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(54) A process for deodorizing oils and fats.

(57) A process for deodorizing oils and fats based on subjecting the products to be deodorized to a current of an inert gas, preferably nitrogen, under vacuum conditions in a pressure range from 1 to 8 mbars and at a temperature between 60ºC and 270ºC.

This process, when compared to the conventional methods using steam currents, results in less power and water consumption, does not contaminate the environment and facilitates the recovery of byproducts.

A PROCESS FOR DEODORIZING OILS AND FATS

The invention relates to a process for deodorizing oils and fats. In this description, the word "oil" has a wide meaning and includes any fatty liquids of vegetal or animal origin.

The deodorizing stage is one of the most important in the process of refining oils, because it has the greatest impact on the quality of the oil or fat substance being refined and it gives the products the desired organoleptic characteristics. Since deodorizing is part of the refining process, it is proper to refer to said process in this description.

The oils are natural products of vegetal origin (seeds and oily fruits) or animal origin (fatty tissues, organs, etc.) that present a complex nature.

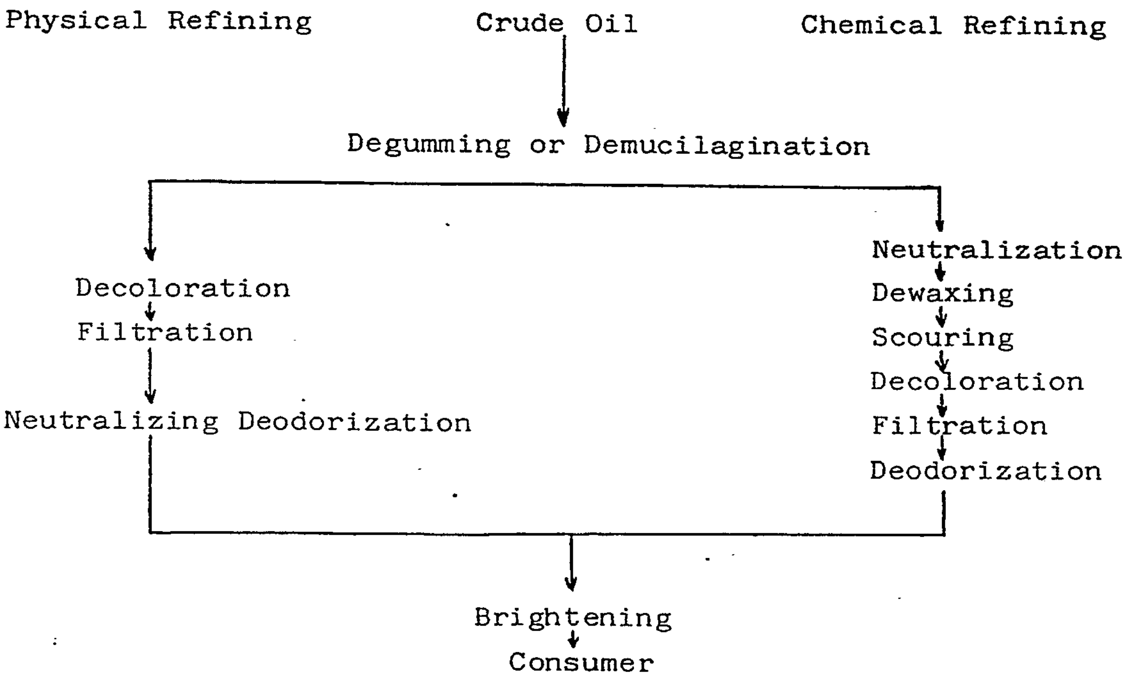
Practically all the oils are formed by glycerides, that is, glycerine esters with fatty acids (acids with a straight chain and between 12 and 24 carbon atoms, except for a few cases). Because the esterification is a reversible reaction, the oils contain not only triglycerides but also mono- and diglycerides formed by the action of certain enzymes, oxidizing processes, etc. that produce the hydrolysis of these triglycerides. This results in the formation of mono- and diglycerides, as well as free fatty acids.

