

FILTERING THROUGH THE NEWS No. 13

Date : 28-07-2015-rev 2

Attn :

To whom it may concern;



COCOA FILTRATION:

With reference to the many questions and previous discussions on this subject we have pleasure to submit our info .

PMI filtration specialists have been involved in many discussions on the subject of filtration of cocoa butter and the correct filter selection for the application . In this write up I will try to summarize our findings.

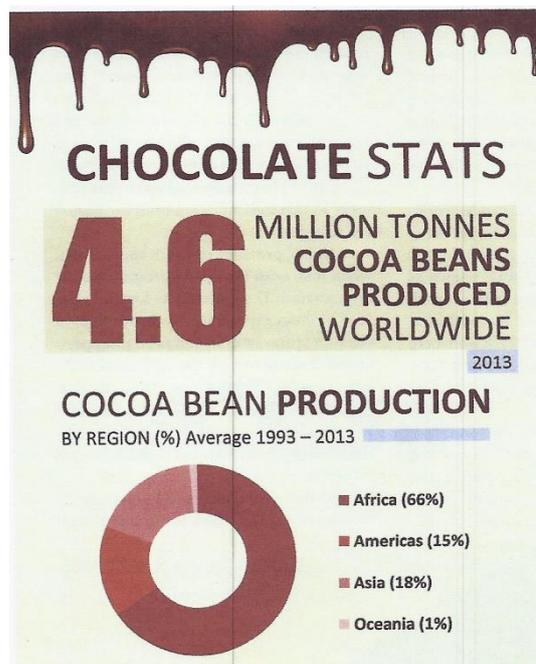
For the extraction and bleached cocoa butter application a special write up is available;

COCOA:

With reference to the many questions asked we have pleasure to follow up with some new and adjusted information on the filtration equipment nowadays used for cocoa liquid/butter after the cocoa (Duyvis) presses. It should be mentioned that we have supplied several filters to cocoa processing plants all over the world and our findings and experience is included in this write up

We at PMI Sdn,Bhd Malaysia situated in the hart of the SEA cocoa bean growth area are experts in the design and manufacture of filters for cocoa liquid/butter filtration after the presses.

PMI Leaf & Tube type filters are used for applications in the oil & fat industry such as;

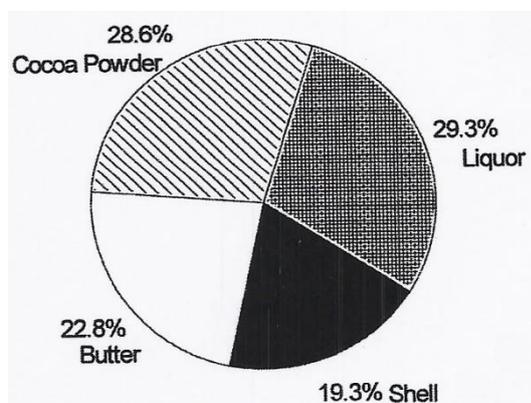


- Crude oil filtration after expeller presses in both pre-press and full-press applications.
- **COCOA BUTTER FILTRATION AFTER PRESSING AND BEFORE DEODORIZATION.**
- Miscella filtration (lecithin)

- Bleached oil filtration **AND BLEACHED COCOA IN EXTRACTION BUTTER PROCESS**
- Hydrogenated oil filtration
- Post bleached oil filtration
- Winterized oil filtration
- All polishing filtration steps.
- Replacement filter leaves for all type leaf filters

For all these and other application we combine excellent design and product quality with first class service to our customers.

