Continuous Deodorization—Two Years Later

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1. INTRODUCTION

Two years ago we had the pleasure of presenting to the American Oil Chemists’ Society a description of the process of continuous deodorization of edible oils, which was developed over a period of several years, and was represented at that time (in 1938) by the successful operation of one 5000 lb. per hour capacity unit and one 1200 lb. per hour unit shown in Figure No. 1.

Developments since that time have confirmed the economies and practicability of the continuous deodorization process, and the very marked saving in steam, fuel and condensing water requirements reflected in lower operating cost as compared to the usual batch method of handling.

2. OPERATION CYCLE OF CONTINUOUS DEODORIZATION VERSUS BATCH DEODORIZATION

Primarily, the process of deodorization consists of distilling out of the oil various volatile constituents which are undesirable, including residual free-fatty acids.

The release of volatile matter from the non-volatile glycerides is accomplished in continuous deodorization, just as in batch deodorization, by the combined application of heat and vacuum together with the introduction of injection steam, which, as in other distilling operations, reduces the partial pressure of the volatile materials, allowing them to vaporize more freely.

Batch Operation—In batch deodorization this injection steam also serves as a method of agitation of the oil. The undeodorized oil is placed in a vessel under vacuum and is heated by steam. Dowtherm vapor, or other means, through closed coils in the deodorizer, and when a certain minimum temperature is reached injection steam is introduced over the remaining period of the deodorizing cycle to agitate and help distill out the volatile material. The finished deodorized oil is then cooled before allowing it to come in contact with air.

Continuous Operation—Continuous deodorization involves in general the same cycle of operations. In the first continuous installation the oil was partially heated before being subjected to the high vacuum, and although the stripping of volatile materials was satisfactorily accomplished and a good commercial product obtained, certain advantages were indicated in the process of placing the oil under high vacuum before and during the heating operation. This arrangement is incorporated in the latest installations.

Deodorization is accomplished in the continuous unit with only a portion of the injection steam required for batch operation because of the progressive and counter-current contacting of the oil with the stripping steam. The heated oil passes successively downward over a series of contacting trays. The stripping steam enters at the bottom tray, so that the pure deodorized oil is contacted only by the incoming pure injection steam, free of volatiles and fatty acids.

The contact tray consists of a series of nozzles through which the steam flows upward; each nozzle being fitted with a cap slotted at the lower edge, which directs the steam downward inside the cap and sidewise through it, where it then bubbles through the relatively shallow layer of oil. These caps and trays are illustrated in Figure No. 2.

This method of steam and oil distribution gives very intimate contact and is much more efficient than steam blowing upward through a 7 or 8 foot depth of oil,—as is customary under batch operation.

The oil on the first or top tray flows across the tray...
while it is being contacted by the up-flowing steam and then passes downward to the second lower tray, where this steam contacting operation is repeated. The same procedure is followed on downward through the successive trays installed in the deodorizing tower.

To illustrate the relative efficiency of this use of stripping steam:—

If there are ten (10) trays in the deodorizing tower, the up-flowing steam has ten times the chance to contact intimately the oil that it would have in the case of batch operation,—where it flows through only once. Therefore, the steam leaving the continuous deodorizer is more closely saturated with the volatile impurities that are being removed.