



SPEED-VAP™ III and Solvent Trap™ User's Manual



Solvent Evaporation and Recovery Systems



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1.0 Introduction

The **Speed-Vap™ III** Solvent Evaporation System (Figure 1-1) provides safe and simultaneous unattended evaporation of up to (9) Oil & Grease extractions.

Simple in design, the **Speed-Vap™ III** will allow testing facilities to:

- Decrease evaporation times by 25 – 50%.
- Provide more reliable results by reducing testing variability.
- Process more samples per hour.
- Bring a new level of productivity to the laboratory.

Designed with simplicity in mind, the evaporator provides several distinct benefits. With the use of vacuum to generate a gentle flow of air over all samples, the evaporation process is controllable and fast. The use of vacuum also allows the evacuating n-hexane vapors to be discharged safely into a hood, or to be trapped with an optional in-line **Solvent Trap™** - Solvent Recovery System, minimizing solvent discharge into the atmosphere. The **Speed-Vap™** uses compressed air (2 CFM, minimum 60 psi) to create the vacuum. If compressed air is not available, please consult Horizon Technology, Inc. The **Speed-Vap™** can be located either in a hood, or if flexible ducting is provided, it can be operated on a lab bench. The integrated cover also prevents any airborne contaminants from entering your samples.



Figure 1-1: Speed-Vap™ III Solvent Evaporation System

Utilizing a solid-state temperature controller, the **Speed-Vap™** assures a consistent, gentle, and uniform temperature heating of the solvent extracts. The System uses a dry heat source eliminating water condensation that may occur when using a water bath heating system. A dessicator, as required with other evaporation techniques, is not necessary with the Speed-Vap III.

The **Solvent Trap**[™] - Solvent Recovery System (Figure 1-2) is designed to operate in conjunction with the **Speed-Vap**[™]. The **Solvent Trap**[™] provides reliable and effortless distillation of n-Hexane during the evaporation of Oil & Grease extracts. The Performance Based Method 1664 for Oil and Grease *requires* the analyst to recover the solvent vapors from the evaporation portion of the analysis.



Figure 1-2: Solvent Trap[™] Solvent Recovery System

The **Solvent Trap**[™] condenses solvent vapor from the exhaust gas stream of the evaporation process, minimizing the release of solvent into the atmosphere. A Solid State Thermal Electric Cooling device (Peltier device) is used in place of a water-cooled system, or refrigeration system. This Peltier effect device is coupled with a Heat Sink to assist in the dissipation of heat away from the unit. The **Solvent Trap**[™] currently recovers up to 70% of n-Hexane. The solvent is collected in an Erlenmeyer flask for re-distillation or disposal. A built in temperature controller allows the **Solvent Trap**[™] to be operated at the optimal recovery temperature. The solid-state temperature controller assures a consistent and uniform low temperature cooling.

Combining the **Solvent Trap**[™] with the Horizon Technology **SPE-DEX**[®] Automated Extraction Systems and the **Speed-Vap**[™] evaporator, Oil & Grease Analysis becomes completely automated for improved performance, efficiency and profitability. It is now possible to achieve better precision and accuracy in your Oil & Grease analysis, while significantly reducing your turn-around time for this labor-intensive analysis.

2.0 Product Safety Notice

This Safety Notice has been provided to inform and guide the operator in safe practices to avoid injury, and is intended to cover general safety requirements for a laboratory. Each laboratory is responsible for implementing and communicating its unique safety requirements and program to all workers.

Personal Protective Equipment:

- 1) Eye protection in the form of safety glasses or goggles is advised when operating the equipment. If solvent liquids or vapors enter the eyes, follow the appropriate first aid procedures set forth in the laboratory's safety manual.
- 2) Lab coats must be provided for protection and convenience. They should be worn at all times when operating the equipment.
- 3) Protection of the hands when working with solvents or any hazardous material is essential. Wear gloves selected on the basis of the hazard.

Equipment Safety:

Using compressed air is the safest method for providing the necessary vacuum to the **Speed-Vap™** and **Solvent Trap™**. If your facility does not have an air compressor, contact Horizon Technology, Inc. for options. The exhaust from the **Speed-Vap™** must be adequately vented into a hood.

