

SEAWATER RADIATION DETECTION SYSTEM

WATER PROTECTION

海水辐射检测系统

Model ~ NEXGEN-SEA

FEATURES: 特点

- MEASURES AT OR BELOW EPA/DHS PAG LEVELS
Protective Action Guideline & Military Drinking Water Limits
- 测量限符合或高于环保部门/国土资源局标准
- (保护行动纲领&军队饮用水标准)
- REAL TIME, IN-LINE, CONTINUOUS
- 实时在线连续检测
- DETECTS ALPHAS, BETAS AND GAMMAS
- 检测 α β 和 γ
- NO REAGENT TANKS TO FILL
- 无需添加试剂
- NO WASTE STREAM
- 无废水流
- EASY CALIBRATION
- 容易刻度
- PREVENT ACUTE HEALTH EFFECTS
- 防止急性健康影响
- REDUCE RISK OF CHRONIC EXPOSURE
- 减少慢性辐射风险
- WORLD'S ONLY PAG-LEVEL $\alpha\beta\gamma$ water monitor
- 世界上唯一符合PAG (保护行动纲领) 标准的 $\alpha\beta\gamma$ 水监测器
- Full SCADA compatibility
- SCADA全兼容



APPLICATION: 应用

- Monitor seawater against any & all RADIOACTIVE contaminants.
- 监测海水中任何辐射污染物
- Monitor liquid-waste stream from seawater cooled nuclear plants.
- 监测核电站冷却用海水流出物
- Monitor around desalination systems.
- 监测盐水淡化系统周围

PROBLEM: 问题

Seawater is vulnerable to accidental or knowing contamination by individuals, groups, industry, medical labs, terrorists and from naturally occurring radioactive materials (NORM). As yet very few locations have real-time radiation monitors in place to notify industry or the public of seawater radioactive contamination.

饮用水源很容易遭到来自个人、团体、工业、医疗实验室、恐怖分子、自然发生的放射性物质的意外或已知污染，然而就地安装的实时辐射监测设备却很少，无法通知企业或公众海水辐射污染情况。



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SOLUTION: 解决办法

For the first time in a **Continuous Real Time** monitor the Model **NEXGEN-SEA** solves this problem by continuously monitoring the water using 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. Sensitivities in the daily updates each meet or exceed the DHS protective Action Guideline Levels.

Please see attached chart of measurements. Using TA Tried and True sample collection & measurement technology these detectors measure Alpha, Beta and Gamma from any radioactive liquids.

Measurements of radiation concentration and total discharge are logged 24 hr/day, 7 day/week.

实时连续水监测器NEXGEN-SSS首次解决了此问题。它使用 $\alpha\beta\gamma$ 探头，持续监测水。探测数据被分析并显示，单位pCi/L。每两分钟，每小时，每天计算更新，更新时段越长，灵敏度越高越精确，日更新的灵敏度达到或超过国土安全局饮用水保护行动准则标准。请参照附件测量表
使用TA Tried and True样品收集&测量技术，来测量任何辐射液体中的 $\alpha\text{-}\beta\text{-}\gamma$ 。辐射浓度测量结果和总排放量每周7天，每天24小时不间断记录。



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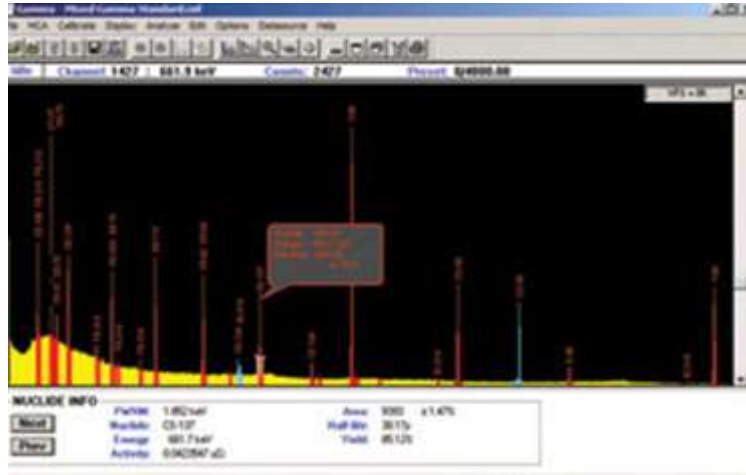
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SEAWATER RADIATION DETECTION SYSTEM WATER PROTECTION 海水辐射检测系统

