Special Methods for Refining Oils

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MANY hours are spent by oil chemists in searching chemical references in an attempt to obtain information which would allow them to solve a special problem at hand. Unless they are fortunate, when working with a process that deviates slightly from the normal, shortly they will be back in the laboratory or plant with little more than a few suggestions and their own experience and intuition as a guide.

There is a noticeable lack of publications in the field of oils concerning the solution of the every-day problems with which we are confronted—those every-day problems being involved in the "unit operations of edible oil treating," namely refining, bleaching, winterizing, hydrogenation and deodorizing. With the constant variation of productions, importations, and markets we are ever trying the old methods on new oils or raw materials, or seeking new methods to apply to the old, and we find that the experiences of those who have preceded us have not been fully recorded.

This article is written to present several special refining procedures which may be used when satisfactory or efficient operation is not attained by the usual methods.

The following procedure was developed at a time when large quantities of crude kapoc oil were being imported and trouble was experienced with certain shipments of this oil in obtaining a clean refining break with a resulting low loss. The method was first applied to high free fatty acid kapoc and walnut oils, and later was found to be adaptable also to other oils, especially to those which gave a break only with difficulty and to those with free fatty acid content above 5 per cent.

Refining Method I (Plant Procedure)
Used about 4% of 15° Bé. lye for kapoc oil of F.F.A. 6.0%.
Added lye while rapidly agitating oil at 80°F.
Added at once, 100 lb. of sod. silicate to which had been added 50 lb. water (for a 30,000-lb. batch).
Agitated at 80°F. for one hour.
Heated to 110°F. while agitating slowly.
Added 5%-8% of cold water sprayed on surface while agitating, until good break was obtained.
Let settle.

The procedure may be modified by addition of the water in portions. For example, when refining rice bran oil of 5.2 per cent F.F.A., which could not be refined by the ordinary or special methods with a loss under 40 per cent, due to persistent suspension of the foots, the following procedure was used:

Refining Method I (Laboratory Procedure)
Added 7% of 20° Bé. lye, 1% of sod. silicate, and 1% of water, and agitated rapidly for 30 minutes.
Heated to 60°C. and agitated slowly for 10 minutes, and at the end of this time added 4% of water while continuing agitation.
Stopped agitation and sprayed surface of oil with about 2% more water; refining loss was 16%.

The lowering of the refining loss from 40 per cent to 16 per cent made it commercially feasible to process this oil.

The large proportion of water added is the novel feature of the method. When using the procedure in the plant, it is a pleasure to watch the grains of foots coalesce into large soft particles when the proper amount of water has been added and to see these particles sink immediately when agitation is stopped at the end of the refining.

Although the method has been used by several refineries in the past few years on hundreds of carloads of oils, there has been no trouble due to formation of emulsions. The fact that the foots are diluted is not a disadvantage.

A second refining method, having never been applied beyond the laboratory stage, is given here because it has shown promise for neutralizing or refining tallow and tallow oil. Low refining losses are obtained because soda ash and sodium silicate are used as the agents. The method does not reduce the color of the oil as much as does the ordinary caustic soda method.

Refining Method II (Laboratory Procedure)
For an inedible tallow oil of F.F.A. 5.2%, used 3% of 25° Bé. soda ash and 4% sodium silicate.
Mixed solutions and added to cold oil while agitating.
Agitated slowly for 15 minutes and then heated to 60°C., agitating for an additional 10 minutes.
Added 5-7% of cold water while agitating slowly.
Stopped agitation and let settle. Loss 9%.

The procedure may need some modification to adapt it to a particular sample so that the foots settle well. This is the principal function of the silicate, for without it, the foots tend to remain suspended or to split—one fraction partially floating and the other partially sinking.

Given below is a table showing results of laboratory refining trials on inedible tallow oil in all cases, except trial No. 2, using Method II. Note low refining losses in relation to high free fatty acids of samples used. This ratio averages 1.9 to 1.

LABORATORY REFININGS OF INEDIBLE TALLOW OIL
(Method II)

Sample	F.F.A. of Sample	Used for Refining	Refining Loss
A	4.9%	8% 30° Be Na_2CO_3 2% Sod. Silicate + 4% water	9.6
A	4.9%	6.5% 14° Be NaOH (ordinary method, for comparison)	13.0%
B	5.2%	3% 25° Be Na_2CO_3 4% Sod. Silicate + 7% water	9.0%
C	6.3%	4% 25° Be Na_2CO_3 6% Sod. Silicate + 7% water	11.7%
D	7.5%	4% 25° Be Na_2CO_3 6% Sod. Silicate + 7% water	14.7%
E	7.7%	5% 25° Be Na_2CO_3 4% Sod. Silicate + 9% water	15.1%

The soda ash and silicate method (Method II) is presented here only to show the possibilities of refining for special cases using agents other than cautic soda, while Method I of this article is an established modification of the ordinary caustic soda method, and is recommended for special use.