Chemical Safety:

- 1) Organic solvents can pose inhalation, skin, and ingestion hazards with potential chronic health effects. N-Hexane is extremely flammable, which could cause fire and/or explosion hazards. Be sure to avoid all sources of ignition. Flashback can occur if vapor travels to an ignition source. All solvents must be handled using appropriate personal protection equipment and in a properly operating fume hood to eliminate inhalation hazards. Refer to the **Material Safety Data Sheet** for the specific chemical for handling and safety instructions.
- 2) **MSDS (Material Safety Data Sheets)** are the source for chemical hazard information including basic information on the manufacturer or distributor, identification of the chemical, the product's hazardous ingredients, physical data, fire and explosion data, toxicity information, protection information, and more. The laboratory is responsible for having a MSDS for every chemical or substance being used. It is also the laboratory's responsibility to make the MSDS available and accessible to all employees and to provide training in the safe handling of hazardous chemicals. MSDS can be obtained from the vendor.
- 3) All hazardous solvents and chemicals must be disposed in accordance with appropriate Federal, State and local regulations.

If you have any questions please call Horizon Technology at 800-997-2997.
(Inside NH 603-893-3663).

3.0 Overview of Systems

3.1 Overview of the Speed-Vap™ Solvent Evaporation System

Use Figures 3-1 and 3-2 to identify the major components of the Speed-Vap™ unit.

- **Temperature Control** Provides the inputs to set and monitor heating temperatures.
- **Vacuum Adjust Knob** Regulates the vacuum supplied to the chamber
- **Vac On / Off** Turns the vacuum supply “On” or “Off”.

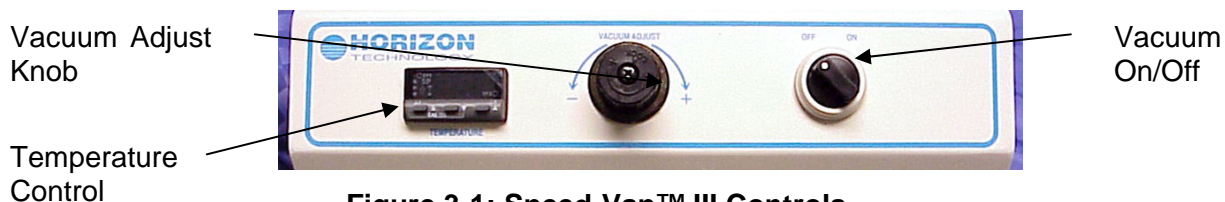


Figure 3-1: Speed-Vap™ III Controls

- **Power Input** Connects the Evaporator to a 120 VAC power source via the power cord.
- **Air Supply** Connection fitting for the 10-foot polyurethane tubing to the compressed air source.
- **Exhaust** Connection Fitting for the polyurethane tubing vented to a fume hood
- **To Trap** Connection fitting for the polyurethane tubing connecting the Speed-Vap™ to Port A of the Solvent Trap™
- **From Trap** Connection fitting for the polyurethane tubing connecting the Speed-Vap™ to Port B of the Solvent Trap™
- **On/Off Switch** Turns unit On and Off

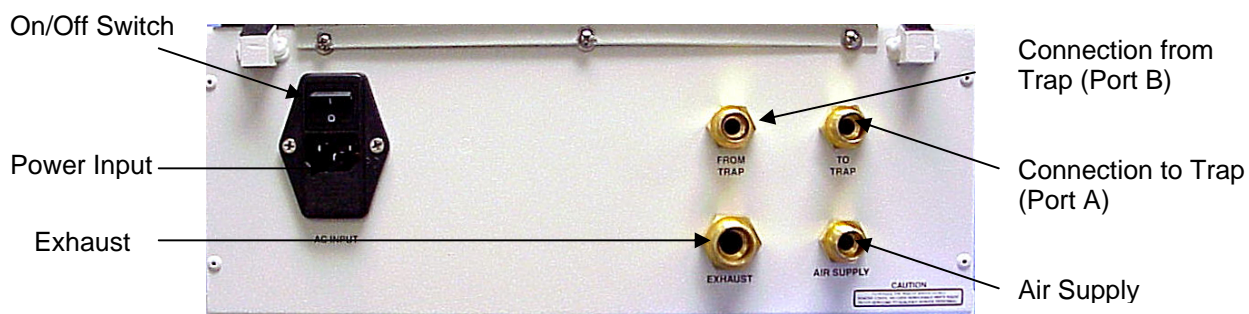


Figure 3-2: Speed-Vap™ III Connections

3.2 Overview of Solvent Trap™ - Solvent Recovery System

Use Figure 3-3 and 3-4 to identify the major components of the Solvent Trap™.