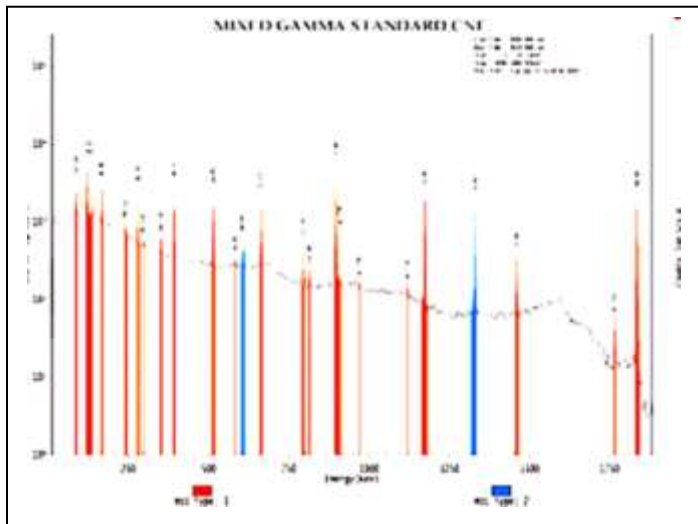
Model ~ NEXGEN-SEA

GAMMA-MCA ISOTOPE IDENTIFIER



ADDITIONAL NUCLIDES
DETECTED

NUCLIDE	NUCLIDE
Tc ^{99m}	Cs ¹³⁷
I ¹³¹	Ba ¹⁴⁰
Cs ¹³⁴	La ¹⁴⁰
Cs ¹³⁶	



MULTI-SOURCE
GAMMA SPECTRUM



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SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

Model ~ NEXGEN-SEA

DESCRIPTION: 描述

Model **NEXGEN-SEA** is a multi-detector water monitor /controller for simultaneous measuring of Alpha, Beta and Gamma-emitting radio nuclides. The electronics are microprocessor with color LCD display. The pre-amps are plug in modules allowing change or addition of functions at a later date, and allow rapid repair by module replacement in the field. The modular system is covered by TA's unique exchange warranty system in addition to the full one year warranty. On-site warranties available in many areas.

NEXGEN-SSS系多探头水探测器/控制器，同时测量 α β γ 放射核素。电子学系微处理器，带LCD彩屏。前置放大器连接在模块上，以便后期改动或使用附加功能，还可以通过更换模块进行快速维修。

除了一年保修期外，此模块系统还享有TA公司包换服务。许多地区提供现场维修。

Detector shields are made of lead encased in welded housing for long useful life and easy decontamination. The alpha and beta flow cells are easily changed via disconnect fittings. Gamma Spec shield can be opened for cleaning with minimum effort. All connections are sealed against leaks. The standard water moving system is based on a high precision pump. It has a 10 liter per minute capacity.

伽马探测器铅屏装入焊接壳内，寿命长且易于去污。通过断开装置很容易更换 α β 流室。伽马专用屏蔽容易打开清理。所有连接均密封以防泄露。标准水动系统基于高精泵，每分钟10升容量

A wide range of pump capacities are available to meet users specific needs. The entire system is mounted in a wheeled, self-contained rugged cabinet. The **NEXGEN-SEA** comes complete with all cabling tubing and connectors in place and is ready to operate. 115 Volt 60Hz is standard; 220 Volt 50/60 Hz is optional.

