Tri Nuclear Corp.

PO Box 1130 - Ballston Lake, NY 12019 Tel. : (518) 399-1389 Fax: (518) 399-9586 E-mail: j_warden@trinuclear.com

Filter/Pump/Shield on Dolly

Assembly & Operating Instructions

Model FPS-65

Document No: OI-11 Rev 0 10/23/02
Date

Digitally signed by John J. Flynn
cn=John J. Flynn, o=Tri Nuclear Corp., c=US
Date: 2002.10.30 08:40:14 -05'00'
Reason: I am the author of this document
Ballston Lake, NY USA

Prepared By: _____ 10/23/02
John J. Flynn, Technical Support Services Date

Digitally signed by James L. Warden
cn=James L. Warden, ou=President, o=Tri Nuclear Corp., c=US
Date: 2002.10.30 08:30:40 -05'00'
Reason: I am approving this document

Approved By: _____ 10/23/02
James Warden, President Date

Tri Nuclear Record of Revision

Revision or Change Number	Effective Date of Revision or Change	Affected Page and/or Para #	Person Entering Revision	Revision or change Cancelled By
Rev. 0	10/23/02	Original Issue	----------	

If you have any questions concerning changes in this document, please call the main Tri Nuclear office at 518-399-1389 or e-mail at info@trinuclear.com

TABLE OF CONTENTS

Attachments:

A. Brochure BR074A, Filter/Pump/Shield on Dolly
B. Drawing BR-109, Filter/Pump/Shield on Dolly
C. OI-6, Rope Filter Lift Tool Operating Instructions
D. Brochure BR-110A, Filter Cartridge

FILTER/PUMP/SHIELD ON DOLLY

(Model FPS-65)

Assembly and Operating Instructions

1.0 INTRODUCTION

This document specifies the requirements and instructions for operating the Tri Nuclear Filter/Pump/Shield Model FPS-65. The procedures cover the initial installation and start-up of the unit, and normal operations.

It is expected that trained and qualified personnel will operate the FPS-65. Radiological considerations and requirements are not included in this document and should be specifically addressed by the end user organization.

2.0 EQUIPMENT DESCRIPTION

2.1 DOLLY

The dolly for the FPS-65 allows the system to be portable. Fork truck tunnels are provided to allow the unit to be moved by a fork truck. The front wheels are connected in a "wheel tracking" system to allow for ease of maneuverability. The dolly also comes equipped with two brakes to prevent the dolly from rolling during operation. The dolly is constructed of 304 stainless steel material.

2.2 LEAD SHIELD

The lead shield surrounding the filter housing is 2" virgin lead clad in 304 stainless steel. There is a removable vertical side plug to allow for removal of the filter housing. The top "clam shell" covers contain 1" lead and are also clad in 304 stainless steel.

2.3 RAD WASTE FITLER HOUSING

The Radwaste Filter Housing is constructed of 304 stainless steel and is designed to hold one standard Tri Nuclear 6"x 30" filter cartridge. Flow enters near the top of the filter housing and exits at the bottom. Vent and drain valves are provided to facilitate filling and venting the Radwaste Filter during operations.

2.4 PUMP

The system pump is an aluminum, 2" ball type, positive displacement, air driven pump rated for 100 gpm @ 125psi air supply. The pump is supplied with an air regulator that is mounted to the side of the shield. This regulator regulates the supply of air to the pump and can be used for adjusting the system flow rate.

2.5 VALVES

2.5.1 INLET & OUTLET

The system inlet & outlet valves are 1-1/2" stainless steel ball valves equipped with male camlock type hose connections. Dust caps are provided to protect the pump openings during storage and transport.

2.5.2 VENT

There is one ¼" stainless steel ball valve located at the high point of the inlet piping to vent any trapped air in the system.

2.5.3 DRAIN

There is one ½" stainless steel ball valve located on the outlet piping of the filter housing to allow for draining of the filter housing and pump.

3.0 EQUIPMENT AS SHIPPED

(This is a general description of how the equipment is shipped, actual may differ depending on customer shipping requirements)

The FPS-65 is shipped in a wooden crate. Take care not to damage the unit during uncrating.

4.0 UNPACKAGE AND EQUIPMENT SET-UP

4.1 RADWASTE FILTER - This unit is fully assembled and ready to be connected to the customer's system.

4.2 FILTER INSTALLATION - Install a new filter cartridge prior to initial start-up as follows:

4.2.1 Swing back the three cam arm levers to the fully open position. This will loosen the three tee bolts. Swing back the three tee bolts from their locked position. Open the pressure housing closure and swing back out of position.

