



MK 3 Passive Operating Guide

Accessories

Terpp Extractors sells accessories designed to help or enhance the operation of closed loop extractors. To browse and learn more about these accessories visit our web site.

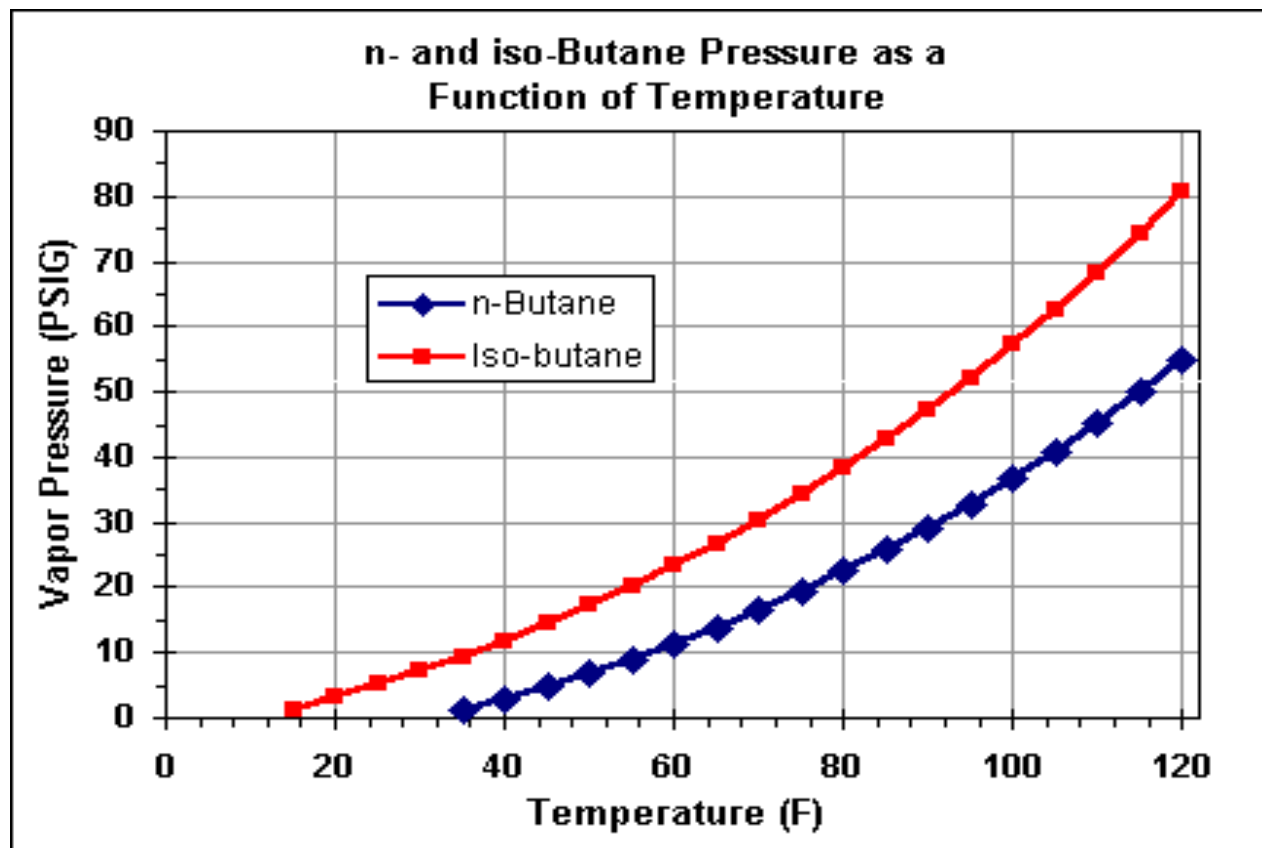
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Safety Guidelines

