

# PHILIPPINE NATIONAL STANDARD

PNS/BAFS PAES 253:2018  
ICS 65.060.99

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## Agricultural Machinery- Cacao Huller- Specifications



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**Foreword**

The Philippine National Standards (PNS) for Agricultural Machinery- Cacao Huller- Specifications (PNS/BAFS PAES 253:2018) has been prepared by the Technical Working Group (TWG) for Various Agricultural Machinery as per approved Department of Agriculture Special Order No. 1045 series of 2016.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

The word “shall” is used to indicate mandatory requirements to conform to the standard.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others.

## 1 Scope

This standard specifies the fabrication and performance requirements for cacao huller.

## 2 References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this documents. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PAES 101:2000, *Agricultural Machinery – Technical Means for Ensuring Safety – General*

PAES 102:2000, *Agricultural Machinery – Operator’s Manual – Content and Presentation*

PAES 103:2000, *Agricultural Machinery – Method of Sampling*

PNS/BAFS/PAES 192:2016, *Agricultural Machinery- Guidelines on After- Sales Service*

PNS/BAFS PAES 254:2018, *Agricultural Machinery – Cacao Huller – Methods of Test*

## 3 Terms and Definitions

For the purpose of this standard, the following terms and definitions shall apply.

### 3.1

#### **blower loss**

ratio of the weight of unhulled dry cacao or roasted cacao beans and cacao nibs blown by the huller fan to the total weight of the input cacao nibs, expressed in percentage (%)

### 3.2

#### **cacao hull**

cacao shell

cacao testa

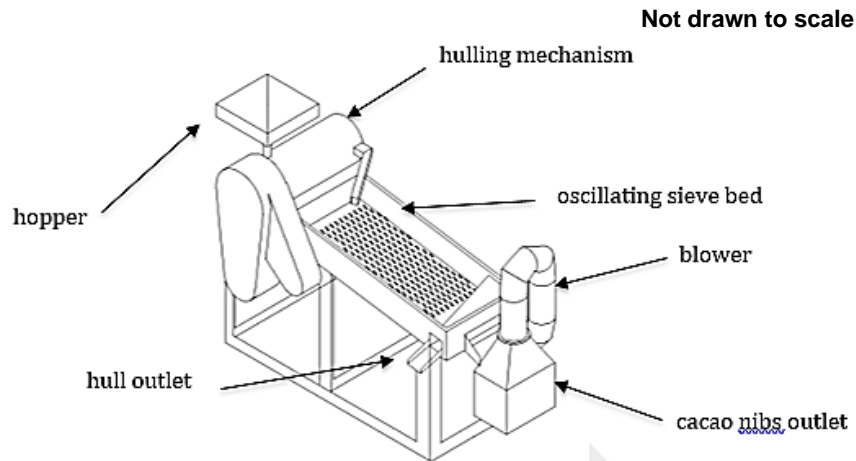
external covering or protective layer of the cacao bean

### 3.3

#### **cacao huller**

cacao winnower

machine that cracks or breaks the dry cacao or roasted cacao beans and removes the hull to produce cacao nibs



**Figure 1 – Cacao huller and its essential components**

**3.4**

**cacao hull outlet**

part of the machine where cacao hulls are discharged

**3.5**

**cacao nib outlet**

part of machine where cacao nibs are discharged

**3.6**

**cacao nibs recovery index**

ratio of the total weight of the cacao nibs collected at cacao nib outlet to the input cacao nibs

**3.7**

**cacao nibs**

cotyledon of the cacao seed obtained from cracking and winnowing of dry cacao or roasted cacao beans



**2.a**



**2.b**



**2.c**

**Figure 2 – a) dry cacao    b) cacao hull    c) cacao nibs**

**3.8**

**cracking**

process of breaking the dry cacao or roasted cacao beans manually or mechanically

**3.9**

**cracking mechanism**

part of the rotary huller that breaks the dry cacao or roasted cacao beans to detach the hull

**3.10**

**dry cacao**

commercial term used to designate cacao beans which are evenly dried and has a moisture content between 6-8 %

**3.11**

**hulling**

cracking and winnowing of dry cacao or roasted cacao beans

**3.12**

**hulling efficiency**

ratio of the weight of the cacao nibs collected at the cacao nib outlet/s to the weight of the unhulled beans and cacao nibs collected at the cacao nib outlet, expressed in percentage (%)

**3.13**

**input cacao nibs**

theoretical amount of cacao nibs in the input dry cacao or roasted cacao beans, expressed in kilogram (kg)

**3.14**

**input capacity**

weight of dry cacao or roasted cacao beans fed into the huller per unit time, expressed in kilogram per hour (kg/h)

