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AUTOMATION AND CONTROL OF VEGETABLE OIL DEODORIZATION PROCESS

Usmonov A.U.
Candidate of technical sciences, docent, Bukhara engineering technological institute
Afakov A.T.
Master`s student, Bukhara engineering technological institute

Abstract: In deodorization devices used in industry, the process of expelling odorous substances is carried out in a thick layer, film, or first in a film and then in a thick layer. Deodorization is carried out periodically, semi-continuously or continuously. In periodic deodorizers, the layer of oil on the battery is large, and the contact with the oil depends on the speed or pressure of the deodorizer. But the speed of the feed is limited, if it is given to a high speed, the loss of oil that gets mixed with the deodorizer will increase.

Key words: Deodorization process, temperature, residual pressure, devices, steam-ejector vacuum pump.

Introduction: The quality of oils intended for consumption depends on the complete and perfect deodorization process. Therefore, deodorization is one of the main processes in oil purification. The purpose of deodorizing oils is to remove odors and flavors from oils. These substances dissolve well in oils, and have high molecular mass and low pressure. The pressures of volatile substances are close to those of fatty acids. Due to the small amount of volatile substances and free fatty acids and low pressure, their solutions are considered ideal solutions and their phase obeys Dalton's law. An important indicator of deodorization is the exposure and deodorization time. These factors, in turn, depend on the pressure in the deodorizer, the amount of oil being deodorized, and the initial and final concentrations of odorants. The open device is fed through a barbattery, mixer and other distribution devices. This ensures intensive mixing of the liquid and reduces overheating. It forms an oily foamy mixture with the expelled oil in the form of small bubbles. Therefore, odorous substances diffuse from the oil droplet to its surface and mix with water. As a result, the deodorization process becomes faster and easier. In many deodorizers, the process of removing odorous substances is carried out in a film layer. In deodorization, the boiling temperature of odorants and the consumption of light are reduced by reducing the pressure. A deep vacuum allows crushing the bubbles that pop out; in which the volume of the bubble expands with the increase of the working surface. As a result, the correlation coefficient increases. Vacuum significantly affects the duration of deodorization, the quality of oil, and the consumption of oil. Another factor that affects the quality of the finished product is the deodorization process and the design of the device. There is a separate optimal deodorization temperature for each type of oil and fat. This depends on the composition of the fragrance. Coconut, palm kernel, and similar oils, which contain low molecular weight odorants, have a lower boiling point than sunflower oil, salomas, and other oils.

In continuous deodorizers, since oil contact occurs in thin layers, plates, plates, it is easy to achieve balance between liquid phases and thus to produce the same product.

In order to obtain high-quality deodorized oil, in addition to the general requirements (high temperature, deep vacuum), the following requirements must be observed:

1) during deodorization, it is necessary to hold the oil at a high temperature for as short a time as possible;

2) oils must be deaerated before deodorization;

3) oils should be kept from contact with moist air when heating, during deodorization, and during cooling;

4) after the deodorization is completed, if the equipment is stopped, oil should be removed from them and all parts should be washed and cleaned.

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Various deodorizers are used to deodorize oils:

1. Periodic (continuous) deodorizers.

2. Deodorizers that work continuously (A1-MND, De-Smet, “Alfa-Laval”).

In the periodic deodorization process, the temperature is 170-210 ^{0}C, and in the continuous process it is up to 230 ^{0}C. The residual pressure in the devices is equal to 5 mm of mercury column. Multistage ejectors (steam-ejector vacuum pump) are used to create a vacuum.