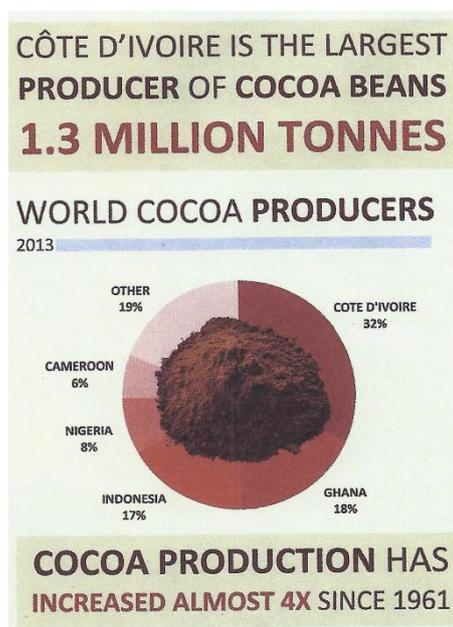
Since we supplied many of our leaf filters to crude oil applications for the filtration of pressed oils coming from expeller presses (DeSmet/Rosedowns, Krupp, Reinartz, Anderson, Skett, etc) it was obvious that our clients also requested improved filtration after the cocoa press operation (Duyvis, Bauermeister, Carver etc).

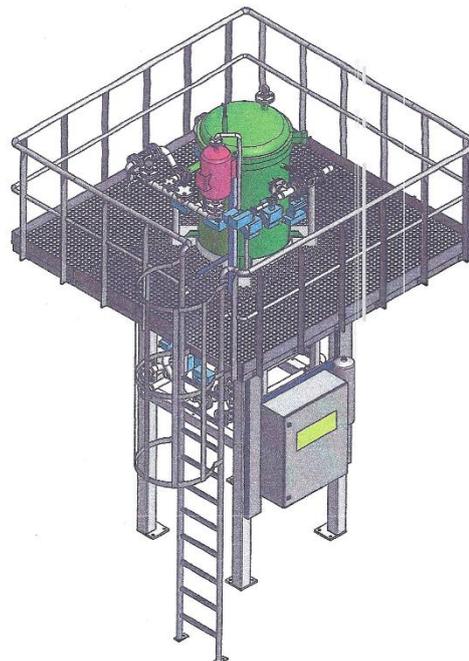
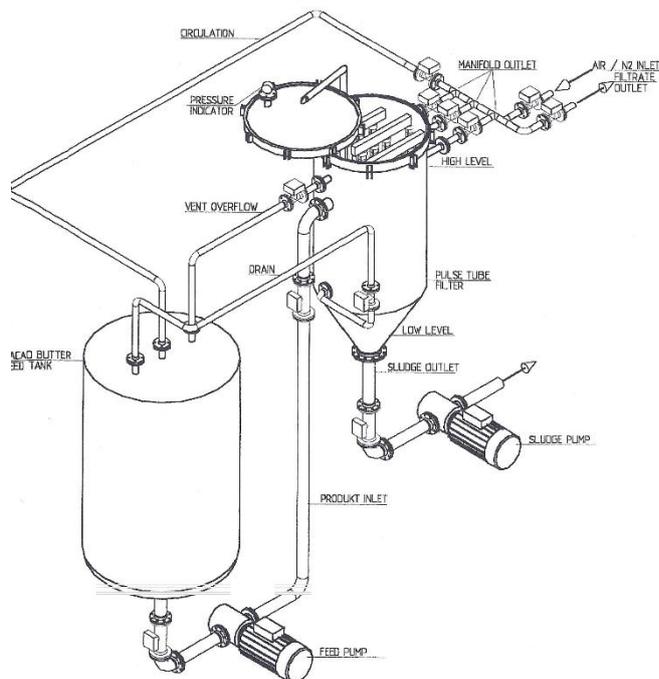


The systems operating with Plate & Frame filters showed lots of handling problems, high product losses, housekeeping problems and expensive manual cleaning adjacent to expensive cloth replacement.

Our RPP pulse filter was introduced to the Industry approx. 10 years ago and became a success right away.

The first small installations were supplied to Duyvis as part of their plant design or to their clients as improvement of their plant but later units were sold to clients directly to replace existing plate & frame filters.