In addition to these mono- and diglycerides, which are detrimental due to their emulsifying properties which negatively affect the processes to be described later, the oils contain a number of other components. Some of these components, such as the tocoferols, sterols, carotenes, etc., due to their antioxidizing, provitaminic, etc., properties, are beneficial while others, such as the free fatty acids, phospholipids, trace metals, humidity, etc., are harmful and must be eliminated.

In view of the foregoing, all oils and fats whether of vegetal or animal origin (except for the virgin oils), must undergo a series of prior treatments in order to be used in food or in industry. The process that includes all these treatments necessary for the separation of the harmful substances is called refining.

Refining is a necessary process in order to reduce to a minimum all the oil contaminants which adversely affect its final quality and negatively impact on the efficiency of the operations - some of them necessary - of fractioning, transesterification and hydrogenation. The refining also makes the oil capable of being used as a food or for other industrial applications.

The refining process can be accomplished by a number of systems, although most of them are no longer in use. Practically, only the so-called traditional or chemical refining and the physical refining processes are used. Hereinafter there is a schematic diagram identifying the differences between both types.



In the case of certain oils and fats, it is desirable to introduce other stages in the process, such as hydrogenation, fractioning, etc., depending on the nature of the oil.

With reference to chemical refining, it is important to point out that in the stage of degumming the oils it is possible to separate the following substances: phospholipids, proteins, trace metals, some pigments, carbohydrates, etc. The separation is usually accomplished in an acid medium, because it produces a more complete and rapid precipitation than performing the degumming operation with water.

The main purpose of neutralization is to separate the free fatty acids naturally present in the crude oils. There are various neutralization systems, although the most commonly used are the neutralization with caustic alkalies and the neutralizing distillation.

The object of scouring is to remove the traces of soap that might have dissolved in the oil. It allows the separation of all alkaline substances (excess soaps and caustic soda) present in the oil, as well as trace metals, phospholipids and other impurities. The water used for scouring should be at a temperature of approximately 90ºC and is used in a ratio that varies from 10 to 15%.

Once the oil is scoured, it is necessary to dry it in order to eliminate any residual humidity. This humidity could adversely affect the subsequent decoloration process because it deactivates the decoloring agents, such as earths and activated carbons.

Most of the pigments are eliminated in the decoloration process through the adsorption on decoloring earths or activated carbon.

The object of the deodorization stage is to eliminate the substances that give bad odor and taste to the oils. Some of these substances have been identified as ketones, aldehydes, carbohydrates, terpenes, alcohols of very different molecular weight and volatility (most of them come from the oxidation and degradation of the fatty acids), etc.

Later, we will refer again to the conventional deodorization process.

Regarding the physical refining process, it is important to mention that the main difference between the traditional or chemical refining process and the physical refining process is that, in the former, the fatty acids are eliminated as soaps or pastes by means of an alkali during the neutralization stage, carrying with them other compounds or impurities such as phosphatides, trace metals, pigments, etc. and requiring less drastic decoloration conditions. In the physical refining process, however, the pretreatment stages prior to the neutralizing deodorization stage must be performed under more energetic conditions.

As indicated above, the process consists of the following stages: degumming, decoloration and neutralizing deodorization.

Owing to the fact that the oils must enter in the distillation apparatus free from any substance that is easily degradable with temperature, such as phosphatides, it is necessary to subject the oils to a prior demucilagination or degumming process.

This process is analogous to that performed during the traditional refining of the oils, with the exception that, in this case, it is a very long and energetic process in order to reduce the phospholipids content to a value of less than 0.2%.

The decoloration is performed in a similar manner as for chemical refining. The only difference is a greater consumption of decoloring earths due to the more energetic pretreatment required by the oil before undergoing the neutralizing deodorization process.

The physical refining process, in itself, consists of a distillation using steam to entrain the free fatty acids, as well as all those volatile substances that accompany oils and give them their typical odor and taste and to destroy the thermolabile pigments.