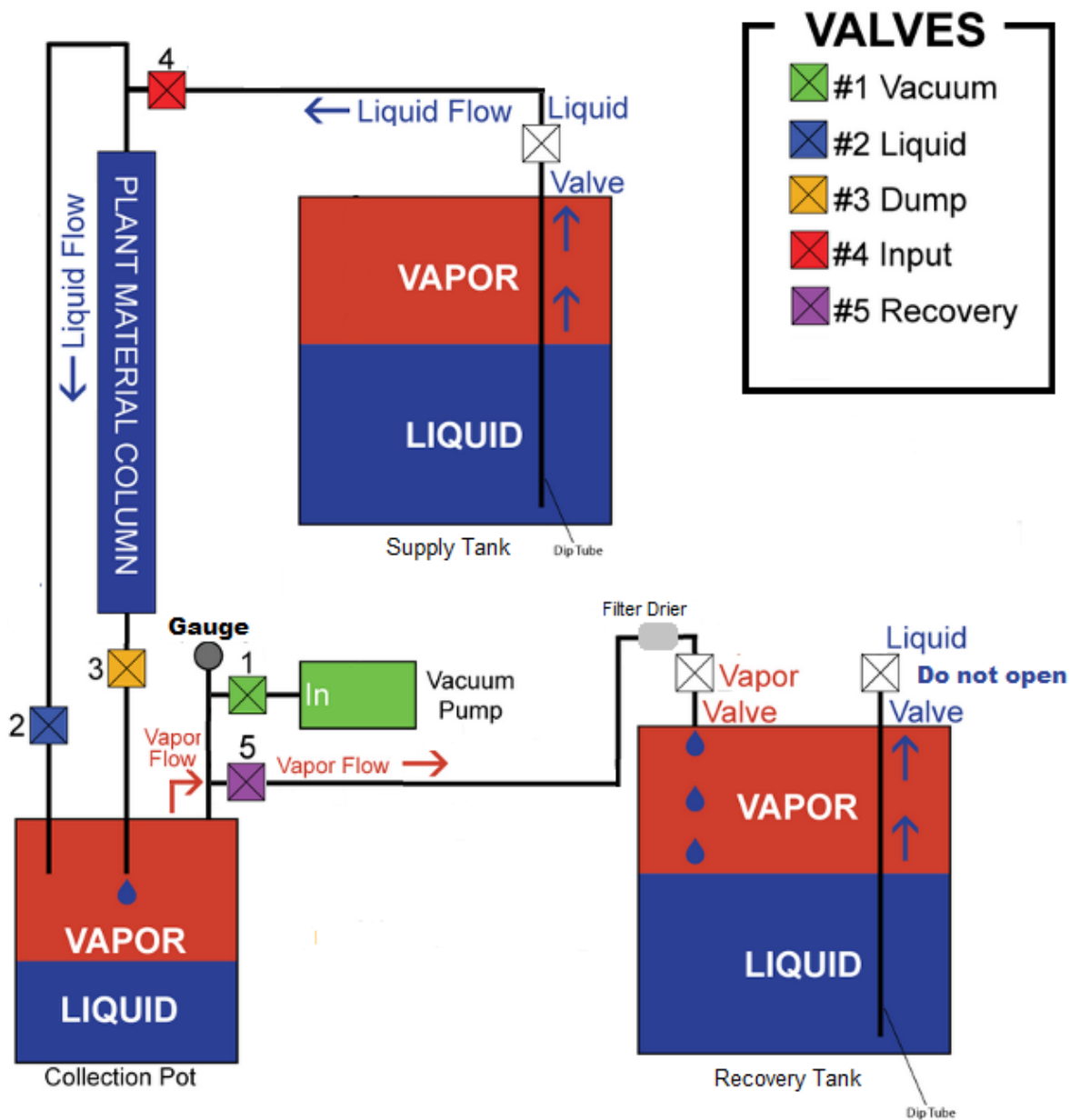
- Read this entire manual thoroughly before operating the equipment. Failure to follow instructions could result in serious injury or death.
- Improper treatment or use of the extractor can damage it, shorten its life, and void your warranty.
 - Use the extractor only for intended purposes.
 - DO NOT expose extractor to conditions not intended for it.
 - DO NOT allow outside interference during operation.
 - DO NOT operate if any equipment appears to have a malfunction.
 - DO NOT modify extractor. Contact manufacturer for repairs/modifications.
 - DO NOT over-pressurize equipment.
 - Maximum Operating Pressure: 120 psig
 - Always have an ABC fire extinguisher ready in the area.
- Butane (also called LPG-Liquefied Petroleum Gas or LP-Gas) is a liquid fuel stored under pressure. LP-Gas is highly flammable when mixed with air (oxygen) and can be ignited by many sources, including, but not limited to, open flames, smoking materials, electrical sparks, and static electricity. Severe “freeze burn” or frostbite can result if LP-Gas liquid comes in contact with your skin. Reference a Material Safety Data Sheet (MSDS) for more detailed information and personal protective equipment (PPE) that must be used when using this equipment.

