SOYBEAN OIL QUALITY FACT SHEET - REFINING

Overview

Crude degummed soybean oil (CDSBO) must be refined to produce high-quality soybean oil that is suitable for human use and many industrial uses. The traditional method to refine CDSBO is called caustic refining. This method uses a chemical process to refine CDSBO and produce refined, bleached and deodorized soybean oil (RBD SBO). The refining process removes free fatty acids (FFA) while reducing phosphatides, color, insoluble matter and unsaponifiable material. The key stages include refining, bleaching and deodorization.

Soybean Oil Refining Stages

The primary goal of the bleaching stage is to remove pigments like carotenoids and chlorophyll, as well as other oxidative products, by filtering neutralized oil through a bleaching clay.[1] Removal of pigments ensures successful quality assessment using a Lovibond test. While CDSBO can have red color of greater than 8 on the Lovibond scale, industry standards require refined, bleached and deodorized soybean oil (RBD SBO) to be less than 0.8 red.[2]

REFINING STAGE

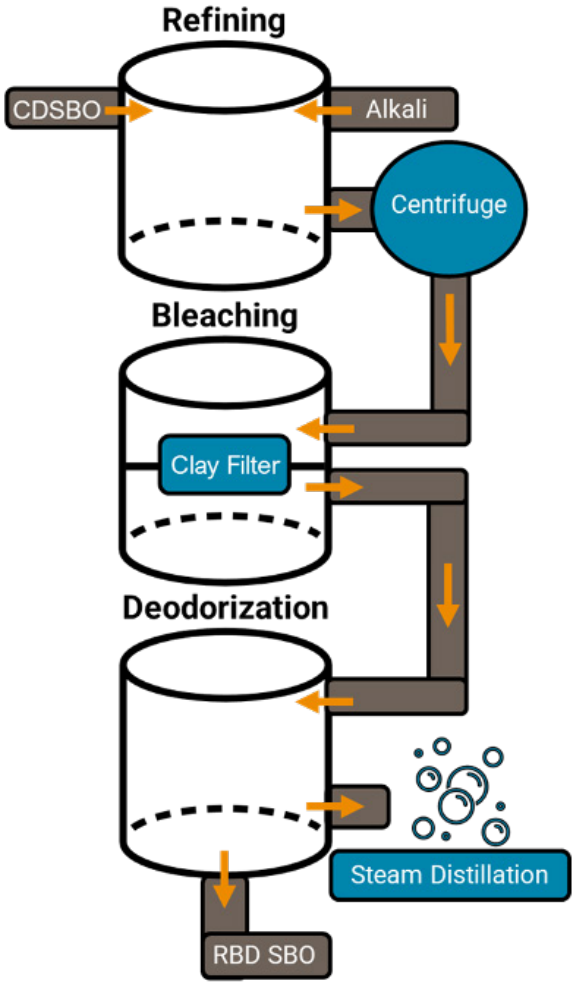
Alkali solution, often sodium hydroxide (NaOH), is mixed into CDSBO. Alkali combines with FFA to form soaps and combines with magnesium, calcium and phosphorus compounds to form gums. Soaps and gums that hold a higher molecular weight than neutral oil are expelled through a centrifuge, resulting in neutral oil. The higher the FFA content, the higher the alkali dosage required and the greater the neutral oil loss. A high FFA content leads to higher refining cost and refining yield loss.

BLEACHING STAGE

Bleaching clay, typically a neutral earth, is used as a filter for neutralized oil. The primary goal of the bleaching stage is to remove color pigments, including carotenoids and chlorophyll, as well as other oxidation products. High levels of chlorophyll or red color require a high dosage of bleaching clay and/or the application of acid-activated clay, increasing input costs and the cost of disposing spent clay.

DEODORIZATION STAGE

Deodorization through steam distillation is the final step in the refining process. It eliminates residual FFA and odiferous compounds such as aldehydes and ketones to improve the organoleptic properties of the RBD SBO. Higher content of these materials results in increased losses during the deodorization stage. High levels of these products in CDSBO lead to lower refining yields.



Refining Stages and Materials Removed

Refining Stage	Stage Description	Primary Material Targeted for REmoval	Additional Material Subsequently Removed
Refining	Treatment of oil with an aqueous alkali solution	Soap Gums	Chlorophyll
Bleaching	Treatment of oil with bleaching clay to decrease its color and	Chlorophyll and pigments Oxidation products	Trace soaps and gums Trace metals
Deodorization	Steam distillation of oil under high temperature and vacuum to remove volatile substances to improve the organoleptic properties of the oil	Trace FFA Trace oxidation products Carotenoids Trace metals, by citric acid treatment	None

Quality and Origin

Soybean oil quality varies by origin. These variations are due to the geographic location where the whole soybeans were grown, storage conditions and handling prior to processing. Variations in the quality of CDSBO can lead to a longer, more costly refining process, while simultaneously lowering refining yields. Understanding these variations allows refiners to make cost-effective decisions when selecting CDSBO to minimize input costs and refining yield loss, while maximizing profit.

To learn more about how U.S. Soy can enable your business, please contact your U.S. Soybean Export Council (USSEC) region or country representative; or submit your contact details via https://ussec.org/contact/.