

Types of products and required quality

The product	Hydration, t/month	Neutralization, t/month	Bleaching, t/month	Deodoration, t/month	Qty of programs/ month	Parameters											
						Acid value		Peroxide value		Colour value*		Phosphorus		Non-fatty impurities		Unsaponifiable matter	
						Input	RBD	Input	RBD	Input	RBD	Input	RBD	Input	RBD	Input	RBD
Cocoa butter			2,300	2,300	3	4	0.1	6	0.1	Y - 70 R - 30 B - 3	Y - 20 R - 2 B - 0	Max. 30	Max. 5	0.1	0.01	1.0	0.3
CBE		600 (STSHEA)	600 (STSHEA) 1,200 (CBE)	1,200	3	1.5	0.1	6	0.1	Y - 30 R - 3 B - 3	Y - 15 R - 3 B - 0	Max. 8	Max. 5	0.1	0.01	1.0	0.5
HPMF				200	1	1	0.1	6	0.1	Y - 30 R - 3 B - 0	Y - 10 R - 2 B - 0	Max. 8	Max. 5	0.1	0.01	1.0	0.5
STSHEA		200	200	200	1	8	0.1	6	0.1	Y - 70 R - 5 B - 2	Y - 15 R - 3 B - 0	Max. 8	Max. 5	0.1	0.01	4.0	1.0
OLSHEA	1,600		1,600 + 1,600 (in case of 2nd bleaching)	1,600	3	40	0.1	8	0.1	Y - 70 R - 30 B - 3	Y - 50 R - 4 B - 1	Max. 20	Max. 5	0.1	0.01	8.0	4.0
SHEA butter	100		100	100	1	30	0.1	8	0.1	Y - 70 R - 30 B - 3	Y - 30 R - 3 B - 1	Max. 30	Max. 5	0.1	0.01	10.0	4.0
						* Colour value shall be estimated as Y – Yellow, R – Red, B – Blue											
per month	1,700	800	7,600	5,600													
per year	20,400	9,600	91,200	67,200													
Production capacity, t/day, on the basis of 310 w.d./year	66	31	294	216													
Contract production capacity, t/day	300		300	300													

Refining parameters and production capacity of sections during shea processing

Product	Process	Neutralization		Bleaching		Deodoration	
		input	outlet	input	outlet	input	outlet
Crude shea stearin	Parameters		Acid value - up to 6-8 mgKOH/g	Acid value - max. 0.5 mgKOH/g	Acid value - max. 0.5 mgKOH/g	Acid value - max. 0.5 mgKOH/g	Acid value - max. 0.1 mgKOH/g
	Parameters		Citric acid 30% 6 L/t Temperature 95-100 °C 15% NaOH 12.5 L per FFA content 1% Water consumption 5% Temperature 90-95 °C		7 kg/t of bleaching clay with filter powder in ratio 6/1 Temperature of bleaching 100-105 °C		Temperature of deodoration 227-230 °C
	Production capacity	Contract	100%		100%		100%
		Actual	100%		100%		70%

Product	Process		Neutralization		Bleaching		Deodoration	
			input	outlet	input	outlet	input	outlet
Crude shea stearin	Parameters		Absent		Acid value - up to 6-8 mgKOH/g	Acid value - up to 6-8 mgKOH/g	Acid value - up to 6-8 mgKOH/g	Acid value - max. 0.1 mgKOH/g
	Parameters				7 kg/t of bleaching clay with filter powder in ratio 6/1 Temperature of bleaching 90-100 °C		Temperature of deodoration 227-230 °C	
	Production capacity	Contract			100%		100%	
		Actual			50% *		70% **	

Product	Process		Hydration		Bleaching		Deodoration	
			input	outlet	input	outlet	input	outlet
Crude shea butter Crude shea olein	Parameters		Acid value - up to 40 mgKOH/g	Acid value - up to 40 mgKOH/g	Acid value - up to 40 mgKOH/g	Acid value - up to 40 mgKOH/g	Acid value - up to 40 mgKOH/g	Acid value - max. 0.5 mgKOH/g
	Parameters		Citric acid 40% 6 L/t Temperature 95-100 °C Water consumption 7% Temperature 95-100 °C		7 kg/t of bleaching clay with filter powder in ratio 6/1 Temperature of bleaching 100-105 °C		Temperature of deodoration 255-260 °C	
	Production capacity	Contract	100%		100%		100%	
		Actual	100%		65% *		50% **	

