The Distillation of Essential Oils

Distillation Process

Plant material is placed in a retort (distillation vessel), usually of stainless steel.
Heat is applied, either to water in the retort, or as pressurized steam.
Steam passes through plant material, causing the essential oil containing glands to rupture.
The essential oils are released into the steam as vapor.
The vaporous mixture of water and essential oil rises into a tube at the top of the still, then descends through a cooling coil. The vapor condenses in the coil, and is collected in a vessel.
The distillate (hydrosol) is a mixture of water, water soluble compounds and essential oil. These separate due to their different specific gravities. Essential oils usually rise, since they are lighter than water. In some cases, such as vetiver, the oil is denser than water, and will sink; other oils, such as cinnamon leaf, have differing densities, so part sinks and part rises.

Heat from the distillation process can change the plant's natural constituents, and may even manufacture valuable new components, such as the powerful anti-inflammatory chamazulene from chamomile.

Distillation times must be adjusted to the particular material being distilled, as well as to the particular still
being used. The goal of distillation is to extract the maximum amount of essential oil, with the widest spectrum of the plant's constituents.

Distillation of essential oils is one of the best extracting methods, since the only substance coming into contact with the plant is water and steam; these oils are free of contamination found in other methods such as absolutes (solvent extractions).

Water Distillation (Hydro-distillation)

Plant material is in direct contact with water.
Used for flower petals such as rose and neroli, so they can float and not coagulate into masses (as happens when petals are steam distilled). Also used for distilling powdered plant materials as a "soup."

Plant material must be properly prepared before distillation so that it releases its essential oils into the steam. Hydro-distillation often requires long distillation times.

Many water distillation systems incorporate cohobation: recycling the distillation water back to the retort. This prevents the plant material from becoming exposed to the full heat of distillation as the water level decreases from evaporation.

Water and Steam Distillation
Plant material is separated from water by a screen, and comes in contact with only steam, which is generated from the water within the retort. Prevents overheating or drying of the plant material.

Preparation of plant material is more important that hydro-distillation, since steam will only come in contact with material as it is rising; plant material must be spread uniformly and not overpacked.

Water and steam distillation is considered a better method than water distillation in many cases; it decomposes the plant material less, requires less fuel, less time, and yields higher volumes of oil with a low rate of vaporization.

Steam Distillation
The most common distillation method for producing most essential oils. Preferred method for oils with a high boiling range.

Steam is generated from a boiler, and pumped into the retort either at or above atmospheric pressure.

Preparation of plant material is also crucial, as is wetness of steam. Superheated steam can dry the plant material, while saturated steam can produce coagulation of plant material.

Hydrodiffusion
Steam is produced above the plant material, rather than below, and forced downward. The oils are richer, denser, and often superior quality. Distillation time is shortened. Not as widely available.