Some references we like to mention are;

- KL Kepong Cocoa in Port Klang (Barry Callibaut)Malaysia.Indonesia.
- Johor Buru Cocoa , Malaysia .
- Cargill/Gerkens Cacao The Netherlands.Brazil, Ivory Coast
- Ferrero Germany & Italy
- Delfi Foods Malaysia, Indonesia , Germany.
- Cargill "Mica" cacao in Ivory Coast
- Duyvis Netherlands. several filters in several sizes to fit projects all over the world
- Various , etc

The design is based on a 10-20 mm filter cake . This will allow the filter to collect the max amount of cake possible in this application and still have relative small vessel size.

The new wedge-wire type core material makes the tubes straight as an arrow , strong and durable and is reason for the long life of the filter cloth . The round shape elements can withstand a Delta P of >8 bar and no change of shape during the process. This will result in durable cloth and not in damages like we see in those installations where “cricket bat” shape elements are used . The round woven filter cloth is easy to install , does not require a backing cloth and can be mounted directly on the wedge-wire core. The smooth and round shape element will give the cloth a long durable life. Our broad range of cloth material and weaving types (mono-, multi filament and felt) will allow you to select the type best suitable for your application

PROCESS:

The transformation of the fermented and dried bean into cocoa powder and chocolate starts at the manufacturing site. The clean, broken and de-shelled kernels are called “nibs”

After sterilization the nib can be immediately roasted (natural process) or alkalized(Dutch Process) i.e. treating the nibs with alkali solution to modify the colour and flavour of the cocoa powder or liquor. Minimum alkali use should be considered.

Nib Grining;

The process of cacao butter involves the pressing of the preliminary grinded beans. This grind is to ensure that the outer shells are removed. Different type of mills are used. Cocoa mass is than a ground mix of cocoa powder and cocoa butter and should contain at least 53% fat

The inner parts of the bean (cacao solids plus cacao butter) then goes through an operation which grinds up the bean producing a slurry of coarse cacao solids in molten butter. This slurry is called “Raw Liquor” or expeller cocoa butter.

The technical grades has been produced by pressing, expelling or by solvent fractionation. This technical grade than is using the normal fat refining techniques of neutralisation, bleaching and deodorisation

Normally press and expeller cocoa butters are used without refining as this process removes the flavour associated with cocoa butter. Because they are used without refining, they do contain measurable levels of FFA although these are limited by law to a max of 1,75%.

The “Raw Liquor” then goes through an additional milling operation which further reduces the particle size of the cocoa solids and releases more butter. This step is called refining.

PRESSING:

Cocoa butter constitutes about half the weight of the cocoa nibs.

The cocoa solids are then separated from the butter in hydraulic presses which use either fabric or more common a tightly woven wire screen .The pressure applied can be as high as 450 kg./cm². Depending on the manufacturer of the press, the pressing time , pressure and the setting of the press the resulting cakes may have a fat content of 10-24 %. (commercially available powders are between 10-12%)

These hydraulic presses are made by :

- Duyvis (world leading) The Netherlands
- Bauermeister Germany
- Carver , USA
- Vitally. Italy

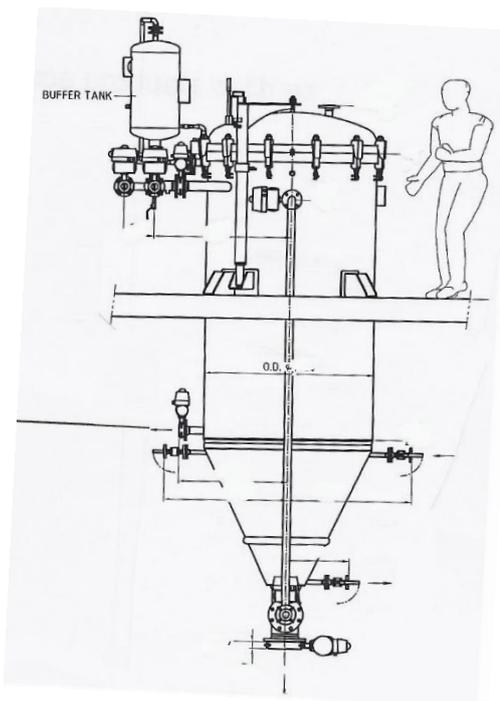
The cacao solids are further processed for use as familiar cocoa products such as hot chocolate, candy bars, etc.