4.2.2 Inspect the filter tube sheet O-ring and the filter closure O-ring for any apparent damage.

4.2.3 Check for and clear any debris on the bottom of the filter housing. Install a new filter cartridge.

4.2.4 Close the filter housing closure. Swing into the locked position the three tee bolts. Swing the three cam arms into their closed position. Be sure the pressure closure head remains aligned with its seating surface. Care should be taken to confirm the closure aligns properly and is fully seated. Lock nuts are provided to adjust the bolts if realignment for tightness is necessary.

5.0 SYSTEM OPERATION

***CAUTION*:**

If an auxiliary pump is used in lieu of the Sandpiper pump, try to maintain an open system at all times. Over pressurizing the Sandpiper pump is not desirable and can cause stretching on the diaphragm leading to premature failure. The system discharge valve should remain open at all times minimizing any buildup in back pressure to the system.

5.1 FILLING THE FPS-65 - Normally, in an open system it is not necessary to fill and vent the system. In a closed system, to eliminate residual air, the following steps can be taken. While running the system, open the 1/4" vent valve and gradually fill the vessel by opening the inlet valve slowly. This will avoid a sudden surge of fluid or pressure shock to the filter cartridge. Close the vent valve when water emerges.

5.2 SANDPIPER PUMP OPERATION:

5.2.1 *Priming* - The pump is completely self-priming from a dry start up to suction lifts of 20 ft.

5.2.2 *Air Supply* - Connect a nominal 100 psi plant air supply to the pump air regulator.

CAUTION: Do not connect the unit to an air supply in excess of ***125 psi***.

5.2.3 *Starting the pump* - Start the pump by adjusting the air regulator valve until the pump starts to cycle. Continue to increase the air supply until the desired flow rate is achieved.

Note: Cavitation of the pump is not desirable. When further opening of the air regulator rapidly increases cycling rate without an increase in capacity, cavitation exists. Reduce the air supply until cavitation ceases.

5.2.4 *Maintenance and Troubleshooting* - Refer to the detailed Sandpiper pump Operating and Service Instructions.

5.3 FILTER CARTRIDGE CHANGE CRITERIA - Continue operation of the filter until it is considered depleted. This should be determined from experience, either by reaching a predetermined maximum dose rate on the filter or by a differential pressure of 12 to 15 psid as read on the installed differential pressure gage (if installed).

5.4 FILTER REPLACEMENT

5.4.1 Secure the Sandpiper pump and close inlet and outlet shut-off valves.

5.4.2 Vent any pressure from the filter housing using the 1/4" vent valve prior to opening the lid.

5.4.3 Open the drain valve and verify that the water level in the housing is below the bottom end cap to prevent any cross contamination.

5.4.4 Swing open the two top lead shield hinged doors. Loosen the filter housing closure cam/bolts and swing back. Open the housing closure and swing out of position.

5.4.4 Remove the filter cartridge either manually or remotely using a UT-9 Rope Filter Lift Tool (See attached OI-6 Operating Instructions for the UT-9)

5.4.5 Inspect the filter tube sheet O-ring and the filter closure O-ring for any apparent damage.

5.4.6 Check for and clear any debris on the bottom of the filter housing. Install a new filter cartridge.

5.4.7 Close the filter housing closure, swinging the cam arm levers to the fully locked position. Care should be taken to confirm the closure aligns properly and is fully seated. Lock nuts are provided to adjust the bolts if realignment for tightness is necessary.

5.4.8 Shut the top lead shield hinged doors. Fill in accordance with Section 5.1 if necessary.

6.0 STORAGE REQUIREMENTS

6.1 Caution should be taken to ***NOT*** store any plastic components (eg. filters or hoses) near high radiation fields associated with equipment such as fuel bundles, LPRM's or control blades. Breakdown of such components can occur with accumulated exposures of 10^6R. For this reason, precautions should be taken to minimize accumulative dose for the following components: suction hose, filter cartridges, power and instrument cable, flow sensor, and electric motor.

6.2 If the unit is to be stored in an unheated storeroom after use, ensure all residual water is drained from housing and pump to prevent freezing and subsequent damage.

7.0 PRECAUTIONS AND WARNINGS

CAUTION:
If an auxiliary pump is used in lieu of the Sandpiper pump, try to maintain an open system at all times. Over-pressurizing the Sandpiper pump is not desirable and can cause stretching on the diaphragm leading to premature failure. The system discharge valve should remain open to a drain at all times minimizing any buildup in back pressure to the system.

CAUTION:
Do not connect the unit to an air supply in excess of ***125 psi***.

Note:

Cavitation of the pump is not desirable. When further opening of the air regulator rapidly increases cycling rate without an increase in capacity, cavitation exists. Reduce the air supply until cavitation ceases.