- **Temperature Control** Provides the inputs to set and monitor heating temperatures
- **Collection Container** Erlenmeyer flask collects solvent distillate
- **Port A** Connection **To Trap** from the Speed-Vap™ III
- **Port B** Connection **From Trap** to the Speed Vap™ III

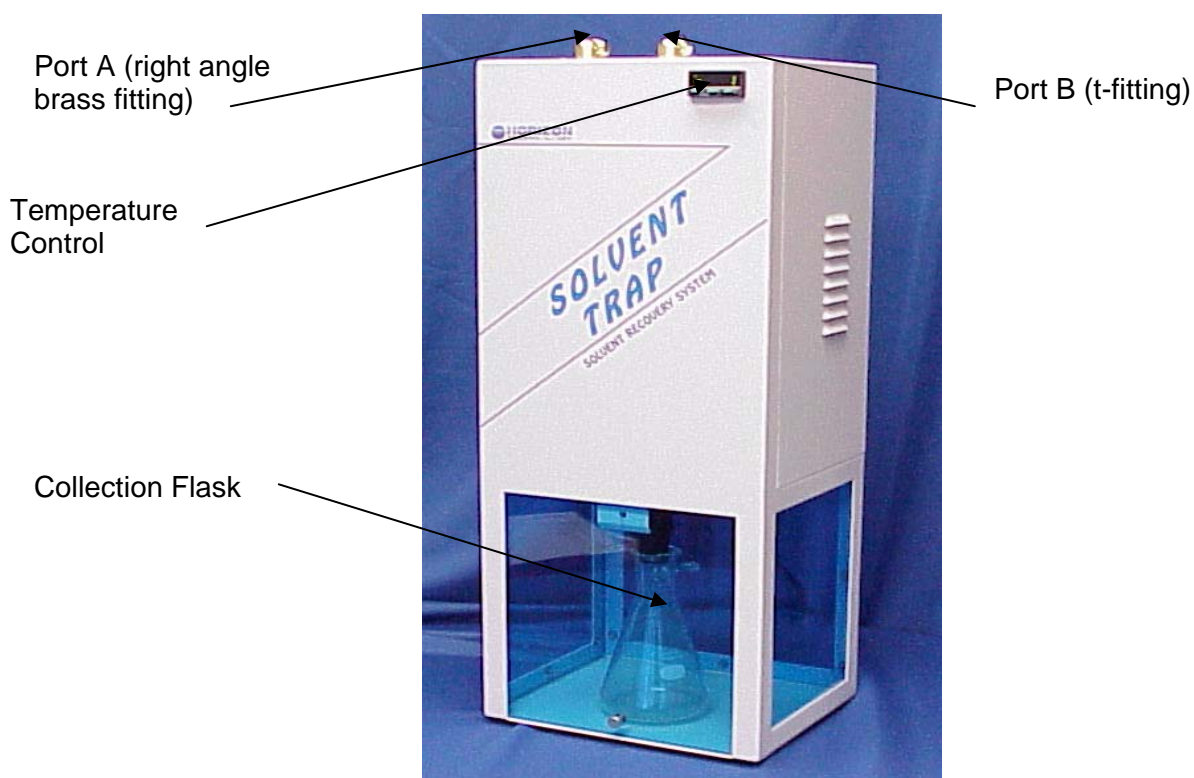


Figure 3-3: Solvent Trap™ System

Fuse

On/Off
Switch

Power
Input

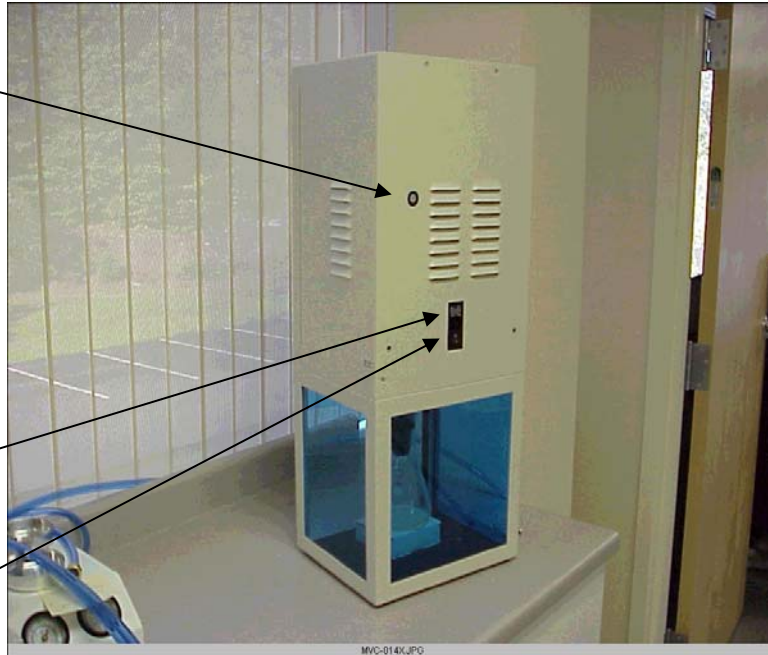


Figure 3-4: Back of Solvent Trap™

- **Power Input** Connects the Solvent Trap™ to a 120 VAC power source via the power cord.
- **On/Off Switch** Turns unit On and Off
- **Fuse** Fuse for Peltier Device