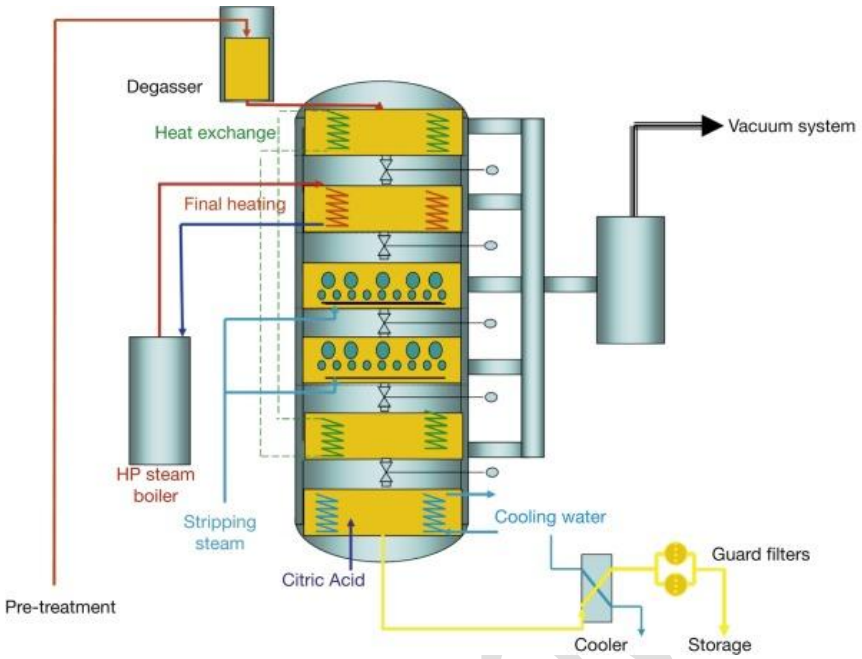

Figure 2. Vegetable oil deodorization process

The essence of the action of the steam ejector is that the speed of the jet coming out of the nozzle reaches 1000 m/c. Such a high speed takes with it the gases in the chamber and enters the condenser and condenses. From the deodorizer comes fresh and gas to the chamber.

Deodorizers must be insulated to prevent the odorants from condensing and returning to the deodorized oil. In order to reduce the oxidation of oils, it is initially deaerated at a low temperature. To increase the stability of deodorized oil, antioxidants or synergists, mainly citric acid, are added to it. They reduce the activity of metals and prevent them from oxidizing like a catalyst. In some cases, it is observed that the smell and taste reappear in the oil. If the deodorization process is carried out in full compliance with the technological regime, the smell and taste will not reappear. Deodorized oil has perfect organoleptic indicators when all conditions are correct. According to experience, if the amount of stearic acid in deodorized oil is up to 0.02%, then the oil is considered deodorized. The standards of losses and wastes in oil enterprises are determined and approved by higher organizations. They are taken into account depending on the devices, technological scheme and mode of operation. Oils and fats are the main raw materials that need to be regulated in refineries. Auxiliary materials include alkali, citric acid, bleaching earth, sulfuric acid, etc. The rate of consumption of raw materials is determined in kilograms depending on the unit of product and the ton of refined oil. Technological losses and wastes arise from the production process and are directly related to it. Organizational waste and losses are independent of technological processes.

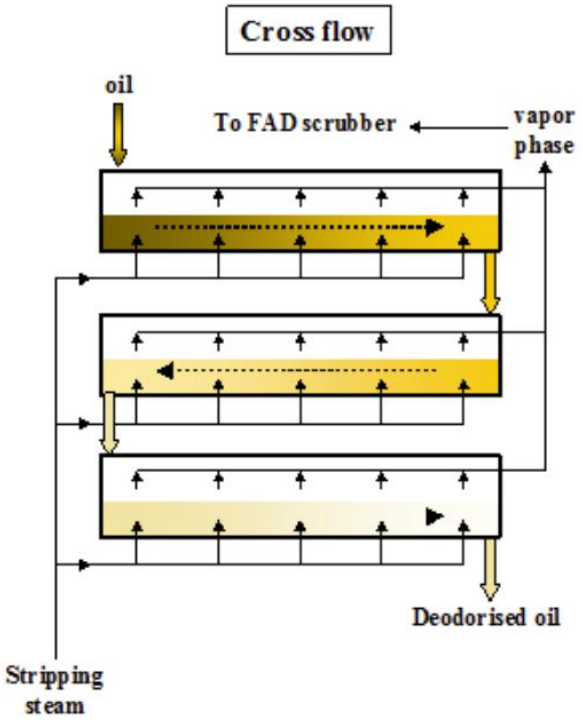

Figure 2. Principle of countercurrent and cross flow stripping.

Since the amount of individual volatiles and free fatty acids in oils is not exact, the liquid phase (oil) is assumed to consist of two components, i.e., triglyceride and free stearic acid. Therefore, the deodorization process is controlled by the reduction of stearic acid. They occur due to incomplete use of returnable waste, loss in storage and transportation of raw materials, natural losses. The standard consumption of raw materials does not include unfit products, as well as deviations from the technological regime, natural losses exceeding the norm, losses and wastes caused by the failure of technological equipment. The part of the raw material that cannot be returned to the production process in the refinery is waste. Losses include residual loss on filter cloths, equipment adhesion, soil spillage, water and bleaching soil, and oil from pods from deodorization and drying. Determining the amount of oil waste at each stage of refining. Hydration. The calculation is based on the amount of phosphatides in hydrated and unrefined oil. Deodorization is one of the methods of driving (distillation) of liquids. The deodorization process consists of three stages: transfer of odorous substances from the liquid layer to the evaporation layer; evaporation of odorous substances; loss of vaporized substance molecules from the evaporation layer. Volatile substances are composed of a complex complex of substances with different composition in terms of quality and quantity. They have more vapor elasticity compared to triglycerides, that is, they create volatility.