8.0 REPLACEMENT PARTS

Recommended Spare Parts

Qty	Part No.	Description
1	O-Ring	Tube Sheet O-Ring
1	RWF-O Ring	Radwaste filter closure o-ring
1	AP-65	Sandpiper Pump, 2" size ball type, air driven positive displacement pump
1	AP-AR	Air regulator for Sandpiper pump
Filter Cartridges		
	VCPH-0.1G	Filter Cartridge 0.1 micron, 6"dia x 30" lg, 6/case
	VCPH-0.3PE	Filter Cartridge 0.3 micron, 6"dia x 30" lg, 6/case
	VCPH-1PE	Filter Cartridge 1 micron, 6"dia x 30" lg, 6/case
	VCPH-5PE	Filter Cartridge 5 micron, 6"dia x 30" lg, 6/case
	VCPH-10PE	Filter Cartridge 10 micron, 6"dia x 30" lg, 6/case

9.0 ADDITIONAL INFORMATION

For additional information, or if special problems develop, please call James Warden, (518)-399-1389.

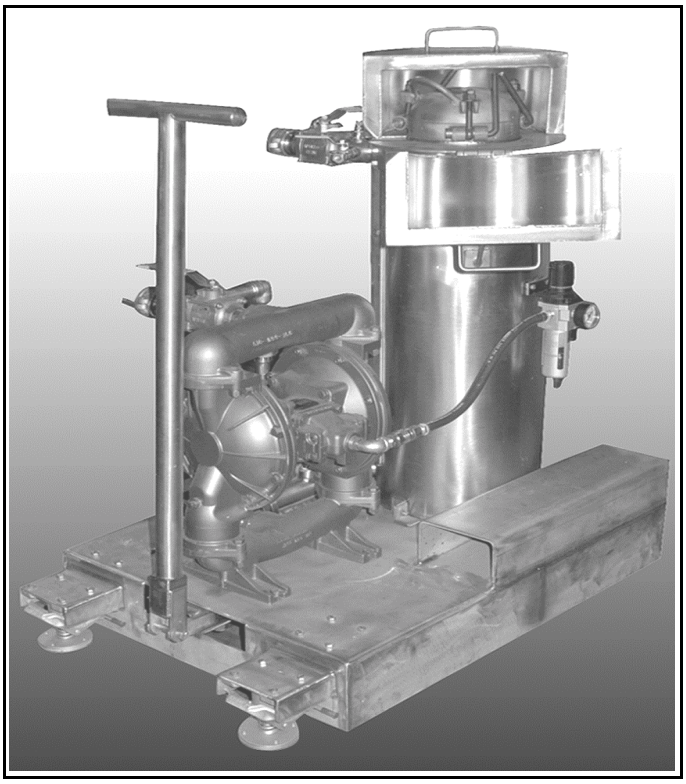
We also have a CD-Rom that contains all the operating procedures/drawings/brochures for this system and all other Tri Nuclear equipment. Please call, fax, or e-mail us to request your copy.

TRI NUCLEAR CORP.

Filter/Pump/Shield on Dolly

Model FPS-65

Technical Data



In nuclear power plants it is necessary to minimize radiation levels by periodically cleaning out settled sludge from sumps, tanks and drain lines. ***Tri Nuclear Corp.*** has developed a special dolly mounted filter and pump assembly, the FPS-65, shown above to meet this need.