Hazard	Cause	Safeguards
Asphyxiation	Release of LP-Gas in the facility due a relief valve cracking or a leaking seal or fitting	A local LP-Gas monitor shall be in operation at all times during the extraction process or where LP-Gas is used or stored.
Asphyxiation	Release of LP-Gas in the facility due to a leaking seal or fitting	An appropriate hazardous exhaust system is required. In addition, every occupied space shall be ventilated by natural means or by mechanical means in accordance with the International Mechanical Code (IMC). Ventilation shall be provided during the periods that the room or space is occupied. Natural ventilation of occupied space shall be through windows, doors, louvers, or other opening to the outdoors. The minimum open-able ventilation area to the outdoors shall be 4 percent of the floor area being ventilated. Mechanical ventilation shall be capable of delivering 15 cubic feet per minute (cfm) per person.

Hazard	Cause	Safeguards
Contact with skin or eyes	Release of LP-Gas in the facility due to a leaking seal or fitting	Appropriate PPE should be worn at all times. Refer to the LP-Gas solvent's MSDS for detailed information.
Explosion or Fire	Release of LP-Gas in the facility due to relief valves cracking or a leaking seal or fitting	The facility must have an appropriate hazardous exhaust system installed to ensure any LP-Gas release is exhausted from the space. All potential electrical ignition sources must be located at least three meters (10 feet) from the extractor. Additionally, all potential electrical ignition sources must be elevated at least 18 inches off the floor. The facility must provide adequate ventilation/exhaust as determined by the Engineer of Record in order to maintain the local atmosphere below 25% of the Lower Flammability Limit (LFL) for this application. Ancillary equipment should be located in another room. An alarming hydrocarbon detector shall be employed in the extraction area.



Terpenator Operating Schematic for Top Flood Passive Distillation



**NOTICE: ALWAYS OPERATE IN AN EXTREMELY WELL VENTILATED AREA
WITH NO IGNITION SOURCES**

1.0 DISTILLATION:

Cleaning Residual Contaminants From Solvents before use:

Only fill Butane Storage Tank up to half full. (25lbs in a 50lb tank or 15lbs in a 30lb tank)

For processes using Alkane refrigerants such as R-600(Butane), R-600A(Isobutane), or R-290(Propane), even 99.99% purity can still have 10,000 Parts Per Millionth contamination from other gases or longer chain molecule gases.

Injecting the refrigerant into the injection port, and recovering the “distilled” gas as normal, will leave any heavier residuals behind in the lower Terpenator collection pot, where they can be cleaned out with alcohol.

