **MODEL -77 - HEAVY WATER LEAK DETECTOR**
- **LOW LEVEL REAL TIME TRITIUM-IN-WATER MONITOR**
- **SENSITIVITY OF 1.0 kBq PER LITER IN 3 MINUTES**
- **3.7kBq/L DETECTABLE IN 20 SECONDS**

HWLD MONITORS – Recent improvements and upgrades

1. Full on-board computing system for data analysis.
2. New Microflow® 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. While still maintaining constant flow resulting in zero dead time, so even short-duration, high-concentration tritium spikes will still be detected.
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 and adapted for environmental and scientific applications.
Low MDA, reliability, ruggedness and simplicity of operation is what sets this monitor apart from less durable laboratory type of the equipment.

The primary purpose of the Model 1925 was to detect the leak of heavy water in nuclear power plants that utilize CANDU reactors; however, the MODEL – 77 has been redesigned, upgraded and is used for other purposes such as monitoring changes in tritium content of ground water, rivers, lakes or ocean currents.

LOW MINIMUM DETECTABLE ACTIVITY (MDA)

The unit detects tritium decay with Photo Multiplier Tubes (PMT) working in coincidence mode. Use of highly effective PMTs, specially designed sampling cell to minimize cosmic radiation and Cherenkov effects and 1" lead shielding provide for low background noise of only One Count Per Second and sample counting efficiency of 40%.

FAST RESPONSE TIME

The response time from the moment when sample enters the system to the moment the unit starts to respond is less than 20 seconds and in 3.0 minutes the full value of tritium concentration in the sample is displayed on the screen. New Microdrive® sampling system and advanced data analysis allow detection to lower limits from 20 seconds to 30 days period.

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 the electronics and/or mechanical failures in the system.

DATA RECORDING

The instrument is equipped with Serial Data Recorder that utilizes Microdrive® card to store up to five years worth of readings in daily files. This information is in text format that is easily extractable to Excel for analysis and graphic presentation.

PRESSURE REGULATING EQUIPMENT

In applications where sample inlet line is under pressure as when measuring H-3 in drinking water 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

Model -77 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 -77 TECHNICAL SPECIFICATION

ELECTRONICS AND MEASUREMENT

MEASUREMENT RANGE:	0 -- 130kBq/L
SENSITIVITY:	See Chart
DETECTABLE LIMIT:	20Bq/L (in 7 days) at confidence level of 95%
DISPLAY:	7” Color LCD monitor
RESPONSE RATE:	20 seconds beginning of the response, 3.0 minutes full value displayed
MEASUREMENT METHOD:	Liquid Scintillation Counting
DETECTOR:	Dual PMT coincidence counter surrounded by multi-element shielding
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:	Serial Data Recorded with **Microdrive®** card

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:	O^o C to 50^o 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, 5A 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)

TRITIUM IN WATER MONITORS
LOW END SENSITIVITIES

Models	TOP OF RANGE	MDA 20sec	MDA 3min	MDA 20min	MDA 3hr	MDA 24hr	MDA 7 day	One Month	Price
HWLD-77	100kBq/L	3.7kBq/L	1.kBq/L	500Bq/l	185Bq/l	60Bq/l	20Bq/l	TBD	$196,000
HWLD-1925-ENV		100,000pCi/l	27,000pCi/l	13,500pCi/l	5,000pCi/l	1600pCi/l	540pCi/l		$250,000
HWLD-1925-NPP-S (-single input)									$395,000
		20sec	**3min**	**20min**	**3hr**	**24hr**	**7 day**	**month**	
HWLD	130kBq/L		3.7kBq/L	1.kBq/L	500Bq/l	185Bq/l	60Bq/l	TBD	$480,000
model 1925			100,000pCi/l	27,000pCi/l	13,500pCi/l	5,000pCi/l	1,600pCi/l		
		20sec	**3min**	**20min**	**3hr**	**24hr**	**7 day**	**month**	$96,500
TMW-3	300kBq/l			3.7kBq/L	500Bq/l	185Bq/l	100Bq/l	60Bq/l	
				100,000pCi/l	13,500pCi/l	5,000pCi/l	2,700Bq/l	1,600pCi/l	
		20sec	**3min**	**20min**	**3hr**	**24hr**	**7 day**	**month**	
SSS-33M84	1,000kBq/l			37KBq/l	5KBq/l	740Bq/L	185Bq/l	TBD	$69,500
				1.0uCi/l	0.135uCi/l	20,000pCi/l	5,000pCi/l		
SSS-33-DHC-WH	1,000kBq/l			37KBq/l	5KBq/l	740Bq/L	185Bq/l	TBD	$88,500
(sensitivities dependent on sufficient water volume)				1.0uCi/l	0.135uCi/l	20,000pCi/l	5,000pCi/l		

OVERHOFF TECHNOLOGY

www.overhoff.com

513 248-2400

sales@overhoff.com

TECHNICAL ASSOCIATES

www.tech-associates.com

818 883-7043

wanda@tech-associates.com

DETAILS AT TECH-ASSOCIATES.COM