The oil, once degummed and decolored, passes to an aerator. The oil, previously heated, is then introduced in the deodorizer where it is subject to an injected countercurrent of steam and remains under vacuum conditions and at an approximate temperature of 275ºC.

It can be seen from the previous description that both refining processes include a deodorization stage, where the substances that give the oils bad odor and taste are removed.

In practice, the removal of these substances is accomplished by the action of a countercurrent of dry steam under vacuum conditions and at a high temperature. The deodorization is possible under these conditions due to the large volatility difference between the triglycerides and the substances that give the oils the odor and taste. The vapour pressure of these compounds is so extremely low that a very high temperature would be required in order to remove them under atmospheric pressure conditions. The deodorization is accomplished more efficiently by combining the vacuum with steam entrainment. When the steam current passes through the oil, the distillation starts when the sum of the partial pressures of the vapour and of the volatile compounds reaches the pressure that exists on the oil surface. This occurs at a temperature lower than without the steam.

In order to obtain the maximum efficiency of the deodorization process, the steam must be injected in the oil in such a manner that a large number of small bubbles are formed with a very large surface in relation to their weight. In experiments, it has been observed that the saturation of the steam bubbles is so fast that it can be considered as complete at absolute pressures of approximately 8 mbars.

There are losses incurred during the deodorization process. In addition to the weight loss caused by the removal of the small amounts of volatile products (less than 0.2%), there is a loss of triglycerides during this process because of the mechanical entrainment of the oil by the steam. The amount of oil entrained is a function of the velocity and density of the steam. The losses due to the hydrolysis of the oil by the steam are unavoidable.

In general, a deodorizing station consists of the following unit:

-Deodorizing device
-Oil heating system
-Vacuum system
-Steam generator for producing the necessary steam flow.
-Condenser for volatile products
-Oil coolers

There is a wide variety of deodorizing facilities, which may be classified as discontinuous, semicontinuous and continuous. No greater details thereof will be given here.

It should be noted that, during the deodorizing process, the oils undergo a partial decoloration due to the loss of color of certain pigments at high temperature. The degree of decoloration depends on the previous bleaching pretreatment and the nature of the oil.

It should also be pointed out that the oils lose the natural antioxidizers during their deodorization, which increase their tendency to become oxidized.

These known systems of deodorizing the oils by the use of steam present the following drawback:

-High energy consumption
-High water consumption
-Environmental contamination
-The byproducts may not be recovered economically.

The purpose of this invention is to provide an oil deodorization process that will eliminate the above mentioned drawbacks.

In this invention, the deodorization is achieved through a process characterized in that the oil to be deodorized is subjected to the action of an inert gas flow, preferably nitrogen, which will carry away the substances that impart bad odor and taste to the oil. The process takes place under vacuum conditions with pressures between 1 and 8 mbars, and at temperatures between 60ºC and 270ºC.

Preferably, the oil to be deodorized has been subjected to a prior degumming, decoloration, neutralization and/or deaeration process.

According to another preferred feature, the inert gas is dispersed within the oil being deodorized, which results in a very good diffusion or distribution of the nitrogen throughout the oil mass.

The optimum inert gas flow value is preferably between 0.8 and 3 Nm^3/hour per tonne of oil.

The process is also applicable to installations for continuous flow. In these cases, there is a continuous incoming volume of oil to be deodorized and, therefore, a continuously outgoing volume of deodorized oil. This creates a continuous oil flow inside the deodorizing facility; in this invention, the nitrogen gas should preferably flow in the opposite direction to the oil flow.