- 1.1 Put on personal protective equipment (PPE).
Anti-static clothing, eye protection, gloves, etc.
- 1.2 Turn on ignition-proof ventilation/exhaust and gas detection systems.
(Refer to Authorities Having Jurisdiction (AHJ) on setting up a properly ventilated room.)
- 1.3 Attach hoses and pressure gauge.
 - ¼” hose from Butane Supply Tank → Input Valve #4 on MK3
 - ⅜” hose from Recovery Valve #5 on MK3 → Filter Dryer → Vapor Valve on Recovery Tank
 - ¼” hose from Vacuum Valve #1 on MK3 → Vacuum Pump (usually a refrigerant charging hose, not a stainless steel braided hose)
 - Pressure gauge → connection without a valve on the 4-way cross on MK3
- 1.4 Inspect system to verify:
 - Clamps are installed and tightened properly
{Viton Gaskets~44 inch pounds; PTFE Gaskets~50 inch pounds}
 - Clamp joints are aligned properly
 - Hoses and fittings are properly connected and tightened. {Hand tighten first, then use two wrenches to secure, so as to not disturb any of the PTFE taped pipe thread connections.}
- 1.5 If this is the first time filling your tank follow these steps, if not then skip to 1.6
 - Open Liquid Valve on the Butane Storage Tank to release Nitrogen.
 - Attach Vacuum Pump to Liquid Valve on Butane Storage Tank with ¼” refrigerant charging hose.
 - Turn on Vacuum Pump and pull the tank down to a full vacuum.
 - Close Liquid Valve on the Butane Storage Tank.
 - Remove ¼” hose from Liquid Valve on the Butane Storage Tank and turn off Vacuum Pump.

- 1.6 Set the scale on a sturdy, level surface and turn it on.
- 1.7 Put Butane Recovery Tank into a reservoir and fill remaining area around tank with ice and cold water.
- 1.8 Place the MK3 in the MK3 water reservoir with a drain. Pour ice water on MK3.
- 1.9 A column is not needed during the distillation process, but may be used. Make sure the end cap connected to the hose is clamped on the extractor.
- 1.10 Open all valves on MK3.
- 1.11 Turn on Vacuum Pump and allow it to pull system down to full vacuum.
- 1.12 Close Vacuum Valve #1, and Input Valve #4.
- 1.13 Remove vacuum hose and turn off Vacuum Pump. (Always close valve and remove hose before turning off Vacuum Pump to prevent vacuum pump oil from being pulled up the hose.)
- 1.14 Put Butane Supply Tank in warm water on the scale and tare it (bring it to zero).
- 1.15 Slowly open valve on Butane Supply Tank.
- 1.16 Slowly open Vapor Valve on Butane Recovery Tank.
- 1.17 Pour ice water on MK3 into MK3 water reservoir to cool the collection pot.
- 1.18 Open Input Valve #4.
 - You will notice the scale losing weight as butane leaves the Butane Supply Tank.
 - For a 6x6 collection pot allow a MAXIMUM of 2lbs of butane to leave the Butane Supply Tank.
 - For a 6x12 collection pot allow a MAXIMUM of 4lbs of butane to leave the Butane Supply Tank.
- 1.19 Close Input Valve #4 when desired weight of butane has left the Supply Tank.
- 1.20 Drain cold water from MK3 water reservoir. Add warm water at approximately 100°F.
 - As the butane in the MK3 collection pot is heated it will create vapor pressure (refer to vapor pressure vs. temperature graph - Page 3) that will push it's way through the path of least resistance (towards the tank).
 - Warm butane vapor will push its way into the Recovery Tank adding pressure until contacting a cold surface and condensing into a cold liquid thus reducing pressure in that specific area allowing more vapor to move in.
- 1.21 Allow pressure in the MK3 to slowly drop down to or below 5 psig. Drain warm water from MK3 water reservoir.
 - Repeat steps 1.17 to 1.21 until you have enough liquid butane in the Recovery Tank.
- 1.22 Close valve on Butane Supply Tank.
- 1.23 Open Input Valve #4 to clear the hose.

- 1.24 Allow pressure in the MK3 to slowly drop down to or below 4 psig.
- 1.25 Close all valves.
- 1.26 Remove all hoses, and open Input Valve #4, then Dump valve #3 to equalize the pressure in the MK3.
 - **CAUTION: This will release any flammable gas left inside. This gas should be vented away and dispersed outdoors through the use of a hazardous exhaust/ventilation system.**
- 1.27 Wipe off any water from the lid assembly.
- 1.28 Disassemble MK3 and thoroughly clean the interior surfaces of the collection pot with alcohol.