This involves a number of stages such as;

- Refining
- Conching
- Tempering
- Molding or Enrobing
- Cooling
- Packing

The cacao butter is used as a base for candy and finds many other industrial, cosmetic and food applications most all of which require a perfectly clear butter, uncontaminated with particles of cacao solids.

A more industrial /technical grade butter can be obtained from the so called extraction process but this will result in a lower grade butter not used in food applications (LFC supplied bleached butter filters type pressure leaf MVDCD to Jan Schoenmaker in Koog ad Zaan , The Netherlands for filtration of bleached extraction butter)



Cocoa Butter filter Malaysia

Cocoa butter:

The cocoa butter from the presses is filtered and stored. Upon request the butter can be partially or fully deodorised. The graph shows the products and by products in cocoa processing;



Safety Valve in Ivory Coast

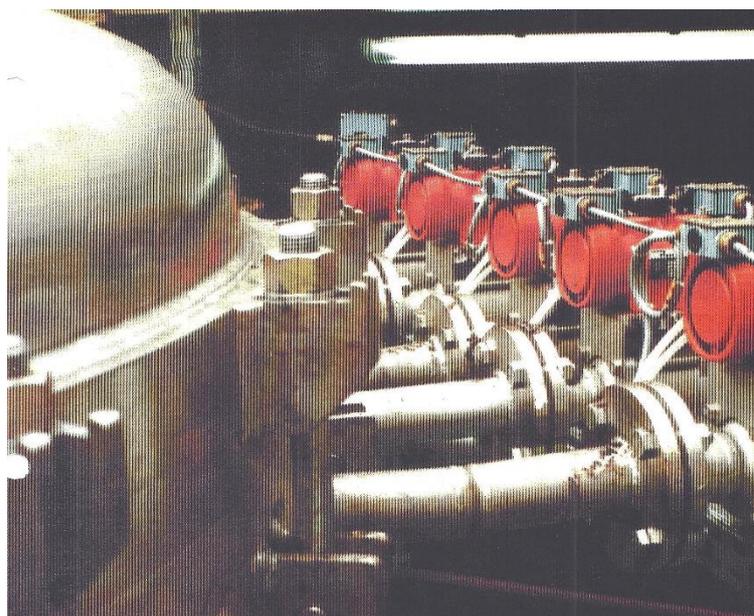
The old conventional cacao butter producers filtered the butter with common plate & frame type presses using cast iron plates (now could be poly propylene but temperature might be a problem) covered with fabric cloth and paper.

These plate and frame presses have several disadvantages:

- I) press is cleaned manually and requires a lot of manual labour.
- II) Cost of laundering the press cloth
- III) Replacement cost of cloth and paper.
- IV) Drillage, leakage and loss of cacao butter
- V) loss of butter in the cake.

This is of course where we come in. We have run pilot test and found that the RPP Reversed Pulse type filter is the most suitable filter for the filtration of this press slurry .

The filter removes all solid particles and results in a brilliant polish. The initial filtration will require short re-circulation to obtain clarity after which the filter is switched to the actual filtration step and a normal filter cycle before the filter is cleaned will depend on the solids but ranges . Runs of 30 hr are common on clean butter feed and for a feed with average 0,5% solids we have seen a minimum of 4 hr filtration time. Like in oil applications the presence of soaps or gums will have a negative effect on the filterability and the presence of these can sometimes not be avoided due to the requirements of the industry (Like very dark cocoa) The end of the filter cycle is generally indicated by the high delta pressure over the filter elements.



External Manifold

The product will solidify at room temperature and this will require a good insulation of the vessel. In most installations the filters are equipped with heating jackets on the conical bottom of the filter.

The wet or slurry cake discharge is performed by a pulse of air/N₂ or by a combination of Air/N₂ that will initiate a reverse flow of clean butter to release the cake from the filter elements.

