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The high adsorption capacity and affinity of SORBSIL® silica hydrogels for soaps, phospholipids and trace metals make them ideally suited for use in a range of edible oil refining processes:

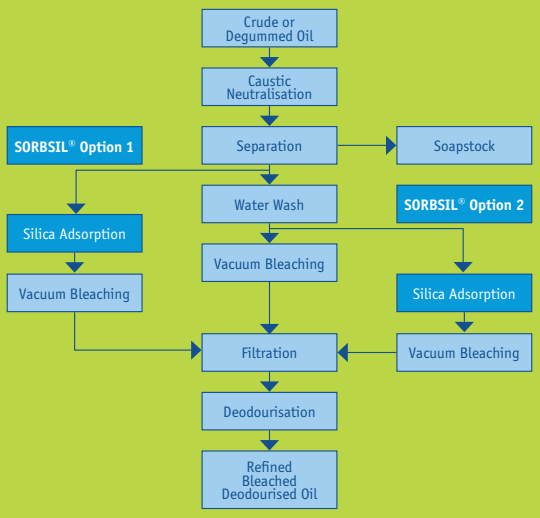
- **Chemical Refining**
- **Physical Refining**
- **Interesterification**
- **Denickelling**

In edible oil refining SORBSIL® Silicas

Chemical refining

SORBSIL® silica hydrogel can be used in the chemical refining process in the following ways:

- Modified Chemical Refining – to replace the water wash step by its excellent adsorption capacity for soap (SORBSIL® Option 1)
- Modified Bleaching – to optimise the bleaching earth loading due to its ability to adsorb phospholipids and trace metals (SORBSIL® Option 2)



In **Modified Chemical Refining**, wash stages can be eliminated by using SORBSIL® silica hydrogel for the removal of high levels of soap, thus reducing wash water effluent and oil losses. Furthermore separation centrifuges are eliminated from the process thus reducing energy and maintenance costs. The high adsorption capacity of SORBSIL® silica hydrogel for soap is illustrated in Figure 1 for a neutralised soybean oil treated at 85°C.

In addition to adsorbing soap from the oil, SORBSIL® silica hydrogel also removes unwanted phospholipids and trace metals. Optimisation of silica loading after caustic neutralisation for the removal of all these contaminants will allow a more efficient use of bleaching earth in the subsequent treatment to remove colour bodies.

Dosage recommendation: As a starting point for laboratory testing, use 0.1% SORBSIL® silica for the removal of approximately 500ppm soap.

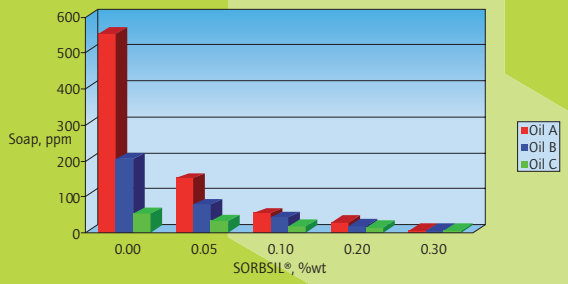


***Figure 1:** Soap removal with SORBSIL® silica hydrogel*

In **Modified Bleaching** SORBSIL® silica hydrogel can be used after the final wash step to remove any residual soap and phospholipids normally removed in the subsequent bleaching stage (see Figure 2). Introduction of SORBSIL® silica hydrogel at this stage facilitates a reduction in the bleaching earth and the overall adsorbent requirement, resulting in reduced oil losses and improved filter performance, partly due to the higher permeability of the silica and partly due to a lower solids loading on the filter per ton of oil processed.