2.0 SETUP

- 2.2 Record the weight of the storage tank and make sure there is at least 2lbs more butane in it than required to complete the extraction.
 - This is to ensure we have enough liquid butane for the extraction.

Stamped on the tank: TW = Tank Weight

Column Size	Lbs of Butane Required to Fill Column @4.2g/in ²	Lbs of Butane Required for Extraction
1.5x12	.38	.76
1.5x18	.57	1.14
1x5x24	.76	1.52
1.5x36	1.14	2.28
2x36	2.15	4.3
3x18	2.32	4.64

- 2.3 If there is an insufficient supply of butane for your extraction then refer to "Distillation".
- 2.4 Ball up 3-6 unbleached coffee filters and pack them inside one end of the column that is going to be used.
- 2.5 Then place a 150 mesh screen gasket and an end cap on the same end of the column and attach them with a clamp.
- 2.6 From the open end of the column, use a dowel rod to tamp the filters down against the screen gasket.
- 2.7 Using a funnel, if necessary, slowly pour material into the column and tamp it down with the dowel rod as you go.
- 2.8 Fill column within an inch of the top.
- 2.9 Then ball up 3 more unbleached coffee filters and put them in the top of the column followed by a 150 mesh screen gasket.

- 2.10 Place MK3 water reservoir with a large drain on the ground where the extraction will take place. Place a spacer in the bottom of the reservoir.
- 2.11 Place MK3 into the MK3 water reservoir, on top of the spacer.
- 2.12 Place the Storage Tank in a separate water reservoir, fill the remainder of the reservoir with ice then water, and carefully place the tank reservoir on the scale. Place a similar sized water reservoir next to it with warm water to move the tank and scale to when vapor pressure is needed to push liquid out of the tank towards the material column.
- 2.13 Turn column over and clamp open end to the MK3 below Input Valve #4.
- 2.14 Remove end cap from what is now the top of the column and replace it with the component with Input Valve #4 and clamp the end cap with hose on top of it.
- 2.15 Attach hoses (with two wrenches) and pressure gauge:
 - $\frac{1}{4}$ " hose from Liquid valve on Recovery Tank → Input Valve #4 on MK3
 - $\frac{3}{8}$ " hose from Recovery Valve #5 on MK3 → Filter Dryer → Vapor Valve on Recovery Tank
 - $\frac{1}{4}$ " hose from Vacuum Valve #1 on MK3 → Vacuum Pump (usually a refrigerant charging hose, not a stainless steel braided hose)
 - Pressure gauge → connection without a valve on 4-way cross on MK3

