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Agricultural machinery – Coffee Pulper – Methods of Test

BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 253:2011, Agricultural machinery – Coffee Pulper – Methods of Test was approved for adoption as Philippine National Standard by the Bureau of Product Standards upon the recommendation of the Agricultural Machinery Testing and Evaluation Center (AMTEC) and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development of the Department of Science and Technology (PCARRD-DOST).

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) through the project "Development of Standards for Agricultural Production and Postharvest Machinery" funded by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development – Department of Science and Technology (PCARRD – DOST)

This standard has been technically prepared in accordance with BPS Directives Part 3:2003 – Rules for the Structure and Drafting of International Standards.

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.

In the preparation of this standard, the following documents/publications were considered:

PAES 207:2000 Agricultural Machinery – Rice Mill – Methods of Test

PAES 221:2004 Agricultural Machinery – Peanut Sheller – Methods of Test

Garcia, Lawrence Dean Basisto. Testing and evaluation of the CvSU coffee pulper based on the formulated standard specifications and methods of test. Undergraduate Thesis. Agricultural Machinery Division, Institute of Agricultural Engineering, College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños. April 2007

CONTENTS

1 Scope

This standard specifies the methods of test and inspection for coffee pulper. Specifically, it shall be used to:

1.1 verify the mechanism, dimensions, materials, accessories of the coffee pulper and the list of specifications submitted by the manufacturer;

1.2 determine the performance of the machine;

1.3 evaluate the ease of handling and safety features; and

1.4 report the results of the tests.

2 References

The following normative documents contain provisions, which through reference in this text constitute provisions of this National Standard:

PAES 103:2000 Agricultural Machinery – Methods of Sampling

PAES 252:2011 Agricultural Machinery – Coffee Pulper – Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 252 and the following shall apply:

3.1
mechanically damaged parchment coffee
ratio of the total weight of damaged parchment coffee to the total weight of sample, expressed in percentage

3.2
input capacity
weight of coffee cherry fed into the pulper per unit of time, expressed in kilogram per hour

3.3
output capacity
weight of parchment coffee collected at coffee outlet per unit time, expressed in kilogram per hour

3.4
overall height
distance between the horizontal supporting plane surface and the horizontal plane touching the uppermost part of the pulper machine

NOTE: All parts of the coffee pulper projecting upwards are contained between these two planes.

3.5
overall length
distance between the vertical planes at the right angles to the median plane of the pulper and touching its front and rear extremities

NOTE: All parts of the coffee pulper, in particular, components projecting at the front and at the rear are contained between these two planes. Where an adjustment of components is possible, it shall be set at minimum length.

3.6
overall width
distance between the vertical planes parallel to the median plane of the machine, each plane touching the outermost point of the pulper on its respective side

NOTE: All parts of the coffee pulper projecting sidewards are contained between these two planes.

3.7
running-in period
preliminary operation of the machine to make various adjustments prior to the conduct of the test until the operation is stable

3.8
separation loss
ratio of the total weight of the parchment coffee that comes out to the pulp discharge to the total input weight of coffee cherry to the pulper, expressed in percentage

3.9
pulping efficiency
ratio of total weight of parchment coffee collected at all outlets to the total coffee cherry input to the machine, expressed in percentage

3.10
pulping recovery
ratio between the total weight of parchment coffee collected at the main outlet to the total weight of input coffee cherry to the machine, expressed in percentage

3.11
unpulped loss
ratio of the total weight of unpulped coffee cherry to the total input weight of coffee cherry to the pulper, expressed in percentage

3.12
scattering loss
ratio of the total weight of the parchment coffee that fell around the base of coffee pulper to the total coffee cherry input to the machine, expressed in percentage by weight

3.13
purity
ratio of the total weight of parchment coffee free of foreign matters to the total weight of sample expressed in percentage

4 General Conditions for Test and Inspection

4.1 Selection of coffee pulper to be tested

Coffee pulper submitted for testing shall be sampled in accordance to PAES 103.

4.2 Role of manufacturer/distributor

The manufacturer/distributor shall submit specifications and other relevant information about the coffee pulper and shall abide with the terms and conditions set forth by an official testing agency.

4.3 Role of the operator

An officially designated operator shall be skilled and shall demonstrate, operate, adjust, and repair as the case maybe, related to the operation of the coffee pulper.

