

PHILIPPINE NATIONAL STANDARD

**PNS/BAFS PAES 257:2018
ICS 65.060.99**

Agricultural Machinery- Cassava Mechanical Dryer- Specifications



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Foreword

The Philippine National Standards (PNS) for Agricultural Machinery- Cassava Mechanical Dryer- Specifications (PNS/BAFS PAES 257:2018) has been prepared by the Technical Working Group (TWG) for Cassava Mechanical Dryer as per approved Department of Agriculture Special Order No. 92 series of 2017.

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 manufacturing and performance requirements for all cassava mechanical dryer intended for the production of dried cassava primary products.

2 Normative 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 258:2018, *Agricultural machinery- Cassava Mechanical Dryer- Methods of Test*

3 Terms and Definitions

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

3.1

cassava mechanical dryer

used to remove excess moisture from the cassava primary products, generally by forced or natural convection

3.2

cassava primary products

clean and pathogen free cassava roots that have undergone primary processing such as grating, granulating, chipping or random chopping and serves as input to the dryer

3.2.1

granulated cassava

cassava primary product prepared by granulating

3.2.2

chipped cassava

cassava primary product prepared by chipping

3.2.3

grated cassava

cassava primary product prepared by grating and pressed to remove excess water

3.2.4

chunked cassava

cassava primary product larger than chipped cassava, prepared by random chopping

3.3

dried cassava primary products

cassava primary products that have undergone drying process

3.3.1

cassava grates

dried, grated cassava

3.3.2

cassava granules

dried, granulated cassava

3.3.3

cassava chips

dried, chipped cassava

3.3.4

cassava chunks

dried, chunked cassava intended for feed and other industrial use

3.4

drying loss

ratio of the total dry weight of cassava primary products collected at all areas of the machine other than the discharge outlet to the total dry weight of cassava primary products, expressed in percent

3.5

fan

blower

air moving device that is used to force heated air through the mass of cassava primary products at the desired air flow rate and pressure

3.6

heating system efficiency

ratio of the amount of heat added in the air to the heat available in the fuel

3.7

input capacity

the amount of cassava primary products fed to the dryer per unit of time

3.8

moisture gradient

difference between the maximum and the minimum moisture content randomly sampled after drying

3.9

output capacity

amount of dried cassava primary products per unit of time, expressed in kilogram per hour

4 Classification

The classification of cassava mechanical dryer should be based but not limited to the following.

4.1 System of operation

4.1.1 Batch type

It is a type of mechanical dryer wherein the material to be dried in fixed volume is held in the drying chamber in batches until it reaches the desired moisture content.

4.1.1.1 Flat Bed

For shallow bed batch type dryer, a fixed volume of the material to be dried is held stationary in a horizontal holding bin.

4.1.1.2 Recirculating

It is a batch type dryer equipped to circulate and/or mix fixed volume of the product during the drying operation.

4.1.2 Continuous flow

A type of dryer in which the material being dried moves through the drying chamber in a substantially continuous stream and is discharged without being recirculated.

4.1.2.1 Concurrent-flow

In this type of dryer, the product being dried moves in the same direction as drying air

4.1.2.2 Counter-flow

The product being dried in this type of dryer moves in one direction and the drying air moves in the opposite direction.

4.1.2.3 Cross-flow

The flow of air in cross- flow dryer is transverse to the direction of flow of the product being dried.

4.1.2.4 Mixing

The drying bin for mixing dryer is similar to columnar drying bin except that it includes louvers causing mixing to occur as the product flows through the system

4.1.2.5 Non-mixing

It is a type of continuous flow dryer wherein the product in the drying bin flows through the column in a straight path.

4.2 Heating system

4.2.1 Method of heat introduction

4.2.1.1 Direct

A type of dryer in which the products of combustion come into direct contact with the product being dried.

4.2.1.2 Indirect

The products of combustion of the indirect dryer do not come in contact with the products being dried. This type of dryer uses heat exchanger.

4.2.2 Heat Source

Heat sources for mechanical dryer may include the following:

4.2.2.1 Petroleum-based

4.2.2.2 Biomass

4.2.2.3 Electrical and solar or any combination.

5 Fabrication Requirements

5.1 General

The dryer shall be provided with thermometer or temperature sensor with readout to measure the actual air temperature entering the mass of cassava primary products.

5.2 For food production

Stainless steel bars, metal sheet or plate and/or heavy-duty mild steel shall be generally used for the manufacture of the different components of the cassava mechanical dryer. Parts that are in direct contact to the material shall be made of corrosion resistant and food grade materials in compliance to the food safety standards.

Food grade paints and lubricants shall also be used for parts that are in direct contact with the product.

5.3 For feed production and other industrial uses

Steel bars, metal sheet or plate and/or heavy-duty mild steel shall be generally used for the manufacture of the different components of the cassava mechanical dryer. Parts that are in direct contact with the product shall be made of corrosion resistant materials.

6 Performance and Other Requirements

- 6.1 Input and output capacity shall meet the manufacturer's specifications.
- 6.2 The performance of cassava mechanical dryer shall be as specified in Table 1.

Table 1 – Performance Criteria for Cassava Mechanical Dryer

Criteria	Batch/Continuous Flow
1. Final moisture content, % w.b., max	14
2. Drying Loss, % max	3
3. Heating system efficiency, %, min. (direct)	70
4. Heating system efficiency, %, min. (indirect)	50

- 6.3 Dried cassava primary products for food should have no traces of unburned fuel or ashes on the product surface and no fermented or musty smell.
- 6.4 Dried cassava primary products for food shall have no distinct change in color after drying. It shall be free from off- flavor, unpleasant odor and contaminants.
- 6.5 Dried cassava primary products intended for feed and other industrial purposes should be free of unpleasant odor.

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 It shall have adequate provision for fire control.
- 7.4 It shall have adequate protection from or for all moving parts. All rotating parts shall be dynamically balanced.
- 7.5 It shall be provided with features for access to parts during repair, maintenance and operation.
- 7.6 The dryer shall have provision for dust control.
- 7.7 Cassava mechanical dryer shall be free from defects that may be detrimental to its use and shall be free from sharp edges and surfaces that may hurt the operator. All metal parts should be machine bend, pressed and cut to avoid rough surfaces and all rough surfaces should be machine finished and smoothed. Warning notices shall be provided in accordance with PNS/PAES 101:2000.
- 7.8 Uniformity of parts and components for same brand and model shall be maintained.

7.9 Provision shall be made so that it can withstand extreme weather conditions to which it can be exposed.

7.10 The cassava mechanical dryer shall be compliant with the Good Manufacturing Practices (GMP).

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 part for at least one year (1) upon the acceptance of the procuring entity of the dryer. General requirements of the warranty shall conform to PNS/BAFS/PAES 192: 2016.

9 Maintenance and Operation

9.1 Each unit of cassava mechanical dryer 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 cassava mechanical dryer shall be provided.

9.3 The cassava mechanical dryer shall be easy to clean and operate.

10 Sampling

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

11 Testing

Cassava mechanical dryer shall be tested in accordance with PNS/BAFS PAES 258:2018.

12 Marking and Labelling

12.1 Each unit of cassava mechanical dryer 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 details 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 drying temperature, °C

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

Duration per day, hours	Sound Levels [dB(A)], slow response
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).

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