3.0 PROCESSING

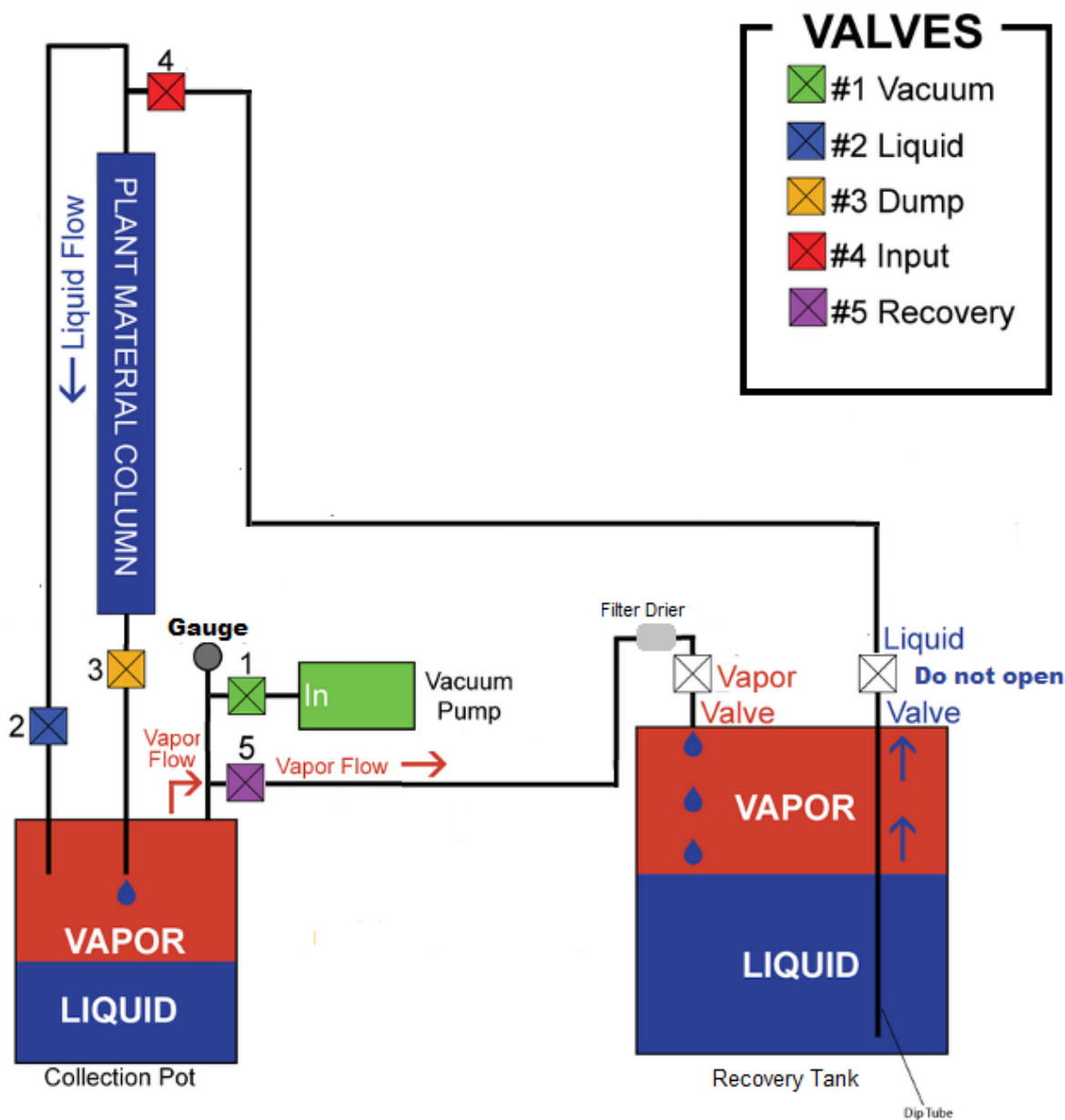
- 3.2 Turn on hazardous ventilation/exhaust system and put on personal protection equipment (PPE). {Refer to Authorities Having Jurisdiction (AHJ) for setting up a properly ventilated room.
- 3.3 Open all valves on MK3.
 - Keep valves on Butane tank closed.
- 3.4 Turn on Vacuum pump and allow it to pump the system down to full vacuum.
 - Value is dependent on your altitude. E.g. Denver \approx 25inHg San Diego \approx 29inHg
 - Double Check by closing vacuum valve on machine to listen for a pitch change on the vacuum pump.
- 3.5 Close Input Valve #4 and Vacuum Valve #1.
- 3.6 Remove vacuum hose from the MK3, then turn off the vacuum pump.
- 3.7 Close Recovery Valve #5.
- 3.8 Open liquid valve on the Butane Storage Tank.
- 3.9 Turn on scale and tare it to zero. Pour ice and water over MK 3 into reservoir.
- 3.10 Open Input Valve #4.
 - You will notice the scale reading decreasing as butane flows into the column.