The following conclusions have been reached from the tests and experiments performed using the process which is the subject of this invention:

a) The quality of the oils deodorized using the process of this invention is not only similar to that of the oils obtained using the traditional method, but also these oils have the advantage that they do not have products originating from the hydrolisis of the glycerides or, furthermore, products resulting from oxidation, such as peroxides.

b) The stability of the deodorized oils using the process of this invention is superior to that of the products refined using the traditional method; the reason for this is due to the higher unsaponifiable compounds content in the oils that have been refined with nitrogen.

c) The utilization of nitrogen is particularly advisable in the refining of highly unsaturated oils, such as soy bean, sunflower, fish and other similar oils.

d) The process is applicable with utmost efficiency to the physical refining of oils (neutralizing deodorization stage).

e) The byproducts obtained with the process of this invention are of better quality than those obtained with the traditional method; besides larger amounts of such byproducts are obtained.

f) There is an important energy saving, as well as a lower water consumption.

g) When the process is used in conjuction with vacuum pumps to obtain an adequate vacuum, the pollution in the deodorizing process disappears.

Several examples of the process of this invention are shown below. These examples are not to be considered as limiting the applications of the invention.

EXAMPLE 1

The raw material was olive oil, neutralized with caustic soda and decolored with Gador C earth. Its content of unsaponifiable compounds was 1.24%.

The steam generated in a container by the heat of a hot plate is injected in a deodorizing flask.

Alternatively, the nitrogen from a pressurized vessel is used as the carrier fluid in this process, with the effective diffusion being regulated by a porous device and a flow control valve with its corresponding flowmeter.

A number of tests were performed to study the effect of the different parameters that have an influence on the deodorizing process: time, temperature, pressure and flow rate of the carrier fluid. It was decided to leave the flowrate and pressure of the carrier fluid constant and to combine the time and temperature parameters. A flow of 30 ml/min of nitrogen gas or steam was selected for the carrier fluid, which resulted in good stirring of the oil in the deodorizer and a pressure of 4 mbars. Once these conditions were fixed, tests were performed by varying the temperature between 180ºC and 270ºC and the time between 2 and 6 hours.

The control for the different tests was the amount of unsaponifiables in the oil and the organoleptic properties of the corresponding refined oils. Table I shows the average data for three such tests.

From the examination of this data it can be seen that the quality of the oils is similar in all cases, because no appreciable differences have been noted between them for most of the tests. What should be pointed out is that the content of unsaponifiable compounds is higher when nitrogen is used in place of steam. This is beneficial for the later stability of the oil. The purpose of using temperatures as high as 270ºC was to prove that the fatty acids did not undergo isomerization (which was verified by the spectrographs of the refined oils), so that the oils could undergo physical refining with this new system.

The amounts of impurities in the two oils to be tested were determined due to the poor quality of these oils. The following are the results:

	Crude 1	Crude 2
Petroleum ether impurities	0.79%	0.08%
Humidity	0.20%	0.10%

In view of the above results, the Crude 1 oil was purified prior to the tests due to its high content of impurities. Such treatment was not considered necessary for Crude 2.

The purification was accomplished heating the oil to 70ºC and adding to it a solution of 2/1000 of phosphoric acid and 4/1000 of water. The oil was stirred during 20 minutes and was then allowed to decant. The precipitate thus formed was then separated. A sample of the oil was taken and its acidity determined to proceed with the neutralization of both the free fatty acids and the residual mineral acid.

Once the acidity was known, the oil was heated again to 70ºC and the amount of 18º Bé caustic soda required to neutralize the acidity, plus an excess of 10% was added to the oil. The oil was then stirred during 20 minutes, the pastes were separated by decantation and the oil was scoured with hot water. These scouring operations were repeated until the wash waters did not show any alkaline reaction.

The oil once scoured and dried, was decolored with 0.5% of Gador C decoloring earth, heated to 80ºC, stirred during 10 minutes and filtered after this time had elapsed.

The oil was then subjected to the deodorizing process, with parallel tests performed using steam and nitrogen under the following conditions:

Conditions : Pressure 4 mbars; Temp.: 270ºC; Time: 3 h; and Flowrate: 30 ml/min.