4.4 Test site conditions

The coffee pulper shall be tested as installed for normal operation. The site should have ample provisions for material handling, temporary storage, workspace and suitable for normal working condition.

4.5 Test instruments

The instrument to be used shall be calibrated and checked by the testing agency prior to the measurements. The suggested list of test instruments and materials needed to carry out the coffee pulper test is shown in Annex A.

4.6 Test materials

Coffee cherry to be used shall be commonly or locally grown and shall be soaked in water for about 24 hours to be able to identify and remove the floaters. The coffee cherry that did not float shall be used as test materials. The amount of test material to be supplied shall be at least 75% of input capacity of coffee pulper.

4.7 Termination of Test

If there is major component breakdown during testing, the test engineer from the official testing agency shall terminate the test.

5 Test and Inspection

5.1 Verification of the technical data and information of the manufacturer

5.1.1 This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the coffee pulper in comparison with the list of technical data and information of the manufacturer.

5.1.2 A plane level surface shall be used as reference plane for verification of dimensional specifications of coffee pulper.

5.1.3 The items to be inspected and verified shall be recorded in Annex B.

5.2 Performance test

5.2.1 This is carried out to obtain actual data on the overall coffee pulper performance.

5.2.2 Data on coffee cherry such as type, size, variety and source shall be recorded.

5.2.3 Test materials to be used.

Test materials prepared to be used for the running-in and for each test trial shall be the same characteristics and conditions.

5.2.4 Running-in and preliminary adjustment

Before the start of the test, the coffee pulper should have undergone running-in period. (No other adjustment shall be permitted while the test is on-going).

5.2.5 Operation of the pulper machine

The coffee pulper shall be operated at the speed and feed rate recommended by the manufacturer. The same recommended feeding rate shall be maintained during the test run. After the test run, the area and the pulper shall be cleaned and then prepared for the next trial. The procedure shall be repeated for the succeeding test trials.

5.2.6 Test trial

There shall be a minimum of three test trials.

5.2.7 Sampling

5.2.7.1 Sampling procedures for test materials

Before the start of each test trials, take at least 500g of representative samples of coffee cherry for determination of material conditions (i.e. size, moisture content)

5.2.7.2 Sampling from outlets

5.2.7.2.1 During each test trial, samples shall be randomly collected from the outlets (parchment coffee outlet and pulp outlet) to be analyzed in the laboratory for losses, purity and parchment coffee quality.

5.2.7.1.2 In the collection of the sample in the outlets, use a rectangular box-shaped nylon catch open at one end of the small side. Three sample shall be collected randomly from the outlets with ten-second duration per collection.

5.2.7.3 Collection of scattered parchment coffee

For testing purposes, scattered parchment coffee shall be gathered. Spreading of canvas sheets on the pulping floor area to catch the parchment coffee after each trial shall be done. The collected parchment coffee shall be put on a container and shall be labeled.

5.2.7.4 Handling of samples

Samples to be taken to the laboratory shall be placed in appropriate containers and properly labeled.

5.2.8 Data collection

5.2.8.1 Duration of test

The duration of each test trial shall commence at the start of the pulping operation and ends after last discharge from the main parchment coffee outlet.

5.2.8.2 Noise level for power-operated coffee pulper

The noise emitted by the machine shall be measured using a noise level meter at the location of the operators and bagger. The noise level shall be measured 50 mm away from the ear level.

5.2.8.3 Speed of components

The speed of the rotating components (e.g. shaft of pulping mechanism, prime mover shaft) shall be taken using a tachometer.

NOTE: Measurements shall be taken with and without load for sub-clauses 5.2.8.2 and 5.2.8.3 as specified in Annex C.

5.2.8.4 Energy consumption for mechanized coffee pulper

A power meter shall be used to measure electric energy consumption. In case an internal combustion engine is used, the fuel tank shall be filled to its capacity. After each test trial the tank shall be refilled using graduated cylinder. The amount of refueling is the fuel consumption for the test.

5.2.8.5 For manually operated coffee pulper, pulse rate of the operator shall be taken. Blood pressure shall be measured using sphygmomanometer. Data obtained shall be recorded in Annex C.

NOTE: Measurement shall be taken before and after operation.

