Distiller Operating Instructions

May 20, 2016
A. Initial setup
   a. Fill outside jacket with water through brass hose connection on the bottom of the distiller vessel until you see water near the top of the sight glass tube that extends from the middle of the system to the top. Be sure to close ball valve after filling.

B. Operating Methods
   a. Method 1 – Distiller Percolation
      For this method the solvent is evaporated, condensed, and then dripped over the raw material in order to collect the oils.
      i. Diagram

      ![Diagram of distiller setup]

      ii. Setup
         1. Place raw material into baskets that are lined with a cloth bag.
         2. Fill the bottom of distiller vessel with alcohol close to but not past the bottom of the lower material basket.
         3. Place the gasket on the top flange and using the boom arm lower the flat head onto the system making sure that the condenser sits over top of the material baskets.
         4. Loosely tighten the screws on the outside of the head. Repeat tightening to hand tight.
         5. Hook chiller outlet to the shortest tube coming out of the condenser head on the top of the system.
         6. Hook chiller inlet to the middle tube coming out of the condenser head on the top of the system.
7. If pulling a vacuum on the system hook vacuum pump up to the tallest tube coming out of the condenser head on the top of the system. If not pulling a vacuum, cap this port. (A vacuum on the system will lower the boiling point of your alcohol.)

iii. Running

1. Turn heaters on to a temperature which will boil your alcohol (temperature based on pressure and specific alcohol used) 110F is normally a good starting point.
2. Turn on chiller and set between 60 and 65F.
3. Turn on vacuum pump (if applicable).
4. The alcohol in the system will evaporate and rise to the top of the distiller where it will collect on the cool condenser and eventually drip over the raw material to collect the oil.
5. After the required amount of time, all the oil will be removed from the raw material and the process can be stopped and the material baskets removed.
6. After the material is removed, Method 2 is normally used to recover most of the alcohol.

b. Method 2 – Distillation/Concentration

This method is usually used to collect most of the solvent and concentrate the amount of oil in the remaining solvent.

i. Diagram
ii. Setup
1. Attach the funnel and tubing inside the distiller as shown in the photo above.
2. Attach the Carboy using the flexible tubing the distiller and then attach the vacuum pump to the other carboy port.
3. Place the gasket on the top flange and using the boom arm lower the flat head onto the system making sure that the condenser sits over top of the material baskets.
4. Loosely tighten the screws on the outside of the head. Repeat tightening to hand tight.
5. Hook chiller outlet to the shortest tube coming out of the condenser head on the top of the system.
6. Hook chiller inlet to the middle tube coming out of the condenser head on the top of the system.
7. Cap the tallest tube coming out of the condenser head on the top of the system.

iii. Running
1. Turn heaters on to a temperature which will boil your alcohol (temperature based on pressure and specific alcohol used) 110F is normally a good starting point.
2. Turn on chiller and set between 60 and 65F.
3. Turn on vacuum pump (if applicable).
4. The alcohol in the system will evaporate and rise to the top of the distiller where it will collect on the cool condenser and eventually drip down into the funnel and collect in the carboy.
5. After most of the now clean alcohol is recovered stop the system (DO NOT recover all of the alcohol as this will make it hard to get the oil out of the distiller.)
6. Open the Valve on the bottom of the system to collect the remaining alcohol with oil still saturated in it.
c. Method 3 – Agitated Extraction
For this method the raw material is immersed in the solvent and a stir motor agitates
the raw material and solvent to remove oil. (NOTE: stir motor and agitator not included
with system but can be purchased)

i. Diagram

![Diagram of Method 3](image)

ii. Setup
1. Place large material basket into the distiller.
2. Insert a cloth bag into basket to hold material and use the bag stand to
   keep the bag from falling in on itself.
3. Place material in basket.
4. Fill the system with alcohol to the top of the raw material.
5. Place the gasket on the top flange and using the boom arm lower the
   flat head onto the system making sure that the condenser sits over top
   of the material baskets.
6. Loosely tighten the screws on the outside of the head. Repeat
tightening to hand tight.

iii. Running
1. Heaters are not needed for this method but can be turned on low to
   help increase alcohols solvency. NOTE: do not raise temperature above
   alcohols boiling point
2. Turn on stir motor
3. Allow system to agitate material for a certain amount of time
4. When extraction is done, empty and collect the alcohol out of the valve on the bottom of the distiller
5. Remove raw material
6. Method 2 can be used to concentrate collected alcohol
d. Method 4 – Vacuum Steam Distillation
   For this method steam is used to collect lighter oils from the raw material.
   i. Diagram

   ![Diagram of distillation setup]

   ii. Setup
   1. Place large material basket into the distiller.
   2. Insert a cloth bag into basket to hold material and use the bag stand to keep the bag from falling in on itself.
   3. Place material in basket.
   4. Fill bottom of distiller with water close to but not past the bottom of the bottom material basket.
   5. Place the gasket on the top flange and using the boom arm lower the conical head onto the system.
   6. Loosely tighten the screws on the outside of the head. Repeat tightening to hand tight.
   7. Attach the stainless steel tubing as shown in the picture above to the top of the conical head.
   8. Hook chiller outlet to the bottom of the condenser.
   9. Hook chiller inlet to the top of the condenser.
10. Use the flexible tubing to hook the carboy up to the bottom of the condenser.
11. Attach the vacuum pump to the other carboy port

iii. Running
1. Turn heaters on to a 90F
2. Turn on chiller and set between 60 and 65F.
3. Turn on vacuum pump.
4. The water in the system will evaporate and rise collecting oil on the way up. It is then forced out the conical head down the attached tubing to the condenser.
5. After the required amount of time, all the oil will be removed from the raw material and the process can be stopped and the material baskets removed

C. Cleaning and Maintenance

<table>
<thead>
<tr>
<th>Every Run</th>
<th>Wash down/clean inside of distiller vessels and baskets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a Week</td>
<td>Check liquid level in chiller and water jacket</td>
</tr>
<tr>
<td></td>
<td>Check vacuum pump oil level</td>
</tr>
<tr>
<td></td>
<td>Pull and hold vacuum for 4 hrs to verify no leaks</td>
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<tr>
<td></td>
<td>Check/clean air filter for chiller</td>
</tr>
<tr>
<td>Once a Month</td>
<td>Pull and hold vacuum for 24 hrs to verify no leaks</td>
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<tr>
<td></td>
<td>Replace water in water jacket</td>
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