TABLE II

		Crude 2	Deodor.1 steam	Deodor.2 steam	Deodor.1 nitrogen	Deodor.2 nitrogen
ACIDITY	6.86	6.59	0.05	0.08	0.08	0.05
K270	0.32	0.50	0.42	0.5	0.43	0.52
PEROXIDE N°	12.5	13.05	1	3.6	0	0
BELLIER N°	-	-	15	12.5	14.5	12.5
IODINE N°	78.4	78.6	78.7	79	78.6	78.9
REFRACT.Ind.	-	-	1.4680	1.4688	1.4682	1.4685
SAPONIF. N°	-	-	195.3	184.5	195.1	194.3
UNSAPONIFIABLES (HEXANE)	1.30	1.32	0.65	0.82	0.72	0.86
ACIDS:						
PALMITIC	14	13.3	7.9	6.1	7	7
PALMITOLEIC	1.4	1.2	1.4	1.2	1.4	1.2
MARGARIC	0.2	0.2	0.2	0.2	0.2	0.2
MARGAROLEIC	0.3	0.4	0.3	0.2	0.2	0.3
STEARIC	2.5	2.3	2.3	2.6	2.4	2.6
OLEIC	71	73.2	72.6	74.9	72.3	74.1
LINOLEIC	8	6.6	7	6.1	7.1	6.2
LINOLENIC	0.9	0.4	0.4	0.4	0.3	0.3
ARACHIDONIC	0.5	0.5	0.6	0.6	0.6	0.6
GADOLEIC	0.3	0.4	0.4	0.4	0.4	0.4
BEHENIC	0.1	0.1	0.1	0.1	0.1	0.1
LIGNOCERIC	0.8	0.8	0.3	0.4	0.7	0.4
POSITION:	1	0.9	3.1	3.1	3	3.9

The quality of the refined oils was as follows: Oil Nº 1 produced a refined product with acceptable almondlike organoleptic characteristics, both with steam and with nitrogen processes. Oil Nº 2 produced in both cases (with steam and with nitrogen) an acceptable refined product with a very slight taste reminiscent of "Pickled olive" oils.

The content of polar compounds was determined for the refined oils. It was observed that the percentages of altered triglycerides, dimers and oxidized compounds were lower than when nitrogen was used, except in the tests at 270ºC where there were similar percentages of altered triglycerides and dimers due to the high temperature. The amount of diglycerides was always lower when nitrogen was used.

TABLE III

Polar Compounds (%)	Crude 1	Crude 2	Deodor.1 Steam	Deodor.2 Steam	Deodor.1 N_2	Deodor.2 N_2
Triglycerides Dimers	0.3	0.1	2,4	3.4	1.3	1.4
Triglycerides Oxidized	1	1.5	0.9	1.6	0.6	0.8
Diglycerides	1.7	3.2	1.7	2	0.5	0.6
Free Fatty Acids	6.5	6.1	0.2	0.4	0.1	0.2
Total:	9.5	10.9	5.2	4	2.5	3

EXAMPLE 2

The method described for Example 1 was applied to a sunflower oil under the following conditions: Pressure: 4 mbars; Time: 3 hours; Steam or nitrogen flowrate: 30 ml/min.; Temperature: 180º and 220ºC.

All the tests produced refined oils with the quality and characteristics of refined seed oils.

EXAMPLE 3

Soy bean oil was used which, as the sunflower oil, is more sensitive to the refining conditions because of its higher content of unsaturated fats. The conditions were the same as for the previous example and the results were similar to those obtained with sunflower oil. The deodorised oil exhibited a significant decoloration.

EXAMPLE 4

Fish oil was used for the tests with animal fat oils because of two very important reasons: its special characteristics because it is a highly unsaturated oil and, therefore, very sensitive to the oxidation and isomerization agents, and also because of its recent significant importance in the preparation of dietetic products. This is due to its high PUFA (polyunsaturated fatty acids) content which are those that result in higher oil instability.