宽量程泵容量可满足用户具体需求。整个系统安装在单独的带轮的坚固柜子中，NEXGEN-SSS自带全部线路管套，连接器以备操作。标准115伏，60赫兹；可选购220伏，50/60赫兹。

Three principal detectors make up the **NEXGEN-SEA** system.

此系统带三个主要探测器

1. Alpha Detectors: A special plastic Alpha scintillator that consists of a light-tight detector assembly which interfaces with the sample via quick disconnect coax cables and medical grade hoses. The sample is viewed by a matched pair of photo-multiplier tubes.

α 探测器：专用 α 塑料闪烁体探头，不透光探头组件通过快速断开的同轴缆线和医疗级软管与样品连接，由一对光电倍增管观察着。

2. Beta Scintillation detectors with 1,100cm² sensitive area.

β 闪烁探头敏感面积达1,100cm²



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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**. Thereby permitting the system to eliminate counting most background and noise counts. Sensitivity is enhanced by the use of stochastic resonance plus high gain, low noise PM tubes and pre-amps.

系统αβ脉冲分析部分通过脉冲高度，持续时间和耦合事件分析光电倍增管输出，以便系统清除大多数本底计数和噪音计数。随机共振，加上高增益，低噪音PM管和前置放大器提高了灵敏度。

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

使用优于1000道的MCA多道分析仪水中伽马发射物，能量范围用户设定，例如MCA可设定伽马能量为10 KeV - 3 MeV.

Isotope Identification System 同位素识别系统

Peak Detection and Isotope Identification

峰值检测与同位素识别

TA SMART-PEAK™ Software detects radiation peaks even at very low gamma concentration, In the event of high activity and during system calibration; the isotope identifier function takes over and displays the exact radioactive nuclides in the sea water.

TA SMART-PEAK™软件甚至在非常低伽马浓度情况下检测辐射峰值；在高辐射和仪器标定情况下，同位素识别功能开始工作，显示海水中确切的辐射核素。

DATA: Analysis – Display - Hard-Copy-Archive

数据：分析-显示-硬拷贝存档

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 **NEXGEN-SEA** semi-automatic self- calibration procedure).

在每个峰值或兴趣区，净计数自动转换成浓度单位pCi/L（自动使用由FPT-H3半自动自校准程序预先测量并存储的探测效率）

The concentration and total activity released and MDA levels are continuously calculated and recorded. This real time information will alert the notification system. Also, all data is saved to the hard drive in spreadsheet format.

Historical data is easily displayed on-screen (and/or printed out on the optional printer) in tabular or graphical format, showing quantitative information as well as trends. Data is recorded frequently so time-resolution is excellent.

浓度和释放总活度及最低探测活度水平持续计算并记录，这些实时信息将警告通报系统。所有数据被储存在电子表格格式的硬盘中。历史数据很容易以表格或图形格式显示在屏幕上（同时/或选择图形打印机打印出来），显示定量信息和走势。数据频繁被记录因此时间分辨率特别出色。



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

以太网和USB端口（加锁）容易存档并进一步数据分析。

Continuous, Reliable Data – **YES**, False Alarms – **NO**

持续、可靠—是，虚报警—无

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

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

我们最新系统无论在软件方面还是在实际应用中有多个保护层和冗余度，防止虚假报警。这包含一个报警表决系统，只有所有数据一致和确定情况下才报警。持续数据录入以便人们解读，每一次报警激活故障安全继电器，用户可通过继电器触点操作外置设备。

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

触发式等分测量: 在报警或兴趣区事件发生时，此功能自动收集并储存少量水样进行独立分析测量

UV Lamp: Used on inlet as algae-cide.