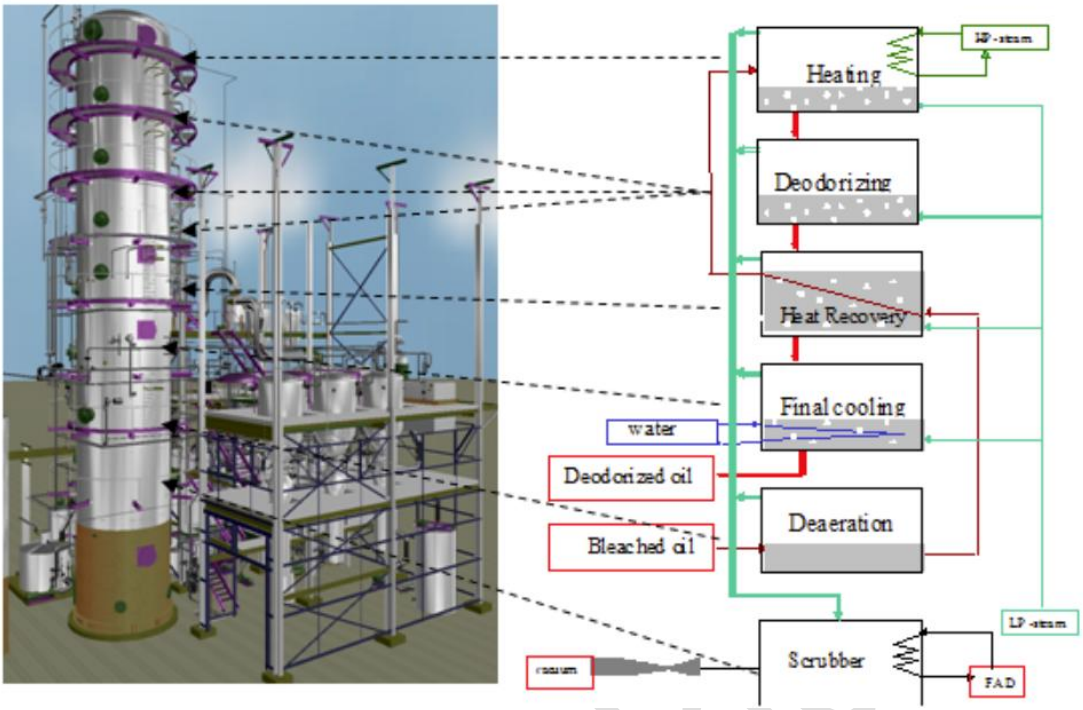

Figure 3. Schematic presentation of the different stages of the deodorizing process.

The amount of waste in refining depends on the type of oil and oil, its quality, intended use, quality, refining method and process mode. Waste and losses also depend on whether or not the oil is hydrated. The effectiveness of deodorization depends on the composition, volatility and process temperature of the odorants. As the temperature rises, the volatility of odorous substances and the tension of vapors increase. If the temperature is too high, this will lead to polymerization and oxidation of oils. If the temperature exceeds 250 C, thermal decomposition of oils increases and loss of oils increases. In order to lower the temperature when driving aromatic substances, the deodorization process is carried out under vacuum, under the influence of open steam. Deodorization is the last stage of the refining process, and it is carried out in order to remove the unpleasant smell and taste of the oil. Toxic substances are also lost during deodorization.

Conclusion: The deodorization process can be carried out in batch, continuous, or semicontinuous installations. Batch deodorizers have one single compartment in which the process steps of deaeration, heating, stripping, and cooling are sequential in time. In continuous deodorizers, the process steps are simultaneous in different compartments (trays) of the deodorizer, and both input and output are constant over time. In semicontinuous deodorizers, the process steps are simultaneous in the different trays, but tray filling and emptying is discontinuous. Filling stops after a certain level has been reached in the first tray. After allowing sufficient time to perform the process step for that tray, the bottom valve is opened and the content drops into the next tray for the next process step.

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