After a few prior tests, a fish oil was used that had the following characteristics:

TABLE IV

Acidity	3.6%
Phosphorus	172 ppm
Unsaponifiables	1.1%
Insoluble Ketones	1.2%
Impurities	0.05%
Humidity	0.2%
Sterols	9804 ppm

TABLE V

Fatty Acids Content				
(Only the most significant percentages are included)				
Acid	Crude	Purified	Decolored	Deodorized
14:0	6.9	7.1	6.8	6.4
16:0	17.4	17.3	17.2	18.3
16:1	9.4	9.5	9.4	5.8
18:0	2.6	2.8	3.1	4.7
18:1	11.0	11.1	11.4	15.9
20:4	1.2	1.1	1.0	0.6
20:5	20.8	20.1	19.0	18.4
22:5	1.7	1.2	2.3	1.6
22:6	6.3	6.1	5.6	4.2
PUFA	30.0	29.1	27.9	24.8

As it can be seen from the previous Table, the total PUFA (polyunsaturated fatty acids) content was significantly reduced when the process followed the described conditions. Therefore, after several tests trying to preserve the polyunsaturated acid content with negative results, it was decided to use an inert gas atmosphere. It was observed that, when the oil was processed in an inert gas atmosphere, nitrogen, its content of polyunsaturates was not affected. After several tests with positive results, the following conditions were selected as being optimum for the process:

-Purification:

The oil was heated to 35-40° C, with nitrogen gas flowing from the beginning of the test. Phosphoric acid was then added with stirring in a ratio of 2:1000. The stirring was maintained until the mixture reached a temperature of 60ºC. A 4% volume of an aqueous 5% sodium chloride solution was added and the stirring was suspended. A 6% volume of water was added, the solution was stirred and the oil was separated from the aqueous phase by decanting. All these operations were performed in a nitrogen atmosphere.

- Neutralization:

The oil was heated to 60ºC and a soda solution of 24º Bé was added in sufficient quantity (with a 20% excess) to neutralize the acidity of the oil plus the remaining mineral acidity from the phosphoric acid that was previously added.

The mixture was maintained with stirring under a nitrogen atmosphere at 60ºC during 30 minutes. After this time, the stirring was stopped and a 25% volume of hot water was added; the mixture was stirred again during 10 minutes. After this time, the stirring was stopped and the solution was allowed to rest until it could be properly decanted (usually from 15 to 20 minutes). The aqueous phase was then separated.

Care should be exercised to prevent the nitrogen gas injection from penetrating in the fatty phase; it should always remain above the surface of the oil because otherwise the nitrogen gas would become mixed with the pastes which would rise to the surface and make the separation very difficult.

-Scouring:

Since the soaps always constitute a poison for the decoloring earths and negatively affect the decoloration process, the neutralized oils were scoured in order to eliminate all traces of soap. A 25% volume of hot water was added and stirring took place during 10 minutes. The mixture was allowed to rest until it could be decanted and the scouring waters were removed. This operation was repeated until the water used in the scouring presented a neutral reaction.

-Decoloration:

Before the decoloration process, the oil was dried to eliminate any humidity remaining from the washing operations. For this purpose, the oil was heated to 60ºC, under vacuum and a flow of nitrogen gas. Once the oil was dry, 1.5% of decoloring earth (Gador Type C) was added, as well as 0.2% of activated carbon (Ceca Type AG). The oil was held 60ºC under stirring during 20 minutes and then filtered.

As indicated before, all the tests were performed in a nitrogen gas atmosphere, and the resulting oils had all the expected characteristics as can be seen from the following data. The data below corresponds to the average values obtained for the different tests performed:

Acidity	0.02%
Humidity	< 0.05%
Impurities	< 0.05%
Oxyacids	< 0.05%
Phosphorus	Negligible
Unsaponifiables	0.65%
Gardner Color	3 - 4

Fatty Acids Content				
Acid	Crude	Purified	Neutralized	Decolored
14:0	6.9	7.1	7.4	6.9
16:0	17.4	17.8	18.0	17.0
16:1	9.4	10.1	9.6	9.6
18:0	2.6	2.6	2.7	2.6
18:1	11.0	11.7	11.8	11.4
20:4	1.2	1.1	1.0	0.9
20:5	20.8	21.9	21.8	21.3
22:5	1.7	0.6	2.0	3.0
22:6	6.3	6.0	7.9	7.9
PUFA	30.0	29.6	32.7	33.1

None of the cases presented trans. isomerization.