**3.15**

**intake hopper**

part of the machine where dry cacao or roasted cacao beans are loaded

**3.16**

**output capacity**

weight of cacao nibs collected at the cacao nib outlet per unit time, expressed in kilogram per hour (kg/h)

**3.17**

**purity**

amount of cacao nibs free from foreign matter to the total weight of uncleaned cacao nibs, expressed in percent (%)

**3.18**

**roasted cacao beans**

product obtained from roasting cacao beans

**3.19**

**unhulled beans**

whole or cracked beans which fully or partially retain its hull after passing through the hulling mechanism

**3.20**

**winning**

process of separating the cacao hull from the dry cacao or roasted cacao beans after cracking

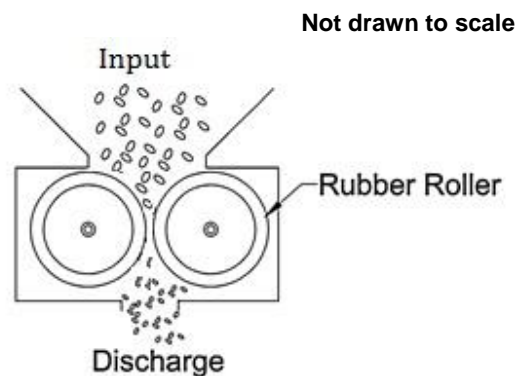
**4 Classification**

The classification of cacao huller should be based but not limited to the following.

**4.1 Cracking mechanism**

**4.1.1 Steel or rubber roller cracker**

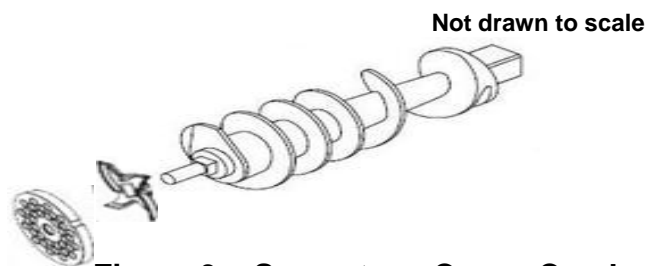
The cracker is made of steel or rubber bonded to an inner metal drum core use for breaking the cacao beans.



**Figure 2 – Roller-type Cacao Cracker**

**4.1.2 Screw-type or auger-type cracker**

It consists of feeding auger and stationary perforated discs or the cracking plate.



**Figure 3 – Screw-type Cacao Cracker**

#### 4.1.3 Serrated cone cracker

It is a type of cracker where the cacao beans pass through a cone-shaped steel with serrations.

Not drawn to scale

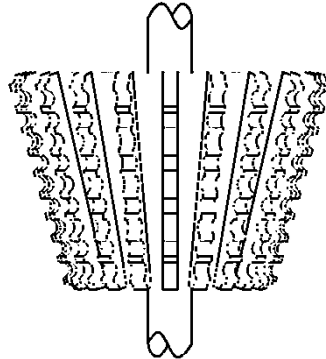


Figure 4 – Serrated Cone-type Cacao Cracker

#### 4.1.4 Hammer-type cracker

Hammer- type cracker crushes the cacao beans by impact. It has a number of hammer bars (fixed or swinging) mounted radially on a shaft rotating along the horizontal axis

Not drawn to scale

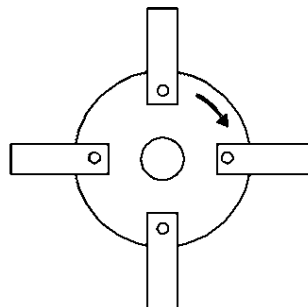


Figure 5 – Hammer-type Cracker

### 5 Fabrication Requirements

**5.1** Steel bars, metal sheet or plate and mild steel shall be generally used for the manufacture of the different components of the cacao huller. Parts that are in direct contact to the cacao nibs shall be made of corrosion resistant and food grade materials in compliance to the food safety standards.

**5.2** Frame and stand shall be able to support the whole cacao huller assembly during operation.

**5.3** For rubber rolls, white or light colored rubber shall be used as cracking mechanism.

**5.6** Bolts and nuts, screws, bearings, bushing and seals to be used shall conform to the food safety requirements, PAES or other international standards

**6 Performance and Other Requirements**

- 6.1 Input and output capacity shall meet the manufacturer’s specifications.
- 6.2 The performance criteria for cacao huller shall be as specified in Table 1.