5.2.8.6 Data recording and observations

Record sheet for all data and information during the test is given in Annex C.

6 Laboratory Analyses

Laboratory analyses shall be made to determine processing efficiency of the pulper machine. The laboratory test data sheet to be used is given in Annex D.

6.1 Moisture content determination

6.1.1 This shall be taken using oven-dry method.

6.1.2 For each test trial, weigh three-100g of coffee cherry, place in the moisture can and record the weight. Ensure that no moisture is lost or gained by the sample between the time it was collected and when it is weighed in a moisture can. Record the initial weight.

6.1.3 Dry the sample in the oven with temperature of 103°C ± 1°C for 72 hours.

6.1.4 After removing the samples from the oven, sample container with samples should be placed in a desiccator and allowed to cool to the ambient temperature.

6.1.5 Weigh the moisture can plus the dried sample. Record the final weight. Calculate the moisture content using Formula in Annex E.

6.2 Purity determination

Take three samples of 500g each from the main parchment coffee outlet. Clean the parchment coffee to remove the impurities and other foreign matters. The clean parchment coffee shall be weighed and recorded. The percent purity shall be calculated using formula in Annex E.

6.3 Determination of losses

6.3.1 Separation loss

In each test trial, separated parchment coffee from the pulp outlet shall be separated and weighed. The time of collection of the three samples shall be taken and recorded for the computaion of the separation loss.

6.3.2 Unpulped loss

In each test trial, unpulped coffee cherry from the parchment coffee outlet and pulp outlet shall be seprated and weighed. The time of collection of the three samples shall be taken and recorded for the computation of the unpulped loss.

6.3.3 Scattering loss

In each test trial, scattered parchment coffee from the canvas sheet shall be collected and weighed for the computation of the scattering loss.

6.4 Determination of percent mechanically damaged parchment coffee

Three 100g samples from parchment coffee outlet shall be taken for analysis. Parchment coffee that are broken, damaged, have cracks or crushed shall be separated and weighed. Computation for the percent broken beans shall be done using formula in Annex E.

7 Formula

The formulas to be used during calculations and testing are given in Annex E.

8 Test Report

The test reports shall include the following information in the order given:

8.1 Title

8.2 Summary of Results

8.3 Purpose and Scope of Test

8.4 Methods of Test

8.5 Condition of the Machine

8.6 Description of the Machine

Table 1 – Machine Specifications

8.7 Results and Discussions

8.8 Observations (include pictures)

Table 2 – Performance test data

8.9 Names, signatures and designation of test engineers

Annex A

Suggested List of Field and Laboratory Test Instruments and Materials

A.1	**Instruments**	**Quantity**
A.1.1	**Field**	
A.1.1.1	Digital Tachometer	1
A.1.1.2	Digital timers (Accuracy: 0.1 sec.)	2
A.1.1.3	Tape measure (with maximum length of 5m)	1
A.1.1.4	Noise level meter Range: 30 dB(A) to 130 dB(A)	1
A.1.1.5	Weighing scale (capacity: 100 kg) Scale division: 0.5 kg	1
A.1.1.6	Graduated cylinder (for engines) (500 mL capacity)	1
A.1.1.7	Power meter (for electric motors) 60 Hz, 220 V	1
A.1.1.8	Psychrometer	1
A.1.1.9	Spygmomanometer	1
A.1.1.10	Digital camera	1
A.1.2	**Laboratory**	
A.1.2.1	Weighing scale (sensitivity: 0.1 g)	1
A.1.2.2	Air oven	1
A.1.2.3	Desiccator	1
A.1.2.4	Vernier caliper (0.05 mm accuracy, 200 mm length)	1
A.1.2.5	Foot ruler (graduation 1mm)	1
A.1.2.6	Aluminum moisture can	
A.1.2.7	Magnifying lens (minimum of 10 magnifications)	1
A.2	**Materials**	
A.2.1	Sample bags	
A.2.2	Labeling tags which include	
A.2.2.1	Date of test	
A.2.2.2	Pulper on test	
A.2.2.3	Sample source	
A.2.2.4	Trial number	

Annex B

Specifications of Coffee Pulper

Name of Applicant/ Distributor: _____
Address: _____
Tel No: _____
Name of Manufacturer: _____
Address: _____
Tel No: _____