用于入口，作为除藻剂

OPTIONAL: Ozone System

可选: 臭氧系统

3 GHz COMPUTER INCLUDES:

3 GHz 计算机包括:

3 GHz Processor, 600 Gig Hard Drive, 4 GIG Ram

3 GHz处理器，600G硬盘，4G存储器

USB Ports

USB接口

OPTIONAL: Full Graphics Printer, color + B/W

选项: 全图形打印机，彩色+ B/W

15" LCD Monitor, Keyboard, Mouse

15" LCD显示器，键盘、鼠标

10 Channel Data Acquisition Board, All Cables

10道数据采集卡，全缆线

Ethernet for hook up to your LAN

以太网本地连接



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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

Windows操作系统, 专用软件计数 α β γ

软件根据用户特别要求容易定制

从1024道 MCA分析仪输出的数据可通过USB或以太网获取

Port: Full SCADA compatibility

接口: 全SCADA兼容

OPTIONAL: MODBUS or DNP3 or other protocols.

选项: MODBUS , DNP3或其它协议



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DETECT	PAG LEVEL	LOWER LIMIT of SENSITIVITY	TOP OF RANGE	SENSOR / METHOD USED	TIME	MAINTENANCE for finished water ACTION
Alpha	U-238 3,000 pCi/l			5" dia. Dual PM Tube crushed scintillation bed of crystals	3 mo	Replace particulate filter cartridge
U-238	30 min 24 hr	2,000 pCi/l 500 pCi/l	2 x 10 ⁷ pCi/l			
Po-210	30 min 24 hr	2,000 pCi/l 500 pCi/l				
Beta	K-40 30,000 pCi/l			5" dia. Dual PM Tube 1000ml chamber	3--6 mo	Replace particulate filter cartridge
Cs-137	30 min 24 hr	1,200 pCi/l 200 pCi/l	2 x 10 ⁷ pCi/l	1100cm ² Beta Scintillator		
K-40	30 min 24 hr	600 pCi/l 100 pCi/l				
Sr-90	30 min 24 hr	200 pCi/l 15 pCi/l				
Gamma	Co-58 30,000 pCi/l			MultiChannelAnalyzer Smart peak detection software	3--6 mo	Simple MCA check
Co-58	30 min 24 hr	1,000 pCi/l 250 pCi/l	2 x 10 ⁷ pCi/l	75x75mm NaI(Tl) Crystal		
Co-60	30 min 24 hr	400 pCi/l 100 pCi/l				
I-131	30 min 24 hr	600 pCi/l 150 pCi/l				
OPTIONS:		LOWER LIMIT	TOP OF RANGE			
DETECT						
Tritium		500,000pCi/l	1 x 10 ⁶ pCi/l	crushed scintillation bed of crystals		Replace ion exchange cartridge
Radon		100pCi/liter	2000pCi/liter		1-3 mo	Clean or replace vapor trap
PRE- CONDITION						
Expel Radon						Clean or replace vapor trap



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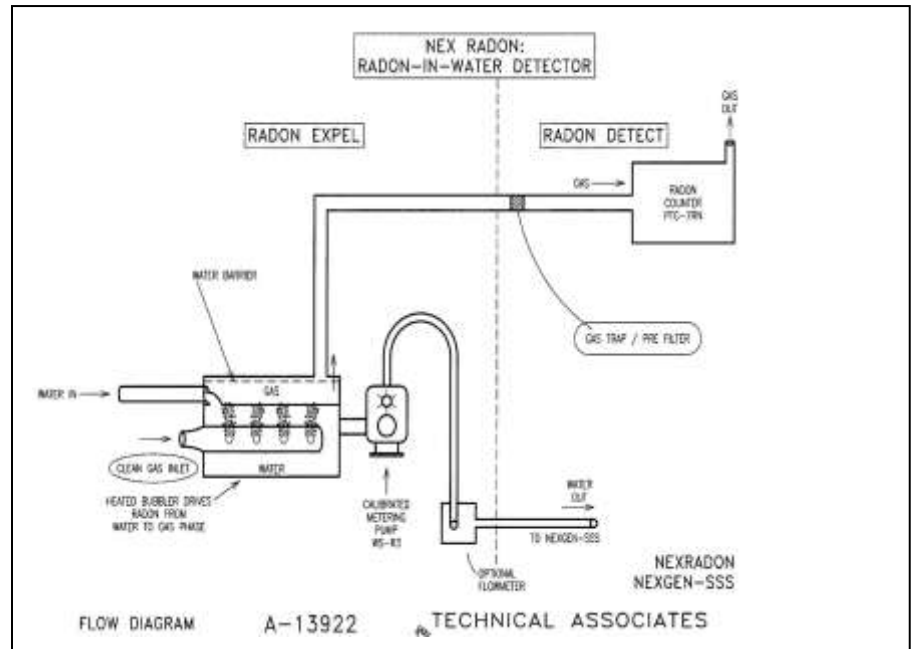
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SEA WATER RADIATION DETECTION SYSTEM WATER PROTECTION