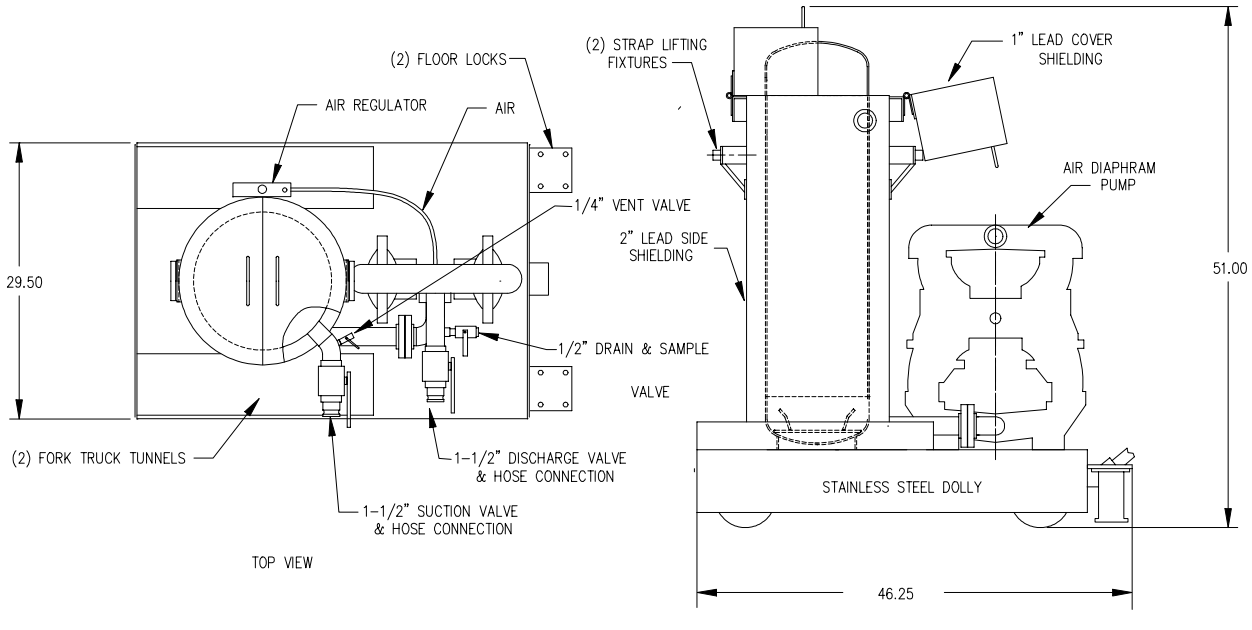
- fully equipped and ready for operation
- very mobile - can be moved by hand, crane or fork truck
- 2" of lead shielding on filter housing, 1" of lead in cover
- filter housing designed for 100 GPM and 200 psi
- uses standard ***Tri Nuclear Corp.*** filters
- air driven 2" positive displacement pump
- capable of pumping lifts of 20 feet of water
- filter housing quick access cover requires no tools for opening
- filter cartridges can be removed remotely
- ***Tri Nuclear*** filter cartridges (inside to outside flow) contain all filtered crud inside the cartridge

Nuclear Applications

- Portable radwaste liquid processing
- Low point drain flushing
- BWR Suppression Pool vacuuming
- Condensate Storage Pool vacuuming
- Fuel Transfer Canal vacuuming

FPS-65 Specifications

Dolly: 46" x 30"
Height: 51"
Weight: 1690 lbs
System flow rate: 65 GPM
Design pressure: 125 psi
Material for filter housing, shield and dolly: Stainless steel
Material for pump: Aluminum



SPECIFICATIONS:

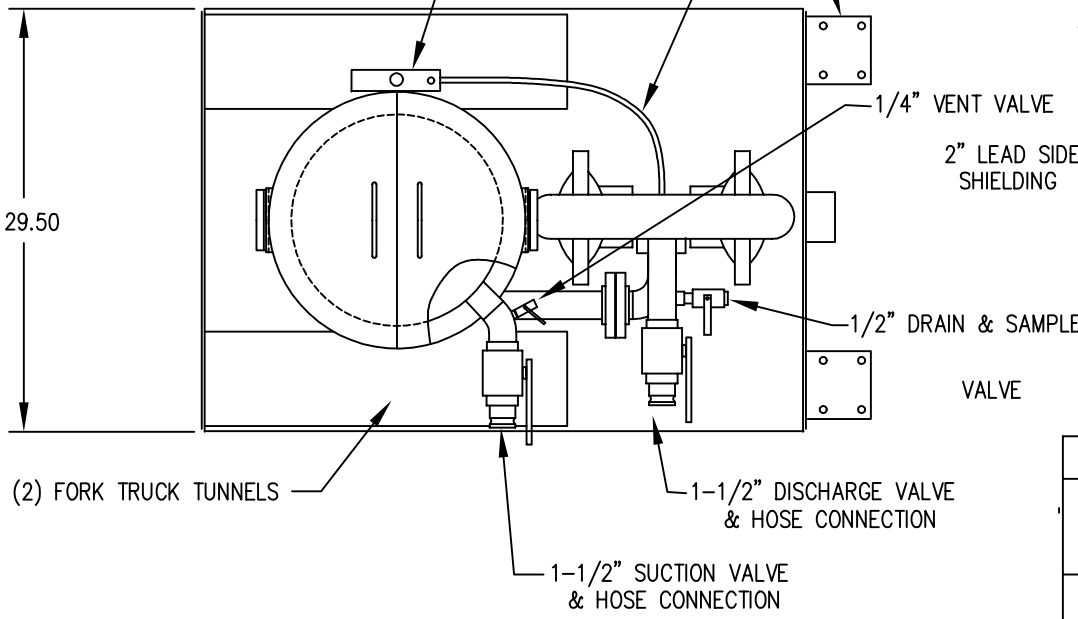
- FOR PORTABLE RADWASTE LIQUID PROCESSING
- FLOW RATE: 65 GPM
- DESIGN PRESSURE: 125 PSI
- TOTAL WEIGHT: 1400 LBS
- MATERIALS:
  FILTER HSG, SHIELD AND DOLLY – STAINLESS STEEL
  AIR DIAPHRAM PUMP – ALUMINUM
- USES STANDARD TNC FILTER CARTRIDGES – 6" X 30"

