

FILTERING THROUGH THE NEWS No.19

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Attn :To whom it may concern.

COUNTER CURRENT BLEACHING AND THE FILTERS USED

After being active in the Edible/vegetable. Animal oil & oleo chemical industry for more than 30 years we would like improve and not just repeat old processing steps.

We as the leading filter supplier for edible oil applications like very much to be- and stay involved in the development of new techniques and better performing filter systems for the various applications in the edible /vegetable /animal oil industry and this requires us to participate in test to either confirm the claim or to show the industry that it will not lead to the expected and hoped improvements.

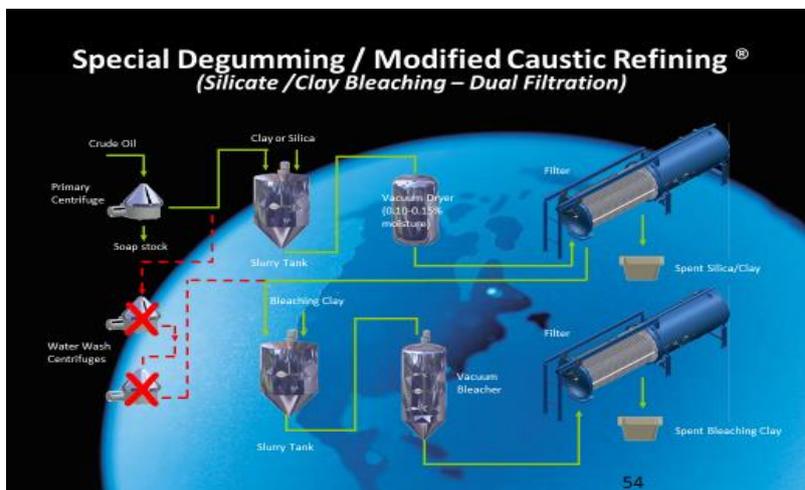
One of the more recent developments in the filtration of bleached oils is the use of activity left in the used bleaching clay with the main target to save on overall clay consumption but at the same time save on other areas where a number of issues are important in their own geographical area.

- Less clay is less oil loss \$\$\$\$\$\$.
- Less clay is less waste or disposal cost \$\$\$\$\$\$.
- Less clay is longer filter cycles i.e. less operator involvement \$\$\$\$\$\$.
- Less clay is less frequent cleaning is less spare part /running cost \$\$\$\$\$\$.

All these are by themselves good reasons to at least look at the options available. In some of our clay filtration publications we mention the main systems used by the industry and the fact that some make use of the remaining bleaching activity in the once used clay.

“DRY DEGUMMING” is one of the options where clay /silica filtration replaces the water wash centrifuges. In this “filtering through the news” article I will walk you through the various options but we do not pretend to be complete.

There are other/more options available.



The first methods where using the clay layer collected on the bleaching filter and used this layer too to filter the degummed oil on the way to the bleacher. This worked but had very short cycles since the phosphatides(Gums) blocked the clay cake quickly.

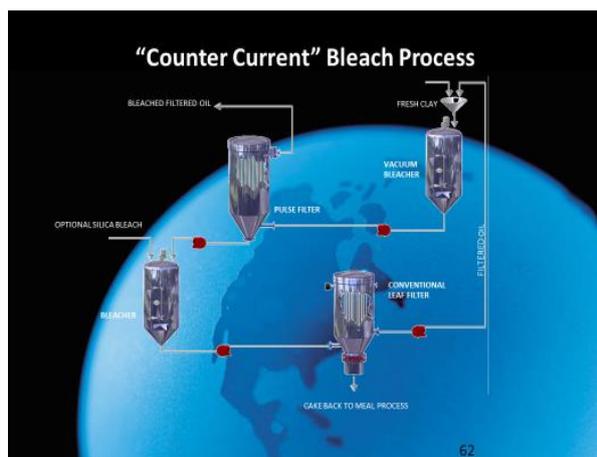
The second system we have been involved with was “Lead trim” where the bleached oil saw two filters each loaded with clay. The idea was to pass the oil through the 2 filters and when in the first filter the chlorophyll content went up we switched and filter 2 became filter 1 , a third filter was pre-loaded with clay and became filter 2 while filter no 1 was dried and cleaned.

This resulted in some savings but the process hick ups very often resulted in more cost than savings.

In view of the results De Smet Belgium , Mr Albert Dijkstra and me where engaged in chromatographic bleaching trials where the clay was used in a system that would tell you by the rise of chlorophyll in the filtered oil that the cay was no longer suitable and exhausted . Up to 5 filters in counter current use where required but the cost exceeded the benefits & avings.