4.0 Installation

4.1 Unpacking the *Speed-Vap™ III* System

Unpack the Speed-Vap™ III system and check the parts received against the list below:

- Speed-Vap™ III *Evaporator* Unit
- Power Cord
- Pan Locator Rack (9-position, P/N 01-0284-02 and/or 5-position, P/N 01-0284-03)
- Air Line, polyurethane tubing P/N 50-0487
- Exhaust Line, polyurethane tubing P/N 50-0489
- Dry Trap, P/N 50-0572
- Clean-out tool for *Speed-Vap™* Window, P/N 99-0326
- Users Manual

Accessory Kit (if purchased separately)

- Aluminum Weighing Pans: 70 mm, P/N 50-002-HT; 105 mm, P/N 50-002-02-HT
- Polypropylene transfer pipettes, P/N 50-001-HT
- Starter Kit, P/N 10-300-SK includes:
 - 50-001-HT Oil & Grease Transfer Pipettes 250/box
 - 50-002-HT Oil & Grease Aluminum Weighing pans 100/box
 - 50-003-HT Oil & Grease Standard Kit, 4 x 30 mL vials
 - 4.0 mg/mL n-Hexadecane
 - 4.0 mg/mL Stearic Acid
 - 40-003-HT Whatman GMF –150 2 micron prefilters 40 /box

4.2 Unpacking the Solvent Trap™ - Solvent Recovery System

Unpack the Solvent Trap™ System and check the parts received against the list below:

- Solvent Trap™ -Solvent Recovery System
- Power Cord
- (2) Vacuum lines, polyurethane tubing P/N 50-0488
- 500 ml Erlenmeyer Flask
- User's Manual

4.3 Installing the Speed-Vap™ III and Solvent Trap™

It is recommended to install the Speed-Vap™ unit in a fume hood. However, if proper ducting is available to minimize solvent vapors when the cover is opened, the unit can be operated on the lab bench (refer to the Introductory chapter). Follow the instructions below to install the unit.

- Step 1)** Remove the protective foam padding taped to the top of the Speed-Vap™ unit.
- Step 2)** Open the Speed-Vap™ cover, remove, and discard the protective foam paper. Close the cover.
- Step 3)** Place the Speed-Vap™ unit in the desired location.
- Step 4)** Locate the bag with P/N 50-0489, containing the polyurethane exhaust tubing. Connect one end to the connector labeled “Exhaust” on the back of the Speed-Vap™ (refer to Figure 3-2). Place the other end of the tubing in a hood. Be certain the hexane vapors are properly vented, well away from any ignition source.
- Step 5)** Locate the bag with P/N 50-0487, containing the polyurethane air tubing. Attach the fitting to the connector labeled “Air Supply” on the back of the Speed-Vap™ (refer to Figure 3-2). Connect the other end of the tubing to the air compressor. The air compressor requirements are a flow rate of 2 CFM and a minimum pressure of 60 psi.
- Step 6)** The Speed-Vap™ comes with a shunt connected to the fittings labeled **From Trap** and **To Trap** (refer to Figure 4-1). Do not remove the shunt if not using the Speed-Vap™ in conjunction with the Solvent Trap™. Proceed to Step 13 if not using the Solvent Trap™.