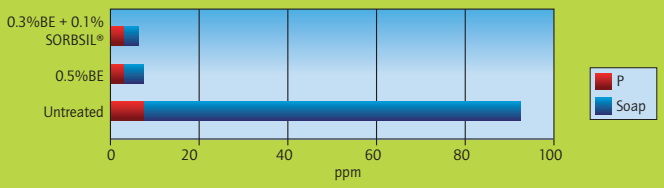


***Figure 2:** Modified Bleaching with SORBSIL® silica hydrogel (neutralised Soybean oil @ 80°C)*

Dosage recommendation: As a starting point for laboratory testing, use 0.05% SORBSIL® silica to remove 30-50ppm soap and 5ppm phospholipids.

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Physical refining

In physical refining, the oil may be treated with SORBSIL® silica hydrogel as a partial or even total replacement for bleaching earth. Since the physical refining process is generally more demanding on the adsorbent to remove phosphorus, the excellent phospholipid capacity of silica hydrogel can be of considerable benefit. The use of silica in this way will reduce the overall adsorbent usage, resulting in lower oil losses and improved filtration performance. The presence of phospholipids and trace metals in the oil reduces the capacity of the bleaching earth to remove the colour bodies. The data in Table 1 shows how the quantity of total solids can be reduced by 20% when SORBSIL® silica is used sequentially with bleaching earth, resulting in lower oil loss and reduced solid waste for disposal.

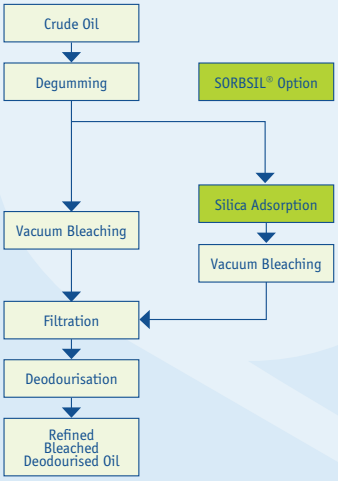

Table 1: *Physical Refining of Palm Oil*

Wt% SORBSIL®	Wt% Bleaching Earth	P (ppm)	Fe (ppm)	Red 5.25" * (Lovibond)
0	0	13.5	5.6	-
0	1.3	< 0.4	0.04	4.0
0.15	0.9	< 0.4	0.03	4.0

** analysis of deodourised oil sample.*

Dosage recommendation: As a starting point for laboratory testing, replace 100% of the bleaching earth with 10 to 20% SORBSIL® silica and 60 to 70% bleaching earth. For modified physical refining, in which the oil is partially neutralised with alkali, a SORBSIL® silica dosage of 0.1% is recommended to remove approximately 25 ppm P and 500 ppm soap.

Interesterification

Chemically catalysed interesterification is a reaction which produces soap as an undesirable by-product. Conventional methods utilise water washing to remove soap from the oil, although environmental pressures make this increasingly unattractive. SORBSIL® silica hydrogel provides an effective answer for soap removal, and is more environmentally friendly than traditional methods. The adsorption capability of SORBSIL® silica hydrogel allows high levels of soap (1000 - 4000 ppm) to be effectively removed. The silica and adsorbed soap are then removed downstream at the filter, thus eliminating the water wash stage of the process.

Dosage recommendation: As a starting point for laboratory testing, use 0.4% SORBSIL® silica for the removal of approximately 3000 ppm soap.

Denickelling

Hydrogenation of edible oils using nickel catalysts can give rise to oils containing unacceptably high levels of nickel, which may be present as dissolved complex ions, soaps or particulate metal. As with other trace metals, SORBSIL® silica hydrogel has excellent capacity for nickel. It can be used in the post bleaching stage as a partial or total replacement for bleaching earth. For best results the oil is pre-treated with citric acid prior to the addition of SORBSIL® R40. If no separate citric acid treatment is possible then SORBSIL® R92 should be used.

Dosage recommendation: As a starting point for laboratory testing, a dosage of 0.1% is recommended for hydrogenated oil containing 5 ppm nickel.

PQ Corporation's philosophy is to work in conjunction with our customers to establish the most suitable grade and dosage recommendation of SORBSIL® silica hydrogel for their application.

For further assistance, please contact us via e-mail: techsupport@pqcorp.com

www.pqcorp.com

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