The influence of the steam flow vs nitrogen gas flow in the different phases of the process was determined by studying the chromatograms corresponding to the fatty acid composition of the obtained oils and the presence of trans. isomers, the formation of which we had tried to avoid. From the data shown in the above table, it can be seen that when a nitrogen gas atmosphere was used, the fatty acids did not undergo any transformation - either oxidizing nor polymerizing - and the important acids were adequately protected. This is contrary to what normally occurs during the conventional refining process. The formation of peroxides was thus avoided in all the phases.

-Deodorization:

The oil, once decolored, had a very good appearance but it still had the characteristic smell of fish oils. To solve this problem, the oil was subjected to a gentle deodorization. Given the tendency of these oils to polymerize at high temperatures, and since this tendency is more marked in the most important fatty acids (eicosapentanoic and docosahexanoic), the conditions of time and temperature were studied with more attention. Temperature steps between 60ºC and 110ºC were evaluated (because higher temperatures would produce polymerization), and time intervals between 60 and 240 minutes. The control of the tests was based on the iodine numbers and the organoleptic characteristics. From the results thus obtained, the conclusion was reached that it was possible to achieve acceptable products, without eliminating the characteristic odor and taste of fish oils, by using temperatures between 80ºC and 90ºC and a time period of 2 hours. Polymers would appear if the conditions were more extreme.

EXAMPLE 5

2,880 Kg of "Lampante" olive oil, with 45º acidity, were refined; once neutralized and decolored, a total of sixteen batches were prepared of 160 Kg each. Eight batches were treated with steam in the industrial deodorizer of the Instituto de la Grasa de Sevilla (Seville Fat Institute) pilot plant; the other eight batches were treated with a similar deodorizing device with provisions to accept the injection of nitrogen gas. The same following conditions were used in all cases: Pressure: 3 mbars; Time: 3 hours; and Flowrate: 0.3 m^3/hour.

The tests were as follows:

N° of Tests	Steam	Nitrogen
1 test	180° C	180° C
3 tests	200° C	200° C
3 tests	220° C	220° C
1 test	240° C	240° C

In all the tests, except the one at 180ºC, the refined oils had the characteristic almondlike taste of refined olive oils of quite good quality, both for the steam and the nitrogen tests. In the tests at 180ºC it was noted for both cases (steam and nitrogen) that not enough deodorization time had been allowed. Another test was performed at this temperature but with a time period of 4 hours. This test produced a good quality refined oil.

EXAMPLE 6

Using the same conditions as for the previous example, a refinable olive oil of poor quality was deodorized. In this case, the refined oil thus obtained had a taste slighty reminiscent of its origin of piled fermented olive, whereby the process time was increased to 4 hours and the results were very good.

EXAMPLE 7

Using the same conditions as for Example 5 and degummed, neutralized and decolored sunflower oils, two tests were performed at 180ºC and 210ºC. Excellent results were obtained, with both steam and nitrogen.

Another series of tests was performed with sunflower oils, but only having been degummed and neutralized - not decolored. A deodorized oil of the same quality as the others was obtained. It was noted that it had lost its color.

The same results were obtained with soy bean oil except that, when the oil was deodorized without prior decoloration using a darker oil, the result was a deodorized oil with very good taste, color and odor.

EXAMPLE 8

The same equipment used for the previous tests was used for the physical refining tests, but in this case the vacuum was obtained with the CRYO-COND system of the firm Busch Ibérica. The ejector system was not utilized in any case.

Four olive oils were used in these tests, with crudes having the characteristics shown in the following Table VI.