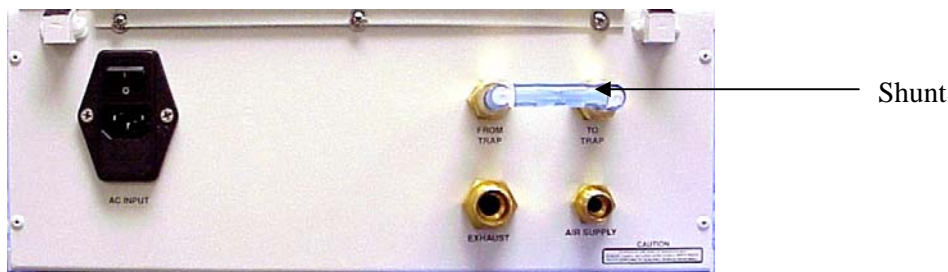


Figure 4-1: Back of Speed-Vap III showing shunt

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- Step 7)** Remove the shunt connected to the fittings labeled **From Trap** and **To Trap** of the Speed-Vap™, if using in conjunction with the Solvent Trap™ (refer to Figure 4-1).
- Step 8)** Remove the protective foam padding from around the Solvent Trap™.
- Step 9)** Place the Solvent Trap™ in the desired location, close to the Speed-Vap™. Be sure to allow approximately 3 inches of space around Solvent Trap™.
- Step 10)** Locate the bag with P/N 50-0488, containing (2) polyurethane vacuum lines. Attach one end of one line to the Speed-Vap™ connector labeled **To Trap** and the other end to the Solvent Trap™ connector for “Port A” (left right angle brass fitting). Attach one end of the second vacuum line to the Speed-Vap™ connector labeled **From Trap** and the other end to the Solvent Trap™ connector for “Port B” (right t-fitting). Refer to Figures 3-2 and 3-3.
- Step 11)** Insert the power cord into the power input receptacle on the back of the Solvent Trap™. Plug the power cord into a 120V outlet, and turn the Solvent Trap™ on using the On/Off Switch located above the power input. The Temperature Controller will first cycle through its internal diagnostics and then start to cool to the preset value (-30°C). The LCD will display the actual temperature. Turn the Solvent Trap™ on 30 min before using to allow it to cool to a temperature of at least -20 °C.
- Step 12)** Locate the Erlenmeyer Flask supplied with the Solvent Trap™. Open the Trap door by lifting. Place the flask in the Solvent Trap™ chamber and insert the tubing through the opening of flask stopper.
- Step 13)** Insert the power cord into the power input receptacle on the back of the Speed-Vap™. Plug the power cord into a 120V outlet, and turn the Speed-Vap™ on using the On/Off switch located above the power input.
- Step 14)** The Temperature Controller on the Speed-Vap™ III will first cycle through its internal diagnostics and then start to heat to the preset value (50°C). The LCD will display the actual temperature.
- Step 15)** Located on the front panel of the Speed-Vap™ is the Vacuum On/Off switch. Verify that the switch is in the “Off” position. Refer to Figure 3-1.
- Step 16)** Open the cover and place an empty aluminum pan into any position. Carefully pour approximately 30 ml of acetone into the pan. Close the cover.
- Step 17)** Turn on the air compressor then turn the Speed-Vap™ Vac On/Off switch to the “On” position.
- Step 18)** Slowly increase the Vacuum Adjust knob on the Speed-Vap™ clockwise. Continue adjusting until a vigorous swirling motion is established, but without forcing the solvent to spill out of the pan.
- Step 19)** To open the Speed-Vap™ cover, first switch the Vacuum On/Off to the “Off” position, then lift the cover using the handle.
- Step 20)** Remove the aluminum pan, being careful not to spill any solvent.

This completes the installation of the Speed-Vap™ III and Solvent Trap™ systems. Turn off the main power to both systems, if they are not going to be used.

5.0 Operation

5.1 Speed Vap™ III - Theory of Operation

The Speed-Vap™ III Solvent Evaporation System provides easy and reliable evaporation of n-hexane Oil & Grease extracts, allowing consistent and accurate recoveries. Taking advantage of the Performance Based allowance of Method 1664 for Oil and Grease, which allows the analyst the flexibility to modify analytical conditions to optimize performance, the Speed-Vap™ III Solvent Evaporation System minimizes the evaporation rate times. One variable to be considered is the temperature at which to evaporate the extracted sample.

Using the Speed-Vap™ III Solvent Evaporation System, data was collected at three different evaporation temperatures. Figure 5-1 shows the time to dryness at the three different temperatures. Figure 5-2 shows the percent recovery, of a 5mL oil and grease standard in 35mL of n-hexane, as a function of temperature.

As would be expected, using a higher temperature significantly reduces the evaporation time. At 35°C, 35mL of total solvent evaporated in slightly less than 30 minutes. At 45°C, the time decreased to approximately 22 minutes. At 55°C, the same volume dried in just less than 18 minutes.

One of the most important factors resulting in low recoveries is leaving the dried pan on the heat source for too long after the extract has evaporated. The recovery loss becomes more pronounced when using higher temperatures. In order to prove this point; weight readings were taken at 15, 30, 45, and 60 minutes after initial dryness, and at the three different temperatures of 35, 45, and 55°C.

The data proves that evaporating at a higher temperature does not significantly affect recovery, if the pan is removed from the heat at initial dryness. The percent recovery of the standard upon dryness at 55°C was over 98%. However, it appears that some of the analytes in the standard are volatile enough to be lost after the sample goes to dryness: the higher the evaporation temperature, the more rapid the loss of analytes.