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FLOW PATH: 流路

- Water Inlet Port
- 入水口
- 15 – 90 PSIG (Typical)
- (典型) 磅/平方英寸
- ISCO Sampler
- ISCO 采样器
- Particulate Filter (with Gamma Detector)
- 粒子过滤器
- Ultra Violet Sterilizer
- UV 消毒器
- Gamma Spec Shield
- 伽马屏蔽
- Main Gamma Detector with MCA
- 带多道分析仪的主伽马探头
- Mass Flow Meter
- 质量流量计
- Metering Pump for Alpha Detector Loop
- α 探头回路计量泵
- Alpha Detector Flow Cell
- α 探头流室
- Alpha Loop Flow Meter
- α 回路流量计
- Ion Exchange with Gamma Detector
- 带伽马探头的离子交换器



Discharge water is clean and can go back into the source. 排放水清洁并可返回水源

No liquid scintillate or reagents are added. 无液体试剂添加

No toxic or radioactive waste of any kind. 无任何辐射有毒污染物产生



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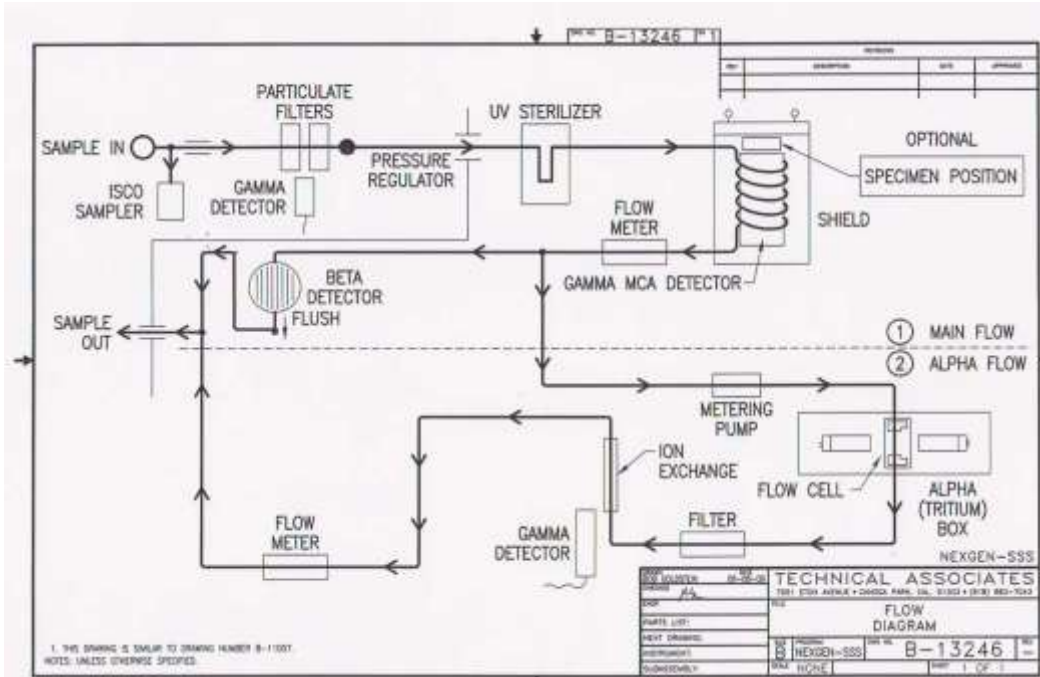
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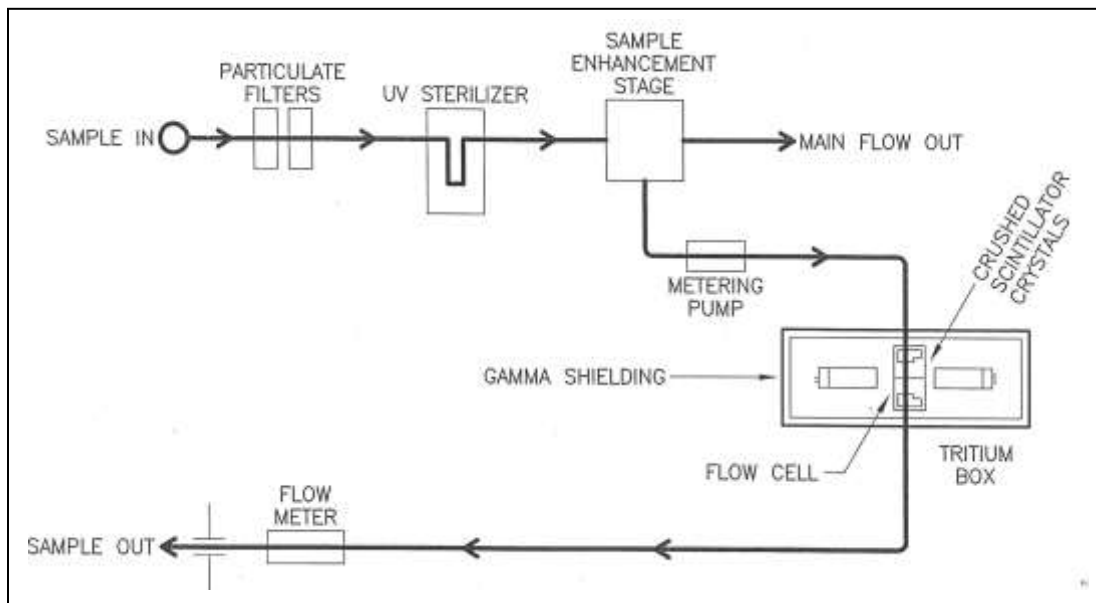
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MAIN SYSTEM
FLOW CHART

OPTIONAL TRITIUM DETECTION PROCESS 氚探测流程



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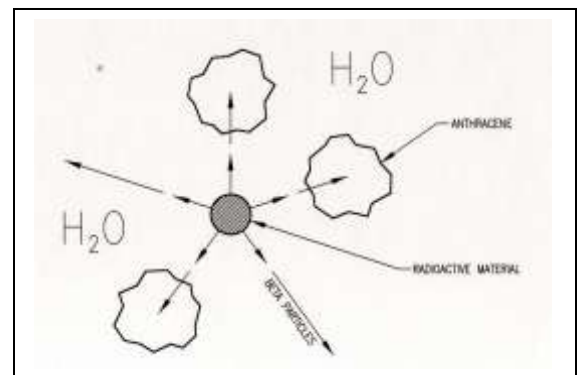
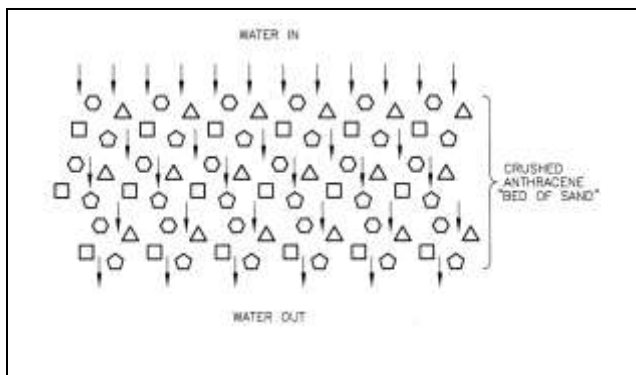
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Optional Tritium Detection Loop