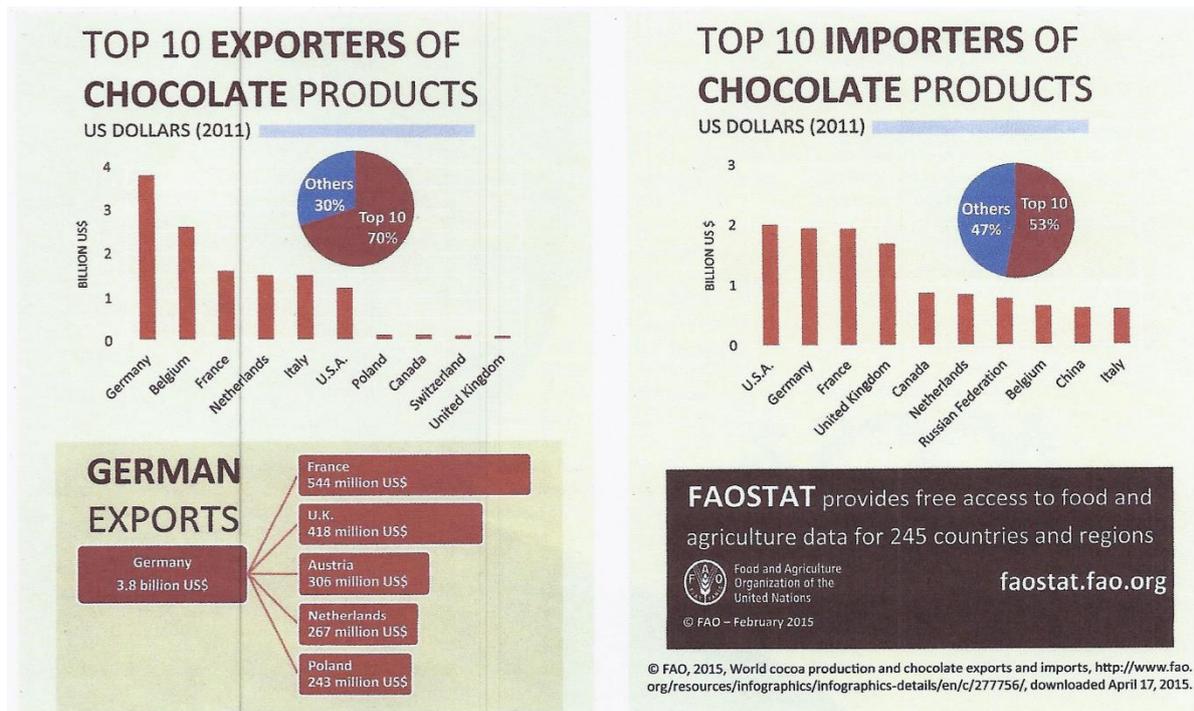
The discharged cake is given some time (3-5 minutes) to settle in the conical part of the filter vessel after which the thickened slurry cake is removed from the discharge opening of the cone. The slurry removal can be performed by a gear pump and this slurry is send back to the feed side of the hydraulic presses to ensure maximum yield and no loss of both cocoa particles or butter.

The RPP filter will have the following advantages over other filters used in the industry;

- No papers, No filter aids used
- 10 minutes or less total down time
- no leakage
- no manual cleaning
- system can be 100 % automated.
- use of durable filter cloth (no seam)
- no contact of butter with air so hermetic operation and no oxidation.

With the purchase of our Pulse type filter for cocoa butter filtration the client will receive a proposed P&ID with full operational description.

Cocoa butter remains a very important product but in the world of (cocoa butter equivalent),CBS (coca butter substitutes) like shea butter, palm oil, palm kernel,etc, fractionated or partially/full hydrogenated where and are used. The negative influence of trans in hydrogenated oils have been good for fractionation but still interesterification is used for special products .



We hope that this summary will give you answers to all questions that you will possibly have.
 Special write ups on other filter applications are available as **FILTERING THROUGH THE NEWS** articles.
 Please don't hesitate to contact our PMI Malaysian office,

FGV.
 27-07-2015
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