GENERAL INFORMATION

Make: _____ Type: _____
Serial No: _____ Brand/Model: _____
Production date of Coffee Pulper: _____
Testing Agency: _____ Test Engineer: _____
Date of Test: _____ Location of Test: _____

Items to be inspected

ITEMS	Specifications of the Manufacturer	Verification by the Testing Agency
B.1 Main Structure		
B.1.1 Overall dimensions, mm		
B.1.1.1 length		
B.1.1.2 width		
B.1.1.3 height		
B.1.2 Weight of machine without prime mover, kg		
B.2 Pulping Chamber		
B.2.1 Drum-type		
B.2.1.1 Material of construction		
B.2.1.2 Dimensions, mm		
B.2.1.2.1 length		
B.2.1.2.2 diameter		
B.2.1.2.3 thickness of drum		
B.2.2 Fluted cylinder		
B.2.2.1 Materials of construction		
B.2.2.2 Dimensions, mm		
B.2.2.2.1 diameter		
B.2.2.2.2 length		
B.2.2.2.3 flute thickness		
B.2.2.3 flute inclination		
B.2.3 Disc-type		

B.2.3.1 Material of construction		
B.2.3.2 Dimensions, mm		
B.2.3.2.1 diameter		
B.2.3.2.2 thickness		
B.2.3.3 Chop rails		
B.2.3.3.1 Material of construction		
B.2.3.3.2 Dimensions, mm		
B.2.3.3.2.1 length		
B.2.3.3.2.2 width		
B.2.3.4 Clearance of disc and chop rails, mm		
B.2.3.5 Disc bulbs		
B.2.3.5.1 Material		
B.2.3.5.2 Dimensions, mm		
B.2.3.5.2.1 thickness		
B.2.3.5.2.2 diameter		
B.2.4 Slotted plate type		
B.2.4.1 Material of construction		
B.2.4.2 Dimensions, mm		
B.2.4.2.1 length		
B.2.4.2.2 diameter		
B.2.4.2.3 thickness		
B.2.4.2.4 size of slots, mm		
B.2.4.2.4.1 height		
B.2.4.2.4.2 width		
B.3 Hopper		
B.3.1 Material of construction		
B.3.2 Location		
B.3.3 Other special features		
B.3.4 Dimensions of bottom opening, mm		
B.3.4.1 length		
B.3.4.2 width		
B.3.4.3 thickness		
B.3.4.4 height from the ground		
B.3.5 Hopper inclination		
B.4 Discharge outlet		
B.4.1 Parchment coffee outlet		
B.4.1.1 Material of construction		
B.4.1.2 Location		
B.4.1.3 Dimensions, mm		
B.4.1.3.1 length		
B.4.1.3.2 width		
B.4.1.3.3 height from ground		
B.4.2 Pulp outlet		
B.4.2.1 Material of construction		

B.4.2.2 Dimensions, mm		
B.4.2.2.1 length		
B.4.2.2.2 width		
B.4.2.2.3 height from ground		
B.5 Water-pulp-parchment conveyor (if available)		
B.5.1 Material		
B.5.2 Dimensions, mm		
B.5.2.1 Length		
B.5.2.2 width		
B.5.2.3 height from ground		
B.6 Safety devices (enumerate)		
B.7 Special features (enumerate)		
B.8 Prime mover		
B.8.1 Engine		
B.8.1.1 Brand		
B.8.1.2 Model		
B.8.1.3 Serial number		
B.8.1.4 Type (stroke/ignition)		
B.8.1.5 Rated power, kW		
B.8.1.6 Rated speed, rpm		
B.8.1.7 Cooling system		
B.8.1.8 Starting system		
B.8.1.9 Weight, kg		
B.8.2 Electric motor		
B.8.2.1 Brand		
B.8.2.2 Type		
B.8.2.3 Make or manufacturer		
B.8.2.4 Serial number		
B.8.2.5 Rated power, kW		
B.8.2.6 Rated speed, rpm		
B.8.2.7 Phase		
B.8.2.8 Voltage, V		
B.8.2.9 Current, A		
B.8.2.10 Frequency, Hz		

Annex C

Performance Test Data Sheet

Test Trial No. _____Date: _____
Test Engineer: _____Location: _____
Assistants: _____ Test Specimen: _____
Test Requested by: _____Manufacturer: _____