Tri Nuclear Corp.	
FILTER/PUMP/SHIELD ON DOLLY MODEL FPS-65	
DATE: JUNE 6,1996	BROCHURE NO: BR-109

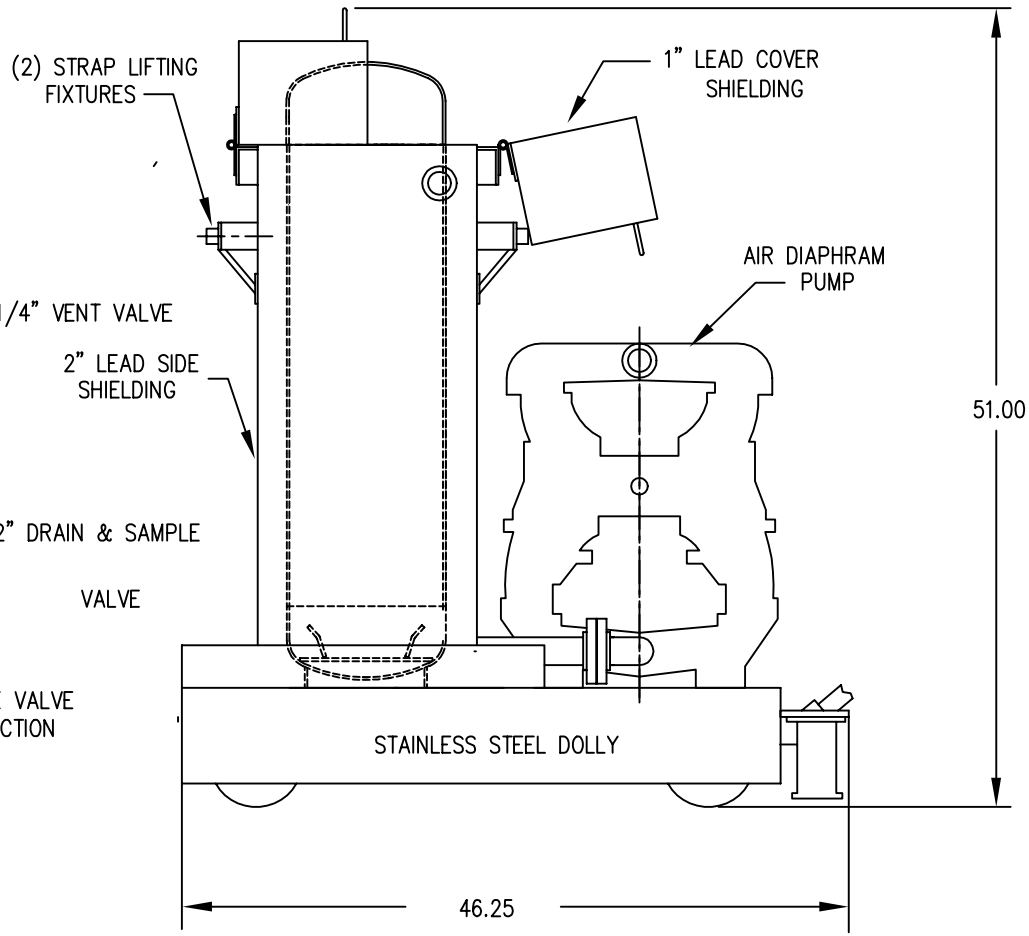
Filter Cartridge Options:

(See "Filter Cartridge" brochure, BR110B for details)
Standard Polyester Cartridge
High Dirt Holding Polyester Cartridge
Bag filters available on request

For Technical Questions, Pricing and Availability, Contact: **James L. Warden, President**
Tel. (518) 399-1389 **Fax: (518) 399-9586** **e-mail: *jwarden@trinuclear.com***



TOP VIEW



SIDE VIEW

SPECIFICATIONS:

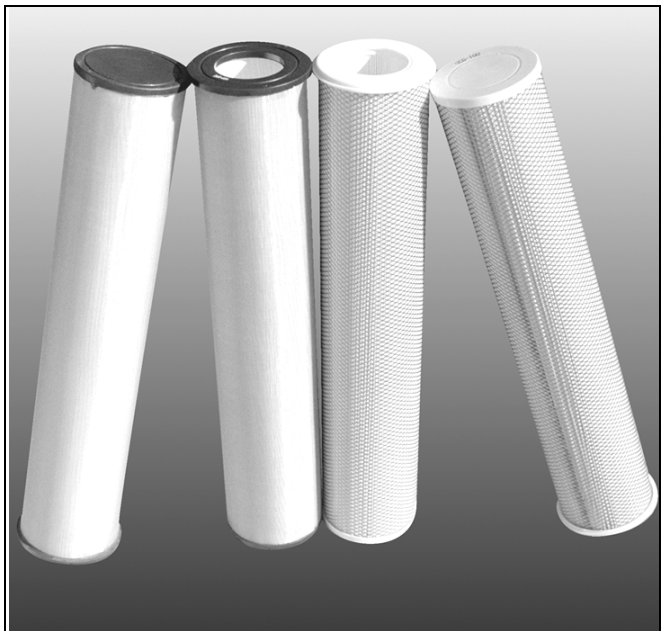
- FOR PORTABLE RADWASTE LIQUID PROCESSING
- FLOW RATE: 65 GPM
- DESIGN PRESSURE: 125 PSI
- TOTAL WEIGHT: 1400 LBS
- MATERIALS:
  FILTER HSG, SHIELD AND DOLLY – STAINLESS STEEL
  AIR DIAPHRAM PUMP – ALUMINUM
- USES STANDARD TNC FILTER CARTRIDGES – 6" X 30"

Tri Nuclear Corp.	
FILTER/PUMP/SHIELD ON DOLLY MODEL FPS-65	
DATE: JUNE 6,1996	BROCHURE NO: BR-109

TRI NUCLEAR CORP.

Filter Cartridges

Technical Data



In order to meet the continually changing demand for filtration in the nuclear power industry, ***Tri Nuclear Corp.*** has developed a wide range of filter cartridges for our equipment that will meet the needs of the nuclear operations environment. Among some of the beneficial design characteristics of these filters are:

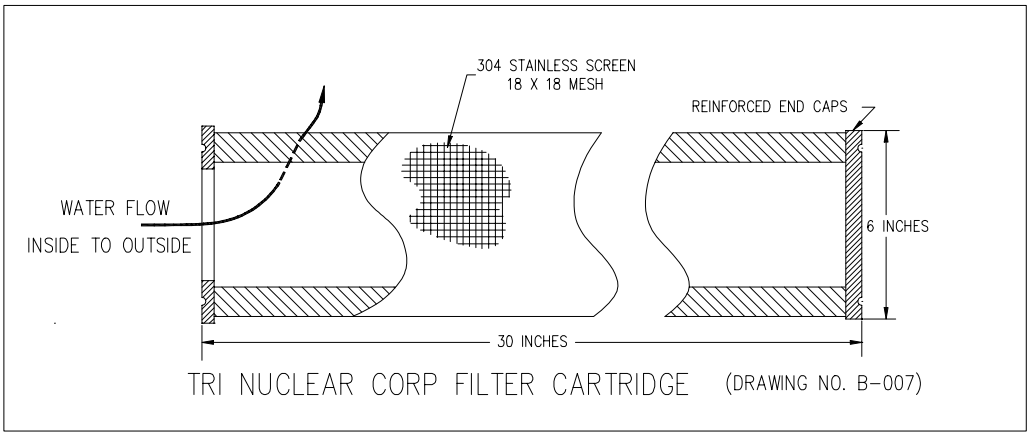
- Physically and chemically suited to all nuclear pool environments for long term storage
- Inside to outside flow with solid bottom end caps to contain filtered crud inside the cartridge and prevent the spread of contamination during filter draining and disposal
- High dirt loading with high flow rates
- Remote underwater handling capability
- Lead shielding available for filters and equipment
- Negative buoyancy to prevent filter floatation
- Easily compacted for volume reduction

Nuclear Applications

- Reactor Cavity and Spent Fuel Pool turbidity control
- Torus/Suppression Pool cleanup projects
- Condensate/Reactor Water Storage Tank cleanup projects
- Reactor Vessel Internal and Component underwater cleaning
- Underwater Plasma Cutting/EDM Machining filtration
- Underwater Loose Parts retrieval
- Fuel Pool surface skimming
- Low Point Drain flushing and clean out
- **Radioactive Waste Processing filtration**

Filter Product Specifications:

Filter cartridge dimensions:
Outside diameter: **6 inches**
Inside diameter: **3.5 inches**
Length: **30 inches**
Filter media: **Polyester, fiberglass**
Maximum operating temperature: **140^{0}F**
Maximum flow rate: **150 GPM**
Maximum differential pressure: **25 psid**



Standard Filter Cartridge

Engineering detail showing design specifications. This detail applies specifically to all VCPH-*PE filter cartridges.