- If the reading on the scale is not decreasing, close the valve on the tank and take note of the weight lost. Move the scale and tank to warm water reservoir to create vapor pressure in the tank to force the liquid out while monitoring the weight change of the tank.
- 3.11 When the scale reads twice the weight of butane required to fill the column from the scale (E.g. 1LB fill weight = 2LB flood weight), close Input Valve #4. (If applicable, move storage tank back to ice water reservoir)
- 3.12 Drain ice and water from MK3 water reservoir and fill it with warm water. Open Recovery Valve #5. Open Vapor Valve on the Recovery Tank and leave it open until step 3.19.
- Maintain water bath temp of approximately 100°F and ice packed around the recovery tank.
- 3.13 Allow pressure in the MK3 to drop down to or below 5psig. Close Recovery Valve #5 and drain warm water from MK3 water reservoir.
- Repeat steps 3.9 through 3.13 as many fills of the column as you would like. 4 fills of the column is recommended.(E.g. 1LB fill weight=4LB flood weight)
- 3.14 Close the liquid valve on the butane tank.
- 3.15 Slowly open Input Valve #4. Fill MK3 water reservoir with warm water and open Recovery Valve #5.
- Allows butane in the hose to be recovered.
- 3.16 Close Dump Valve #3, warm water should now be applied to the material column to assist in vaporizing any liquid trapped in the column and be directed through the #2 Liquid Valve.
- 3.17 Allow pressure to drop down to or below 4 psig. Close Recovery Valve #5.
- 3.18 Close all valves on MK3.
- 3.19 Close vapor valve on butane tank.
- 3.20 Drain water from MK3 water reservoir.
- 3.21 Disconnect all hoses.
- 3.22 Slowly open Input Valve #4, then Liquid Valve #2, to equalize the pressure in the column and the collection pot.
- **CAUTION: This will release any flammable gas left inside. This gas should be vented away and dispersed outdoors through the use of a hazardous exhaust/ventilation system.**
- 3.23 Remove the end cap and Input #4 from the top of the column.
- 3.24 Remove the column from the MK3.
- Be sure to grab the screen gaskets when removing column from the MK3 to prevent any material from falling out of it and into the dump valve.
 - Caution: material may contain small amounts of butane vapor. This should be completed in your ventilated extraction room.

- 3.25 Attach the end cap with hose to the lid assembly for easier transport.
- 3.26 Wipe off any water from the lid assembly.
- 3.27 Remove the lid assembly and place it to the side or on the next recovery pot to be used.

3.28 Dry off the outside of recovery pot and take it to the purging area.

Terpenator Operating Schematic for Top Flood Passive Extraction



NOTICE: ALWAYS OPERATE IN AN EXTREMELY WELL VENTILATED AREA WITH NO IGNITION SOURCES.

SCRAPING

- 4.0 Remove the clamp from the bottom of the recovery pot and dry remaining water that was under the clamp.
- 4.1 Carefully separate the sides and gasket from the bottom plate.
 - Lift slowly and in a circular motion so that the extract stuck to the sides and gasket fall inward onto the bottom end cap.
- 4.2 Place collection pot and seal upside down out of the way.
- 4.3 Use scraper to remove extract from bottom plate.
- 4.4 Scrape the extract off the gasket and put it on a separate piece of parchment.
 - This is done to minimize the possibility of nucleation when making shatter because the scrapings are agitated more.
- 4.5 Scrape extract from sides of the collection pot using small scraping blades.
 - Combine with what was cleaned off the gasket.

5.0 CLEAN UP Remove Butane Storage Tank from ice bath and place caps on valves.

- Store Butane Storage Tank in a cool, dark, safe, and ventilated area.
- 5.2 Use alcohol and micro-fiber towels to thoroughly clean the lid, sides, gasket, and bottom plate of the collection pot.
- 5.3 Empty packed dry material column.
 - **USE CAUTION.** Flammable Vapors may be present if not completely evacuated.
 - Connect the Column Ejector to compressed air or nitrogen, then to one end of the column to eject spent material. Locate column in a safe area. Open compressed air source and open column ejector valve to force material out of the column.