	Trials			Ave
	I	II	III	
C.1 Test Materials				
C.1.1 material				
C.1.2 variety				
C.1.3 source				
C.1.4 moisture content, %				
C.2 Ambient Condition				
C.2.1 Wet-bulb temperature, °C				
C.2.2 Dry-bulb temperature, °C				
C.3 Performance Test				
C.3.1 Speed of components, rpm				
C.3.1.1 Prime mover				
C.3.1.1.1 without load				
C.3.1.1.2 with load				
C.3.1.2 Pulping shaft				
C.3.1.2.1 without load				
C.3.1.2.2 with load				
C.3.2 Noise level, dB(A)				
C.3.2.1.1 without load				
C.3.2.1.2 with load				
C.3.3 Weight of input, kg				
C.3.4 Weight of output, kg				
C.3.5 Total operating time, min				
C.3.6 Input capacity, kg/h				
C.3.7 Pulping Efficiency, %				
C.3.8 Purity, %				
C.3.9 Mechanically damaged parchment coffee, %				
C.4 Power consumption				
C.4.1 For Mechanically Operated Coffee Pulper				
C.4.1.1 Internal Combustion Engine				
C.4.1.1.1 Engine time of operation, min				
C.4.1.1.2 Fuel consumed, L				

C.4.2.1.3 Fuel consumption rate, L/h				
C.4.1.2 Electric Motor				
C.4.1.2.1 Power, kW				
C.4.1.2.1.1 Without load				
C.4.1.2.1.2 With load				
C.4.1.2.2 Current, A				
C.4.1.2.2.1 Without load				
C.4.1.2.2.2 With load				
C.4.1.2.3 Voltage, V				
C.4.1.2.3.1 Without load				
C.4.1.2.3.2 With load				
C.4.2 For Manually Operated Coffee Pulper				
C.4.2.1 Pulse rate, bpm				
C.4.2.1.1 before operation				
C.4.2.1.2 after operation				
C.4.2.2 Blood pressure, mmHg (systolic over diastolic)				
C.4.2.2.1.1 before operation				
C.4.2.2.1.2 after operation				

C.5 Welding Acceptance Test	**Remarks**
C.5.1 Crack prohibition	
C.5.2 Weld/base-metal fusion	
C.5.3 Crater cross section	
C.5.4 Weld profile	
C.5.5 Time of inspection	
C.5.6 Undersize welds (if any)	
C.5.7 Undercut	
C.5.8 Porosity (presence of air holes on the welded part)	

C.6 Evaluate the following observations:

Items	**Remarks**
C.6.1 Ease of loading	
C.6.2 Ease of cleaning parts	
C.6.3 Ease of adjusting parts	
C.6.4 Ease of repairing of parts	
C.6.5 Ease of collecting output	
C.6.6 Ease of operation	
C.6.7 Safety	
C.6.8 Ease of transporting the machine	
C.6.9 Vibration	

C.7 Other Observations:

_____
_____
_____
_____
_____

Annex D

Laboratory Test Data Sheet

Machine Tested: _____ Analyzed by:_____
Date of Test: _____ Date: _____

D.1 Crop Condition

D.1.1 Moisture content determination (Oven method)

Item	Trial I	Trial II	Trial III	Average
Initial weight, g				
Final weight, g				
Moisture content, %				
			General Average	

D.2 Parchment Coffee Analysis

D.2.1 Purity determination

Initial weight of samples (unclean) = 500g

Items	Trial I				Trial II				Trial III				Gen. ave.
	I	II	III	ave	I	II	III	ave	I	II	III	ave	
Cleaned, g													
Purity, %													

D.2.2 Loss determination

Trials	Separation Loss		Unpulped Loss		Scattering Loss
	Duration, sec:		Duration, sec:		
	Sample weight, g	Parchment coffee recovered, g	Sample weight, g	Unpulped coffee cherry, g	Parchment coffee recovered, g
1a					
1b					
1c					
Total					
2a					
2b					
2c					
Total					
3a					
3b					
3c					
Total					
TOTAL					

D.2.3 Pulping efficiency

Trial No.	Separation Loss		Unpulped Loss		Scattering Loss		Total	
	Wt.	%	Wt.	%	Wt.	%	Output, kg	Input, kg
I								
II								
III								
Average								