Another option was the modified caustic refining by using silica or clay to remove the gums and replace wash centrifuges by filters. The centrifuge suppliers did not like the idea but in some cases the system was implemented successfully. We have realized long time ago that there is in only very few cases competition between filters and centrifuges and our statement in this is;

A filter supplier should never compete with a centrifuge supplier since the choice is so obvious ,If a centrifuge works and will give you the wanted separation grade i.e. a clear filtrate than this continuous device is your first choice. (crude oil , degumming and water washing , etc).But in case a clear filtrate is wanted(Crude oil for lecithin, hydrogenated oil with <0,5 ppm nickel , winterized oil with cold test and <10 ppm residual wax or bio diesel G/S with < 15 ppm) a filter might be your only choice.

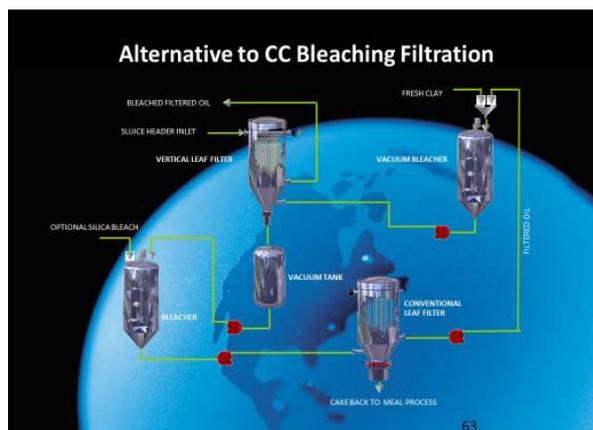


The next generation re-use systems where based on “out of the box” thinking and made use of either the “new” adsorbent material like SILICA or it reintroduced filter bleaching clay that had been used once before.

One of the re-use clay systems became known as the Counter Current method with a claim of up to 40 % clay saving (only in high clay consuming oils)

Counter Current bleaching;

The counter current location requires a system that will remove the spend clay from the filters and ensure that the clay slurry can be re-introduced in a first bleacher under inert conditions. The wet /or slurry filter cake outlet connection is connected to the bleacher (RPP Tube filter) or to an intermediate vacuum tank from where the cake is re-introduced in the bleaching process (PLV Leaf filter). Fresh oil is coming to the first bleacher where it is mixed with the once used clay (possibly with fresh silica). After the first bleaching the oil is filtered by conventional leaf filters. The spend cake from these filters is used 2 times and will be waste. The filtrate from the filters is going to a second bleacher where it is mixed with fresh clay. After the bleaching time has elapsed the oil / clay mixture is filtered and the filtrate is final and ready for deodorisation. The clay however is removed from the filter and reintroduced into the first filter but should be kept from contact with atmosphere, oxygen or moisture. Depending on the plant size, type of oil and filters used the reduction(saving) of clay can vary but from the installations supplied we know that it varies between 20 and 40 %. **NOTE:** The higher the original clay consumption was the more you can save.



Specialists you can contact are :

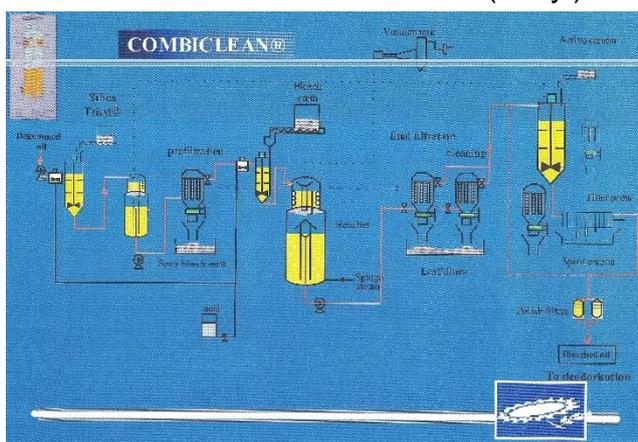
B&B engineering in Germany . Mr G Boerner, Mr M Schneider or Mrs J.Hollien.

MORE WAYS TO SAVE CLAY:

And then there was the method called Combi-Clean (De Smet), Double Bleach (Crown) or Tri-Clear process*WR Grace). In this process the clay filter ,when almost ready to be cleaned, is shifted in front of the bleacher but now to filter on the already accumulated clay layer the incoming oil . This oil is first treated with silica (Trisyl) at lower temperature (70-80 °C) and atmospheric pressure.

This silica treated oil is then dried and goes to the bleacher. The idea is to filter clay for let's say 4 hr and then 4 hr silica (1kg silica = 1 mm and 1 kg clay = 3 mm).

The claim from those who sell these systems is that up to 50 % clay is saved.