Anthracene Scintillation Crystal Bed Detail for Optional Tritium Detector



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SYSTEM FLOW RATE:

系统流量:

Standard Main Flow:	10 l/minute
标准主流量:	10升/分钟
Alpha - Tritium Flow:	100 ml/minute
α - 氚流量	100 ml/分钟

OPTIONAL:

选项 Very wide range of flow rates is available
可提供不同流量

Sample temperature standard: Up to 80° F liquid. (**OPTIONAL** to higher temperatures)

样品温度标准: 80° F 液体 (可选更高温度)

Ambient temperature: 65 - 100 ° F (wider temperatures ranges **OPTIONAL**)

环境温度: 65 - 100 ° F (可选更宽温度范围)

OPTIONAL:

Cooler **Model Cool-33** for detector & sample is used in case of higher sample or ambient temperatures.

可选:

在更高样品和环境温度情况下可选购Model Cool-33

SIZE AND WEIGHT:

尺寸与重量

Dimensions:

One cabinet: 34" wide X 31" deep X 72" high including wheels

尺寸:

单柜: 34" 宽 X 31" 深 X 72" 高, 包括轮子

Wheels:

5" dia, high capacity, rugged wheels with lock & rubber tires.

轮子:

直径5", 带锁和橡胶轮胎, 耐用型

Shipping Weight:

Standard unit: 380kg - excluding shielding

装运重量:

标准箱: 380kg-不含屏蔽

NOTE: Lead Shot for shielding can be shipped with or stripped separately or overseas customers may wish to buy lead shot locally.

注: 铅粒可随机邮寄, 或分开装运, 或海外客户可以当地购买。

FRONT CABINET VIEW



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FILTER DETECTORS

SPECIFICATIONS	PARTICULATE DETECTOR	ION EXCHANGE DETECTOR
Detector	Pre-filter	De-ionizer
Radiation detected	GAMMA	GAMMA
Materials monitored	Particulates	Dissolved metals and salts
Scintillator shape	2" x 2" dia	2" x 2" dia
Scintillating crystal	NaI TI Spectroscopic grade	NaI TI Spectroscopic grade
Shielding	None	None
More Shielding (Optional)	1/2" 2pi	1/2" 2pi



DESALINATION PLANT



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DESIGN CRITERIA

MODEL	NexGen-SEA
MAJOR USE PROTECTIVE-ACTION GUIDELINE	NEXT GENERATION WATER MONITOR
Serve as Accident/Attack Alarm	
Serve as Alarm in case of major pollution event	
MEASURES AT OR BELOW	
Acute Health Effects Rad Level	Reads at Full Scale
Chronic RAD levels leading to severe health risk	Yes
Military Limits for Drinking Water	Yes
DHS Protective Action Guideline Levels	Yes
Public Drinking Water Limits	Send sample for lab analysis
DETECTS	
Detects Alpha and Beta as well as Gamma OPTIONAL: Tritium Detection	Has never been done before in real time, in liquids
False Alarm Protection	Yes
Action	Saves water sample for independent analysis
Local and remote Alarms	Yes
Local and remote data availability and data archive	Yes
Response Time	Prompt response – 2 min & 1 hr warn or alarms
Efficient	Continuous, automatic, unattended operation
Maintenance interval	30 days or longer see “Maintenance Schedule”
Serviceable	Easy Maintenance, low cost
Durability	Rugged, dependable
Customer Support	Annual upgrades are available on request
Software upgrades	No Charge
Hardware upgrades	At Cost



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