D.3.2 Other physical observations on parchment coffee

_____
_____
_____
_____
_____

Annex E

Formula

E.1 Moisture Content

$$MC_{wb} = \frac{W_i - W_f}{W_i} \times 100$$

where:

MC_{wb} = moisture content, %
Wi = initial weight of the sample, g
Wf = final weight of the sample, g

E.2 Fuel Consumption Rate

$$F_r = \frac{Fc}{T_e}$$

where:

F_r = fuel consumption rate, L/h
Fc = amount of fuel consumed, L
T_e = engine time of operation, h

E.3 Input Capacity

$$C_i = \frac{W_c}{T_o}$$

where:

C_i = input capacity, kg/h
Wc = total weight of coffee cherry input, kg
To = total operating time, h

E.4 Output Capacity

$$C_o = \frac{W_{cpc}}{T_o}$$

where:

C_o = output capacity, kg/h
W_{cpc} = weight of clean parchment coffee, g
To = total operating time, h

E.5 Purity

$$P = \frac{W_{cl}}{W_{uc}} \times 100$$

where:

P = purity, %
W_{cl} = total weight of cleaned parchment coffee, g
W_{uc} = total weight of uncleaned parchment coffee, g

E.6 Losses

E.6.1 Total Loss

$$L_t = L_S + L_{UP} + L_{SC}$$

where:

Lt = total loss, g
L_S = separation loss, g
L_{UP} = unpulped loss, g
L_{SC} = scattering loss, g

E.6.2 Separation Loss

Amount:

$$L_S = \frac{W_s}{T_c} \times T_o$$

where:

L_S = separation loss, g
W_s = weight of separated clean parchment coffee, g
T_c = total duration of collection, h
T_o = total duration of operation per trial, h

Percentage:

$$L_S = \frac{W_s}{W_{cpc} + L_t} \times 100$$

where:

L_S = separation loss, %
W_s = weight of separated clean pulped parchment coffee, g
W_{cpc} = weight of clean parchment coffee, g
L_t = Total loss, g

E.6.3 Unpulped Loss

Amount:

$$L_{UP} = \frac{W_{up}}{T_c} \times T_o$$

where:

L_{UP} = Unpulped loss, g
W_{up} = weight of unpulped clean coffee cherry, g
T_c = total duration of collection, h
T_o = total duration of operation per trial, h

Percentage:

$$L_{UP} = \frac{W_{up}}{W_{cpc} + L_t} \times 100$$

where:

L_{UP} = Unpulped loss, %
W_{up} = weight of unpulped clean coffee cherry, g
W_{cpc} = weight of clean pulped parchment coffee, g
L_t = total loss, g

E.6.4 Scattering Loss

Percentage:

$$L_{SC} = \frac{W_{sc}}{W_{cpc} + L_t} \times 100$$

where:

L_{SC} = scattering loss, %
W_{sc} = weight of scattered clean parchment coffee, g
W_{cpc} = weight of cleaned pulped parchment coffee, g
L_t = total loss, g

E.7 Pulping Efficiency

$$Eff_p = \frac{W_{cpc} + L_S + L_{SC}}{W_{cpc} + L_t} \times 100$$

or $Eff_p = 100\% - L_{UP}$

where:

Eff_p = pulping efficiency, %
W_{cpc} = weight of clean parchment coffee, g
S_L = separation loss, g
SC_L = scattering loss, g
L_t = total loss, g
L_{UP} = unpulped loss, %

E.8 Pulping recovery

$$R_{pc} = \frac{W_{cpc}}{Wc} \times 100$$

where:

Rpc = pulping recovery, %
Wcpc = total weight of clean parchment coffee on the main Parchment coffee outlet, kg
Wc = total weight of coffee cherry input, kg

E.9 Mechanically Damaged Parchment coffee

$$MD_{cb} = \frac{W_{dpc}}{100g} \times 100$$

where:

MD_{cb} = mechanically damaged parchment coffee, %
W_{dpc} = weight of mechanically damaged parchment coffee, g

Philippine Agricultural Engineering Standards

AMTEC-UPLB – PCARRD Project: "Development of Standards for Agricultural Production and Postharvest Machinery"

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