Filter Cartridge Options:

Standard High Dirt Holding Polyester Cartridge

Model: VCPH-0.3PE Type: 0.3 micron, 60 sq. ft
Model: VCPH-1PE Type: 1 micron, 62 sq. ft.
Model: VCPH-5PE Type: 5 micron, 85 sq. ft.
Model: VCPH-10PE Type: 10 micron, 64 sq. ft
Model: VCPH-20PE Type: 20 micron, 64 sq. ft.

OPTIONAL Polyester Cartridge

Model: VCP- (micron size)PE
Micron size: 1, and 50 nominal
Filter effective surface area: 43 sq. ft.

Bag filters available on request

Equipment Using Tri Nuclear Filter Cartridges

Underwater Filter/Vacuum Units:

• UFV-100	Filter/Pump/Shield on Dolly: FPS-65
• UFV-260	Strainer Housing: ST-65
•UFV-600	Radwaste Filter and Shield: RWFS-1
	Skimmer/Filter/pump: SFP-100

For Technical Questions, Pricing and Availability, Contact: **James L. Warden, President**
Tel. (518) 399-1389 **Fax: (518) 399-9586** **e-mail: *jwarden@trinuclear.com***

Tri Nuclear Corp.

PO Box 1130 ♦ Ballston Lake, NY 12019 Tel. : (518) 399-1389 Fax: (518) 399-9586

Rope Filter Lift Tool

Operating Instructions

Model UT-9

Document No: OI-6 Rev 0 06/26/02
Date

Digitally signed by John J. Flynn
cn=John J. Flynn, o=Tri Nuclear Corp., c=US
Date: 2002.07.22 14:41:46 -05'00'
Reason: I am the author of this document

Prepared By: _____ 06/26/02
John J. Flynn, Technical Support Services Date

Digitally signed by James L. Warden
cn=James L. Warden, ou=President, o=Tri Nuclear Corp., c=US
Date: 2002.07.22 14:35:10 -05'00'
Reason: I am approving this document

Approved By: _____ 06/26/02
James Warden, President Date

Tri Nuclear Record of Revision

Revision or Change Number	Effective Date of Revision or Change	Affected Page and/or Para #	Person Entering Revision	Revision or change Cancelled By
Rev. 0	6/26/02	Original Issue	----------	

If you have any questions concerning changes in this document, please call the main Tri Nuclear office at 518-399-1389 or e-mail at info@trinuclear.com

ROPE FILTER LIFT TOOL
(Model UT-9)

Operating Instructions

1.0 PURPOSE

One of the advantages of TRI NUCLEAR Underwater Filter/Vacuum Units is the ability to change-out depleted filter cartridges while the unit is still submerged on the bottom of the pool.

TRI NUCLEAR has designed a special "Rope Filter Lift Tool" Model UT-9, to change out filters underwater. A single nylon line (or equivalent) is attached to the Rope Filter Lift Tool to allow for fast and easy filter change outs.

2.0 DESCRIPTION

The Rope Filter Lift Tool is shown on Dwg. TN-1687. The left view shows one of the two openings in the side of the housing allowing the fingers to extend out to catch under the top cap of the filter cartridge for lifting. The center view describes the key parts of the tool. The right view is a picture of the tool suspended over a filter cartridge, ready to be lowered into the cartridge for remote transferal.

As the top pull rod is operated up or down in the tool housing, the hinged arms rotating on an internal cam will extend either in or out through the two open slots. The hinged arms will capture the filter for lifting, or release it for withdrawal of the tool.

3.0 OPERATION

3.1 To change-out an expended filter cartridge from an Underwater Filter/Vacuum Unit, first lower the Underwater Filter Storage Rack with new filter cartridges down to the bottom of the pool adjacent to the Underwater Filter/Vacuum Unit. Allow the filters to fill with water before lowering quickly into the pool.

3.2 Attach a nylon line to the top lifting eye of the Rope Filter Lift Tool, and lower it down until it lands on the top cover of the filter housing.

3.3 Rotate and move the tool until the bottom J-hook engages the lift handle on the filter housing top cover. Note that the hook locator tab welded on the top of the tool indicates from a top view the orientation of the open side of the hook

3.4 Raise the nylon rope with tool to open and lay back the top cover and disengage the tool from the cover.

3.5 Next, lower the tool down into the open top of the expended filter cartridge until the top plate of the rope tool seats on the top of the filter cartridge. This is determined by a sudden decrease in the weight of the tool on the nylon line.