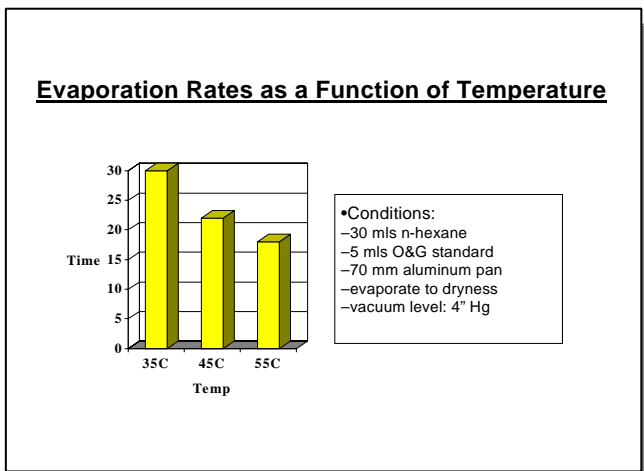


Figure 5-1: Evaporation Rates as a Function of Temperature

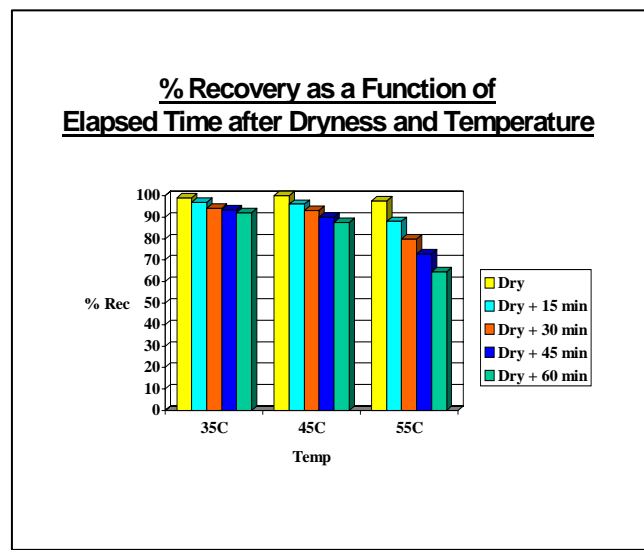


Figure 5-2: Recovery as a Function of Time and Temperature

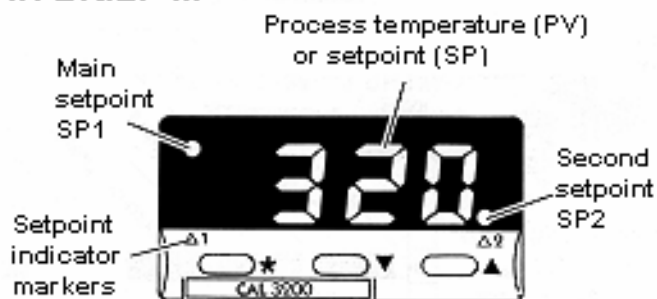
Therefore, if higher temperatures are used to reduce the evaporation times, it is critical to remove the pan from the evaporator immediately after the pan initially reaches dryness. If the pan is not removed, the recovery will drop considerably over time. (Refer to Figure 5-2).

With the Speed-Vap™ III, analysts are able to evaporate the extracted Oil and Grease samples as rapidly as required, contingent upon how closely they monitor the time to dryness of their samples. The consistent and precise temperature control provided by the Speed-Vap™ III allows the analyst to predict the time to dryness with great accuracy. Any loss of analytes will thus be minimized. Turn around times can be reduced without sacrificing the quality of the analytical results.

5.1.1 Programming the Temperature Controller

To check the preset controller temperature, hold down the left key (*). The display will flash and alternate between the set point temperature and the actual temperature of the heater (Centigrade). The controller temperature is set at the factory to 50°C.

IN BRIEF ...



- Routine adjustments
- * View setpoint
 - * ▲ Increase setpoint
 - * ▼ Decrease setpoint

To change the temperature value, hold the (*) key down while pressing the (▲) key or (▼) the key until the desired temperature is reached. The factory preset temperature range is 20°C to 60°C. Read the information in Section 5.1 "Theory of Operation" to select the optimal temperature for the desired evaporation rate.

5.2 Solvent Trap™ - Theory of Operation

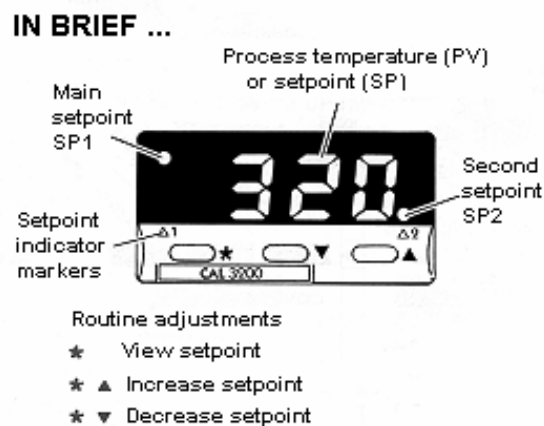
The Solvent Trap™ - Solvent Recovery System provides reliable and effortless distillation of n-Hexane during the evaporation of Oil & Grease extracts. The Performance Based Method 1664 for Oil and Grease requires the analyst to recover the solvent vapors from the evaporation portion of the analysis.