* Reduction in section capacity due to increased filtration time on vertical filters/no additional available filters

** Reduction in section capacity due to high acid value and oil composition specifics

Equipment selection requirements

- 1) Processing capacity on the current neutralization section while running on shea butter and its fractions is not reduced.
 - 2) Bleaching of shea butter and its fractions is carried out with the addition of bleaching clay, more than 1-1.5%, which significantly reduces the rate of filtration, and leads to up to 30% reduction in the section capacity due to the following:
 - shea butter has a high content of unsaponifiable matter and phosphatides
 - in refining, crude shea products with high acid value and non-fatty impurities content are used, the oil is very dark
 - unique product parameters - high content of symmetrical triglycerides, it requires lower deodoration temperatures of 227-230C, with high level of FFA content
 - at current capacities it was noted that the capacity of vertical filters decreases rapidly during operation, 2-4 times more bleaching clay is used.
- Please note that the commercial samples of refined shea butter have the quality parameters indicated on p.2. Commercial samples of shea butter fractions on the market also have high level of unsaponifiable matter content. We assume that these products will be refined by us with such quality parameters.

During the processing, shea butter undergoes a degumming stage, partial removal of “latex”, and separation by liquid fractionation. Unsaponifiable matter and latex are concentrated in different ratios in shea olein and shea stearin. Products are fed for neutralization, bleaching and deodoration without additional degumming stage.

This then brings us to a number of questions:

IMPORTANT: please specify if there are any potential losses in production capacity, and section performance problems that may occur while processing shea products with unsaponifiable matter value of 2% and with unsaponifiable matter value of 8%? Can this change the capacity of the bleaching section? In what way?

What quality parameters of the section can be put in the contract, if the capacity of the section is 300 tpd with the specified parameters?

The proposed section has 2 vertical filters. From our processing experience, there is a need to install a third filter (spare one) to allow maintenance of the filters without downtime.

Equipment selection requirements

3) refining

Shea products have a specific triglyceride composition and require lower deodoration temperatures (220-230C), with high acid value. The deodorizer shall allow deodoration of cocoa butter, which also consists of symmetrical triglycerides, at a deodoration temperature of 150-160C.

Mix-up of more than 0.5% are not allowed in the products processed in the section.

Please specify the maximum deodoration capacity at temperatures of 150C, input FFA level 3, and after deodoration - 0.05%. Change of product is possible once per day. Due to the specific parameters of raw materials (different FFA levels and different temperature requirements), it is necessary to take into account the time for temperature changes and minimize the risks of cross-contamination of the products.

When feeding shea olein with 8-10% unsaponifiable matter content and 6-8% caritenes content to deodoration, will it affect the process, wear and tear of the equipment? In what way? How often is the cleaning/flushing of the stripping column, scrubber, deodorizer plates, and heating elements required?

How long the transition from shea deodoration at 230°C to cocoa butter deodoration at 150°C will take? What time is required for the temperature drop and subsequent heating when switching back to shea processing?

What are the losses when switching to a new product? How can losses or mix-up of the products in the bleaching and deodorization section be minimized?

Physical-chemical parameters

	Deodorized cocoa butter requirements	Crude cocoa butter	Bleached cocoa butter	Cocoa butter after deodoration at 170C for 2 h	Cocoa butter after deodoration at 170C for 4 h
Acid value, mgKOH/g	Max. 4	5.1	4.43	2.72	2.49
Peroxide value, mmol O ₂ /kg	Max. 4	4.2	2.4	0.9	0.5
Anisidine value, c.u.		1.7	1.5	0.5	0.6
Solid Fat Content, %					
20		75.7	74.5	74.5	73.7
25		67.7	66.9	67.8	69.6
30		44.2	43.8	43.5	43.9
35		0.3	0.2	0.5	1.4
Triglyceride content, %					
POP		17.59	15.1	15.9	16.48
POS		41.85	40.91	39.15	41.46
SOS		27.12	27.45	26.93	27.71
Lovibond colour					
Yellow		70	72.9	72.6	70
Red		15.5	10.4	8.6	7.9
Blue			2.9		
Arbitration tasting assessment		5.5	-	7.2	7.3