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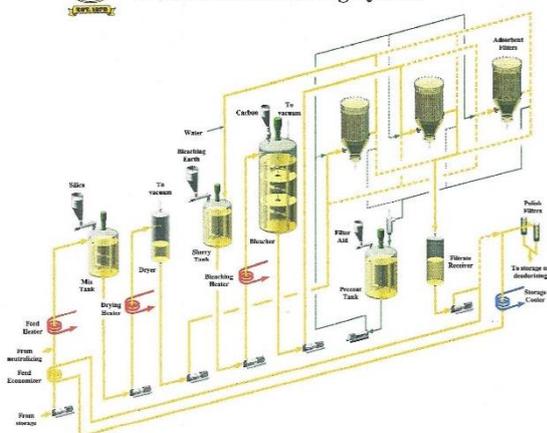
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DoublePass Bleaching System



In good refined oil the soap and phosphatide are as low as possible, Moisture is <0,1%, and P = approx. 5-10 ppm. In physical refined oil we will get after the water-wash /degumming approx 25 ppm P (up set can be 40 ppm P) and in some refineries they acid treat the oil with phosphoric- or citric acid to get the gums hydrated and filter them in the bleaching step.

If we want to use the remaining activity in the clay in systems like Tri-Clear (by WR Grace)/Combi Clean (by De Smet) or Double Bleach (by Crown Iron Works) we

must ensure that the plugging contaminants are removed first. The industry has embraced silica (Trisyl or another brand) but also an Oildri product like SELECT silicate=clay the Clariant product TONSIL 424 or even an std clay adsorbent should be able to do the same.

Recently we have seen cellulose products (EFC by JRS) being used as well. To be informed about these products it is best to contact at WR Grace in Worms Germany Mr Massoud Jallapour for Silica performance or Oildri-SELECT silicate clay mr Roberto Berbesi. For JRS cellulose products contact Mr Stefan Neufeld. (These are just a few of the many that can be consulted like Sud Chemie/ Clariant; Filtrol/BASF, Galleon, Taiko, etc).

CAPACITY:

In general and for physical refined oils we allow 250-280 kg/m²/hr filter throughput and this is based on the physical refining of palm oil with 20-25 ppm max phosphatides. In the beginning the filter, with good clay and excellent refining, will run at over 300 kg/ m²/hr but this is only at the beginning so in average we use the 250-280 figure. Make sure not to compact the cake and the initial filter run should be with set max deltaP until a minimum flow of 250 kg/ m²/hr is reached. Then the system will be monitored on a set flow with rising Delta P. This will be continued until max total flow through filter is reached (max clay in filter is known as +/- 10 kg dry clay per sqm per cycle). Flow minimum is 160-180 kg/ m²/hr and max deltaP of 4,5 bar when this is reached we will prepare for filter shift or cleaning. The more modern filter installations use load cell's under the 3 vessel brackets to measure the filter weight after cake discharge and be sure all cake left the filter. (see special publication on "bridging" for details).

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The cake thickness obtained is 18-20 mm which will nicely fit with the 3 inch or 75 mm leaf pitch of Vertical tank Vertical leaf filters mostly used.

MATERIAL CHOICE:

In the physical refining process the correct material choice is essential. With the presence of some excess acid from the acid pre-treatment, the use of acid activated clay, the presence of a vapour lock above the leaves in the dished cover part of the filter vessel make that we have to consider the very corrosive environment in this process. It is for this reason that our filter elements ,for any bleaching filter, are always made in material AISI 316L(1.4404) but with the actual filter screen in a special alloy NSCD or 316S which is a 904L alloy(1.4539) with high Cr,Ni,Mo and some copper. This material has proven to be resistant against the conditions. We strongly recommend not to use 1.4404/316L since corrosion for the fine screen will be just a matter of days(in the best case a few weeks).

The vessel is in most cases carbon steel but we have been able to convince more and more people to consider and full ss vessels or use at least a stainless steel AISI 304 cover disc for the vessel. At least the part where we can have a weak acid environment (in gas form) at high temperature is than protected and we can avoid the more expensive full stainless vessel.

CAKE DRYING:

The cake blowing is std done with steam since this will give you the lowest residual oil contend. The steam consumption is approx 0,5-1 kg steam at 2-3 barG pressure (140 °C) per kg of dry clay cake based on max 15-20 minutes drying time. The residual oil contend in the spend clay will be approx 22-25%.

When air/N2 is used the consumption is 0,12-0,15 nm3 /m²/min at 2-3 bar pressure and the residual oil content in the cake is not less than 30-35 %

All these figures are based on the use of first class clays and no use of filter aid or pre-coat material.

Recently people are promoting the use of (acid activated) cellulose as pre-coat and with only very short steam blowing the cake will contain approx 5% less oil than in other conventional systems. Weather this is true and if it works is currently tested but still has to be seen. The often heard remark that longer drying will lead to drier cake and better cake discharge is a mistake . Over-drying makes the cake more difficult to remove but not dryer.

The only real true story about oil content in spend clay cakes was written by the late Mr Barry Morton .

More info is available on dedicated write up's ;

- Bleached oil filtration & Bio Diesel filtration
- Trouble shooting and screen choice in edible oil filter applications.
- Winterised oil filtration.

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PMI-Technology
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- Hydrogenated oil filtration.
- Cocoa filtration.

We hope that this will have your greatest interest and in case of questions please contact us

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Lochem 11-08/2015.
F.G. Veldkamp.

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