The Solvent Trap™ is designed to operate in conjunction with the Speed-Vap™ III. The Solvent Trap™ condenses solvent vapor from the Speed-Vap™ evaporation process, minimizing the release of solvent into the atmosphere. A Solid State Thermal Electric Cooling device (Peltier device) is used in place of either a water-cooled system, or a refrigeration system. This Peltier effect device is coupled with a Heat Sink to assist in the rejection of heat away from the unit. The Solvent Trap™ provides reliable and effortless distillation of n-Hexane during the evaporation of Oil & Grease extracts. It currently recovers up to 70% of the n-Hexane evaporated from the Speed-Vap™ III. The solvent is collected in an Erlenmeyer flask for re-distillation or disposal. A built in temperature controller allows the Solvent Trap™ to be operated at the optimal recovery temperature.

As would be expected, using a cooler temperature significantly increases the amount of distillate collected. At -20°C, evaporating 9 pans with 30 ml of n-Hexane in each, approximately 65% of the solvent is collected or recovered. Allowing the Solvent Trap™ to cool below -20°C before attempting to recover solvent, placing the collection flask in an ice bath, and covering the vent ports of sample stations not in use on the cover of the Speed-Vap™ III, as well as covering those in use when they become dry, all aid in optimizing recovery.

5.2.1 Programming the Temperature Controller

To check the preset controller temperature, hold down the left (*) for five seconds. The display will flash and alternate between the set point temperature and the actual temperature (Centigrade). The controller temperature is set at the factory to -50°C.



To change the temperature value hold down the (*) key while pressing the (▲) key or the (▼) key until the desired temperature is reached. The factory preset temperature range is -50°C to 30°C. Read the information in Section 5.2 “Theory of Operation” to select the optimal operating temperature for the desired distillation rate.

5.3 Daily Operating Procedure

- 1) Turn on the Solvent Trap™ power and allow the unit to cool for approximately 30 min. Maximum operating temperature (-20°C to -30°C).
- 2) Allow the Solvent Trap™ to reach the operating temperature range of at least -15°C to -20°C. Place the collection flask with stopper in the Solvent Trap™ chamber. Insert the blue tubing into the opening of the collection flask stopper. Make sure this gives a vacuum tight seal.
- 3) Remove the T-fitting from Port B (right port) of the Solvent Trap™. Supercharge the Solvent Trap™ by pouring 50 ml of liquid n-Hexane into Port B.
- 4) Look for solvent to start dripping into the collection vessel. When it has stopped, add another 50 ml of liquid n-Hexane into Port B.
- 5) Repeat Step 3 and 4 two more times.
- 6) Recap the T-fitting.
- 7) Obtain clean, empty aluminum pans from the cardboard container. As cardboard “dust” can collect on the inside of the pans, use a Kim wipe to gently wipe the inside of the pans. Turn the pans over, and using a hard point pen, write the sample identification on the bottom of each pan. This will eliminate any confusion when multiple pans are in use.

NOTE: Only use pan transfer tongs or forceps to move or transfer the pans. Do not touch the pans with your fingers, as oils from the skin will contribute to the weight.

- 8) Once the pans have been cleaned and labeled, use the tongs or forceps to transfer them to the analytical balance. Record the weight of each pan on the worksheet provided in Appendix A.
- 9) Transfer the pans to the Speed-Vap™. Use the 9-place rack to hold the smaller pans and the 5-place rack to hold the larger pans.

NOTE: One drop of concentrated food color is added to the collection vessel containing the extract to visually aid in identifying the water layer from the hexane layer. If some of the colored water layer is pulled into the pipette it can be dispensed back into the collection vessel.

- 10) Using a polypropylene transfer pipette, carefully transfer the top, clear hexane layer from the extract collection vessel into the pan labeled with the sample ID. If some colored liquid is pulled into the pipette tip, dispense the colored liquid back into the collection vessel. Be careful not to spill any of the solvent during the transfer to the pan.
- 11) Using fresh n-hexane and a new transfer pipette or squeeze bottle, rinse down the walls of the collection vessel. Using the pipette originally used to transfer the hexane into the pan, transfer the rinse hexane into the pan. Repeat the rinsing operation two more times to ensure all of the extracted Oil and Grease is transferred into the pan.
- 12) Perform Steps 10 and 11 for all samples extracted.