3.6 Continue to partially lower the nylon line ONLY another 4 or 5 inches. This will allow the side arms of the tool to extend out through the open slots on the side of the tool housing and engage the underside of the filter top cap.

3.7 Pull up on the tool to raise the filter out of the filter housing, and lower it into one of the open tubes in the Underwater Filter Storage Rack.

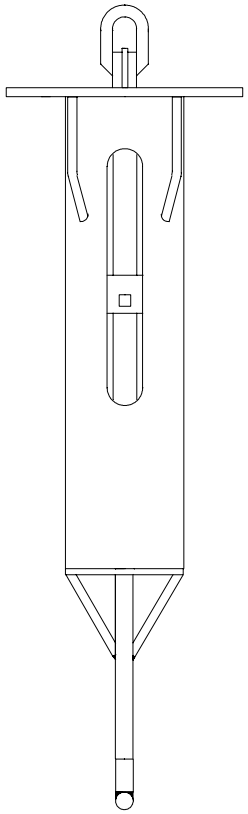
3.8 Slack-off the nylon line until the rope tool slide rod hits the bottom and all of the weight of the rope tool is transferred to the filter cartridge. This will rotate the internal cam fitting so the hinged arms will no longer extend out through the side slots in the tool housing.

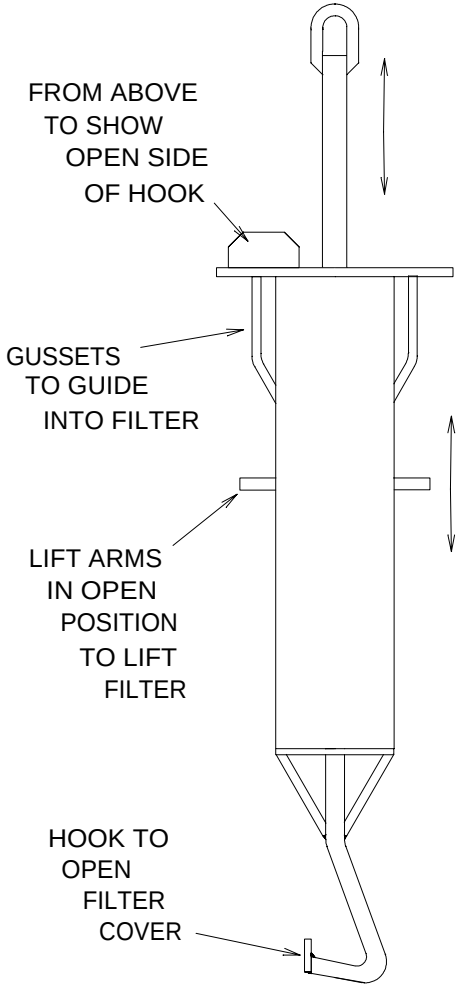
3.9 Next, raise the nylon line and lift the rope tool out of the filter cartridge.

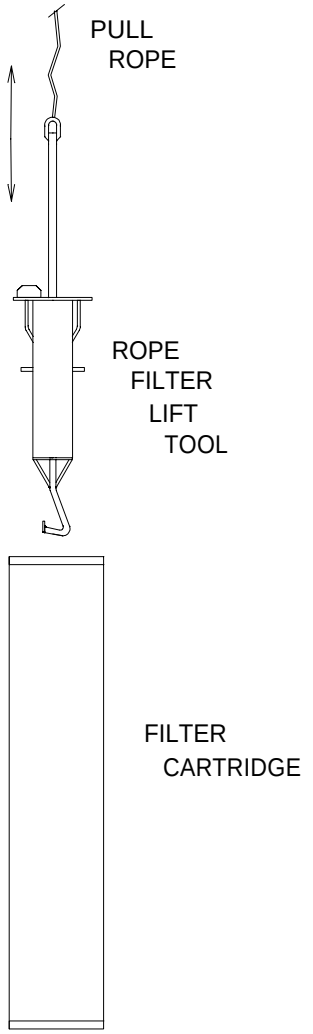
3.10 Lower the rope tool down into a new filter cartridge, and repeat the steps to install a new filter into the housing.

3.11 Finally, re-engage the bottom J-hook of the rope tool onto the lift handle on the filter housing top cover, lift up to close the filter housing cover, and then disengage the hook. This will complete the filter change-out operation.

End







ROPE FILTER LIFT TOOL MODEL UT-9	TN-1687 REV: 7/28/95	TRI NUCLEAR CORP BALLSTON LAKE NEW YORK 12019	APV'D