All the oils were purified and decolored before being subjected to the deodorization-neutralization process. The working conditions were the following:
Pressure: 2 mbars
Temperature: 260ºC
Time: 5 hours
N_2 Flowrate: 0.3 m^3/hour

TABLE VI

PHYSICAL REFINING OF OLIVE OIL						
Parameter	Castilblanco de los A.			Arcos de la Frontera		
	Crude	Steam	N_2	Crude	Steam	N_2
Triglycerides Dimers	-	0.6	0.4	-	0.2	0.2
Triglycerides Oxidized	0.8	0.7	0.2	1.0	1.3	0.2
Diglycerides	4.8	4.2	4.2	5.3	4.5	4.1
Free Fatty Acids	4.3	0.2	0.15	9.85	0.2	0.1
Peroxide Value	15.5	0.4	0.0	15.0	2.1	0.0
	Pickled olives 1			Pickled olives 2		
	Crude	Steam	N_2	Crude	Steam	N_2
Triglycerides Dimers	0.3	1.4	0.6	0.1	3.4	1.3
Triglycerides Oxidized	1.0	0.6	0.5	1.5	1.5	0.4
Diglycerides	1.7	0.9	0.8	3.2	3.2	2.7
Free Fatty Acids	6.8	0.12	0.08	6.6	0.08	0.0
Peroxide Value	12.5	0.8	0.0	13.5	0.6	0.0

The results were positive and the characteristics of the refined oils, both when steam and nitrogen were used in the process, are shown in the previous Table. From the indicated values, it can be seen that the altered triglycerides, peroxide value, etc., were always lower when nitrogen was used instead of direc steam. In the same manner, the proportion of diglycerides was less because no steam hydrolysis occurred.

The physical refining of sunflower oil was performed using an oil that had been degummed and decolored before undergoing the neutralizing deodorization process. The conditions of the tests were the following: Vacuum: 3 Torr; Temperature: 230ºC; and Time: 3 hours. The characteristics of the resulting oil are shown in Table VII.

TABLE VII

PHYSICAL REFINING OF SUNFLOWER OIL				
Parameters	Crude		Refined	
		Steam		Nitrogen
Triglycerides Dimers	-	1.1		0.2
Triglycerides Oxidized	6.6	3.0		1.1
Diglycerides	1.3	0.8		0.4
Free Fatty Acids	1.1	0.1		0.08
Peroxide Value	99.5	0.14		0.0

Claims

1.- A process for deodorizing oils and fats characterized in thatthe oil or fat to be deodorized is subjected to the action of a current of inert gas entraining the substances producing unpleasant odors and taste in the oil or fat, the process being conducted under vacuum conditions ranging from 1 to 8 mbars and temperatures between 60ºC and 270ºC.

2.- The process for deodorizing oils and fats, of Claim 1, characterized in that the oil or fat to be deodorized is subjected to the action of a current of nitrogen gas that entrains the substances producing unpleasant odors and taste in the oil or fat, the process being conducted under vacuum conditions ranging from 1 to 8 mbars and temperatures between 60ºC and 270ºC.

3.- The process of Claims 1 or 2, characterized in that the oil or fat to be deodorized has undergone a prior degumming process.

4.- The process of any one of Claims 1 to 3, characterized in that the oil or fat to be deodorized has undergone a prior decoloration process.

5.- The process of any one of Claims 1 to 4, characterized in that the oil or fat to be deodorized has undergone a prior neutralization process.

6.- The process of any one of Claims 1 to 5, characterized in that the oil or fat to be deodorized has undergone a prior deaeration process.

7.- The process of any one of Claims 1 to 6, characterized in that the flow of the nitrogen gas current is between a range from 0.8 to 3 Nm^3 per hour per tonne of oil or fat.

8.- The process of any one of Claims 2 to 7, characterized in that said nitrogen gas current is subjected to dispersion.

9.- The process of any one of Claims 2 to 8, characterized in that the nitrogen gas circulates in a direction contrary to the direction of movement of the oil or fat.