**Table 1 – Performance Criteria for Cacao Huller**

<b>Criteria</b>	<b>Performance Data</b>
Hulling efficiency, percent, minimum	98
Cacao nibs recovery index, decimal, minimum	0.85
Purity, percent, minimum	97

**7 Safety, Workmanship, and Finish**

- 7.1 The noise level should conform with the provisions given in Annex A.
- 7.2 There shall be earmuffs or other ear protective devices provided for the operators to use when 95 db (A) is exceeded during operation.
- 7.3 Cacao huller shall be free from any manufacturing defects that may be detrimental to its operation.
- 7.4 The rotating components of cacao huller shall be statically and dynamically balanced.
- 7.5 Cracking mechanism shall be adjustable and replaceable when needed.
- 7.6 All metal surfaces shall be free from rust.
- 7.7 The cacao huller shall be free from sharp edges and surfaces that may injure the operator. Warning notices shall be provided in accordance with PAES 101:2000.
- 7.8 Mechanism for immediate disengagement of power shall be provided.
- 7.9 All moving parts shall be provided with cover or guard.
- 7.10 Cracking chamber shall be totally enclosed to avoid contamination.

**8 Warranty for Fabrication and Services**

Warranty shall be provided for parts and services except for normal wear and tear of expendable or consumable maintenance parts for at least one (1) year upon the acceptance of the procuring entity. General requirements of the warranty shall conform to PNS/BAFS/PAES 192:2016.



## **9 Maintenance and Operation**

**9.1** Each unit of cacao huller shall be provided with a set of manufacturer's standard tools required for maintenance.

**9.2** Operator's manual based on PAES 102:2000, maintenance schedule and list of warrantable parts of the cacao huller shall be provided.

**9.3** The cacao huller shall be easy to clean and operate.

## **10 Sampling**

Cacao huller shall be sampled for testing in accordance with PAES 103:2000 or any other suitable method of selection.

## **11 Testing**

Cacao huller shall be tested in accordance with PNS/BAFS PAES 254:2018.

## **12 Marking and Labeling**

**12.1** Each unit of cacao huller shall be marked at the most visible place with the following information:

**12.1.1** Registered trademark of the manufacturer

**12.1.2** Brand

**12.1.3** Model

**12.1.4** Year of Manufacture

**12.1.5** Serial Number

**12.1.6** Name, address and contact number of the manufacturer/importer/distributor

**12.1.7** Country of manufacture/origin (if imported) / "Made in the Philippines" (if manufactured in the country)

**12.1.8** Input capacity, kg/h

**12.1.9** Recommended hulling speed, rpm

**12.1.10** Power requirement, kW

**12.2** Safety/Precautionary markings shall be provided. It shall be stated in English and Filipino and printed in red color with a white background.

**12.3** The markings shall be durably bonded to the base surface material. The markings shall be all weather resistant and under normal cleaning procedures. It shall not fade, discolor, peel, crack or blister and shall remain legible.

**Annex A**  
(informative)

**Occupational Safety and Health Standard (Rule 1074.01 – 1074.03)**

**A.1 Threshold Limit Values for Noise**

The threshold limit values refer to sound pressure that represents conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech.

Feasible administrative or engineering controls shall be utilized when workers are exposed to sound levels exceeding those specified in Table 8b hereof when measured on a scale of a standard sound level meter at slow response. If such controls fail to reduce sound within the specified levels, ear protective devices capable of bringing the sound level to permissible noise exposure shall be provided by the employer and used by the worker.

**A.2 Permissible Noise Exposure**

**A.2.1** The values specified in Table 2 apply to total time of exposure per working day regardless of whether this is one continuous exposure or a number of short-term exposures but does not apply to impact or impulsive type of noise.

**Table 2 - Permissible Noise Exposure**

<b>Duration per day, hours</b>	<b>Sound Levels [dB(A)], slow response</b>
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼	115

**A.2.2** If the variation in noise level involves maximum intervals of one (1) second or less, it shall be considered as continuous. If the interval is over one (1) second, it becomes impulse or impact noise.

**A.2.3** When the daily noise exposure is composed of two or more periods noise exposure of different levels, their combined effect should be considered rather than the effect of each.

If the sum of Equation A exceeds one (1), then the mixed exposure should be considered to exceed the threshold limit value. However, the permissible levels found in the table shall not be exceeded for the corresponding number of hours per day allowed. Noise exposures of less than 90 dBA are not covered by Equation A.

$$X = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} \quad (\text{Equation A})$$

where: X is the sum of the ratios of C and T  
C is the total time of exposure at a specified noise level  
T is the total time of exposure permitted at the level

**A.2.4** Exposures to impulsive or impact noise shall not exceed 140 decibels peak sound pressures level (maximum value).

**Bibliography**

OSHC-DOLE (2016). *Occupational Safety and Health Standard, Rule 1074:01-03 – 2013*

PNS/BAFPS 131:2014, *Code of Practice for the Prevention and Reduction of Ochratoxin A (OTA) Contamination in Philippine Tablea*

PNS/BAFPS 111:2012, *Philippine Tablea*

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