-
- 13) Close the cover of the Speed-Vap™, make sure the air compressor is on, and turn the **Vac On/Off** switch to the “**On**” position. If necessary, use the **Vacuum Adjust Knob** to achieve the desired swirling rate in the pans.
 - 14) When the solvent has visually appeared to be completely evaporated, turn the **Vac On/Off** switch to the “**Off**” position and lift the cover. Use tongs or forceps to transfer the pan back to the balance. Take the weight of the pan with the dried extract. If the weight is stable, record the new weight on the worksheet in Appendix A. If the weight is slowly dropping, this may indicate solvent is still evaporating off the pan. In this case, let the pan sit for a while or return to the evaporator for a short period of time (approximately 1 minute).
 - 15) Repeat the above steps for all extracted samples.

NOTE: If the vacuum knob will be switched off for more than 10 minutes and there are samples in the Speed-Vap™, it is recommended to turn off the Speed-Vap™. This will minimize any safety issue due to solvent vapors.

- 16) When all samples have been completed, turn the **Vac On/Off** switch of the Speed-Vap™ to the “**Off**” position. Turn the **Vacuum Adjust Knob** counter-clockwise to shut down the vacuum. Shut down the air compressor. Finally, switch off both the Speed-Vap™ and Solvent Trap™. Empty the collection flask in the Solvent Trap™, and appropriately dispose of the solvent.

6.0 Maintenance

To ensure proper functioning and longevity of the Speed-Vap™ III and Solvent Trap™ systems, follow the maintenance instructions below.

6.1 Speed Vap™III Maintenance

- Use the Cleanout tool for the Speed-Vap™ Window (part number 99-0326) to clean the small openings on the cover above each pan to ensure unrestricted air circulation. The frequency with which the holes must be cleaned will depend on the cleanliness of the room air.
- If the cover is cracked or distorted, please call Horizon Technology to order a replacement cover.
- Keep the heating surface clean and free of debris. Periodically remove the aluminum tray or rack, containing the cutouts for each pan, and visually inspect the surface. Wipe the heating surface clean and replace the aluminum tray.
- Check the line to and from the compressed air source to be certain that it is not crimped.

6.2 Solvent Trap™ Maintenance

- Track the temperature on the Solvent Trap™, to verify performance. In an air-conditioned room, with laboratory hoods, it should take an average of 30-45 minutes to cool to -20° C. *Note: The temperature will fluctuate during normal operation.*
- Remove the solvent collected daily and dispose appropriately or recycle. Do not leave solvent within the flask after operation is completed. Place the empty flask back onto the Solvent Trap™ to collect any remaining solvent that could drip out.
- Verify that all lines connected to the Solvent Trap™, to and from the Speed-Vap™, are securely connected and not crimped.

Call Horizon Technology at 800-997-2997 (inside NH use 603-893-3663) promptly if problems arise with the Speed-Vap™ and Solvent Trap™ systems.

Appendix A

Sample Worksheet

Use this worksheet to record and calculate sample weights, and percent recoveries for standards. See the example below.

Oil & Grease Worksheet

Date May 3, 2003

Sample ID 980503-128

Final Wt 2.5835 g

Empty Wt 2.5641 g

Wt Δ 19.4 mg

Std added 20 mg

% Recovery 97

Date _____

Sample ID _____

Final Wt _____ g

Empty Wt _____ g

Wt Δ _____ mg

Std added _____ mg

% recovery _____

Date _____

Sample ID _____

Final Wt _____ g

Empty Wt _____ g

Wt Δ _____ mg

Std added _____ mg

% Recovery _____

Date _____

Sample ID _____

Final Wt _____ g

Empty Wt _____ g

Wt Δ _____ mg

Std added _____ mg

% Recovery _____

Date _____

Sample ID _____

Final Wt _____ g

Empty Wt _____ g

Wt Δ _____ mg

Std added _____ mg

% Recovery _____

Date _____

Sample ID _____

Final Wt _____ g

Empty Wt _____ g

Wt Δ _____ mg

Std added _____ mg

% Recovery _____

Appendix B

Warranty

The **Speed-Vap™ III** and **Solvent Trap™** are warranted against defects in materials and workmanship for a period of one year from the date of purchase.

No other warranties are expressed or implied.

Please call Horizon Technology, Inc. at (603) 893-3663 for information on Service Contracts available.

For service assistance or resolution of a service problem, or for product information or operation, contact:

Horizon Technology, Inc.

1-(800)-997-2997

1-(603)-893-3663

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