

Pyroligneous Acid from Tree Bark



Approximately 30 Kg. of mixed tree bark (80% U.S. Eastern Hemlock - Tsuga, 10% Spruce – Picea, and 10% Oak – Quercus) was placed in a 55 gallon drum setup for open burning method for making pyroligneous acid. Moisture content of the bark was approximately 30%.



On top of the tree bark a layer of thin dry maple scrap kindling was added.



Crumpled paper is placed on top of the kindling.



The cover and burning plate is then installed and fastened with a few sheet metal screws..



The drum is inverted. The air intake is near the crumpled paper which is now on the bottom.



Another 55 gallon drum is used as a condenser and is connected with the appropriate plumbing.
The condenser drum is wrapped with wet canvas for cooling.



The paper is ignited by using a small propane torch.



The plugs are removed from the top of the drum to vent the exhaust gases from the burning paper and kindling.



A small blower (old style hair dryer) is attached to the air intake to place a small positive pressure to the drum. This is connected by a piece of flexible steel corrugated tubing.



After the kindling is ignited, the plugs are replaced in the top of the burning drum.
The blower forces
the combustion gases into the condensing drum where pyroligneous acid and
tars
are condensed into a liquid.



Leaks in the plumbing are common and will eventually seal from the tar.
Repairing the leaks is difficult once the burning process is underway.



The combustion process in the drum can be occasionally checked by removing one of the plugs.
The presence of white or off-white smoke is an indication that the biomass is still under combustion.



Off-white feathery sublimate clogging the exhaust. This can be found in the entire length of the exhaust plumbing. A sample was saved for analysis.



The combustion/pyrolysis process is nearing completion when blue smoke is found to issue from the drum when one of the plugs is removed. This cannot be determined from the color of the exhaust gases.



The end of the process can also be determined by the glowing charcoal in the drum.



When it has been determined that the pyrolysis has been completed, the plumbing is disconnected. The condensing drum still contains a large quantity of uncondensed gases and vapors which makes it an unreliable indicator of when the process is done. Carrying the process any further increases the possibility that valuable components could be volatilized and lost.



The pyroligneous liquor is drained in increments from the condensing drum. The liquid is of a yellow-green color and contains a large quantity of clumped tars. The approximate yield of pyroligneous acid was about 2 liters.

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