PHILIPPINE NATIONAL STANDARD

PNS/BAFS PAES 247:2018
ICS 65.060.99

Agricultural Machinery – Multicrop Pulverizer – Specifications

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Foreword

The Philippine National Standard (PNS) for Agricultural Machinery – Multicrop Pulverizer - Specifications (PNS/BAFS PAES 247:2018) 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 Standard cancels and replaces the provisions recommended by PAES 238:2008 edition.

This edition includes the following significant changes compared to the previous edition:

- Modification of format in accordance with ISO/IEC Directives Part 2 eight edition;
- Change of name of the machine from “Multicrop Micromill” to “Multicrop Pulverizer”;
- Revision of the scope such that both dried commodities for food and feed purposes were included;
- Revision and deletion of some terms and definitions under Clause 3;
- Addition of some classification of the machine in Clause 4;
- Revisions of the provision for fabrication requirements in Clause 5;
- Change of the performance data for the pulverizing efficiency;
- Noise level provision moved under the “Safety, Workmanship and Finish” clause and change of the noise level recommendation;
- Revision of “Warranty for Construction and Durability” to “Warranty for Fabrication and Services” and modification in the provision under it;
- Modification in the provisions under “Maintenance and Operation”;
- Modification in the provisions under “Marking and Labeling”;
- Addition of Annex A

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 of multicrop pulverizer used in pulverizing dried agricultural commodities both for foods and feeds.

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 document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AWS D1.1/D1.1M:2002, *American National Standard – Structural Welding Code – Steel*

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 248:2018, *Agricultural Machinery – Multicrop Pulverizer – Methods of Test*

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

3 Terms and Definitions

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

3.1
cyclone collector
vortex pre-cleaner used to roughly remove flying flour dust

3.2
dried agricultural commodities
includes the edible parts of crops with moisture content of 12-15% and is prepared for pulverizing

3.4
flour
finely pulverized products from grains or other starchy plant foods

3.5
hopper
part of the machine where the dried agricultural commodities are loaded

3.6
input capacity
weight of input dried agricultural commodity per input time into the hopper, expressed in kilogram per hour

3.7
multicrop pulverizer
machine that grinds/pulverizes dried agricultural commodities into pulverized products

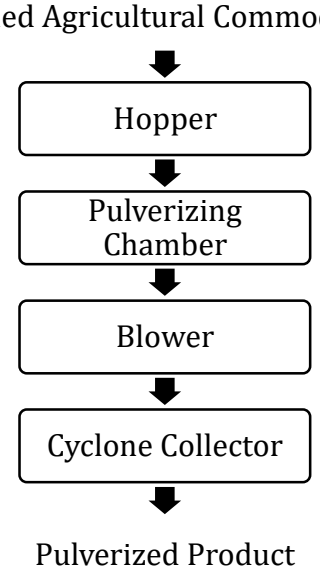

Figure 1 - Schematic diagram of multicrop pulverizer

3.8
pulverizing capacity
total weight of pulverized products over the total operating time, expressed in kilogram per hour

3.9
pulverizing chamber
part of the machine where pulverizing takes place

3.10
pulverizing efficiency
ratio between the amount of acceptable pulverized products and the total pulverizing recovery, expressed in percentage

3.11
pulverizing recovery
ratio between the pulverized products and the total weight of dried agricultural commodity loaded in the hopper, expressed in percent

3.12
prime mover
electric motor or internal combustion engine used to drive the multicrop pulverizer

4 Classification

The classification of multicrop pulverizer should be based on the type of pulverizing mechanism but not limited to the following.

4.1 Hammer-type

It consists of rotating beaters (fixed or swinging) mounted radially on the shaft and a heavy duty perforated screen. Size reduction of the dried agricultural commodity is done by impact.

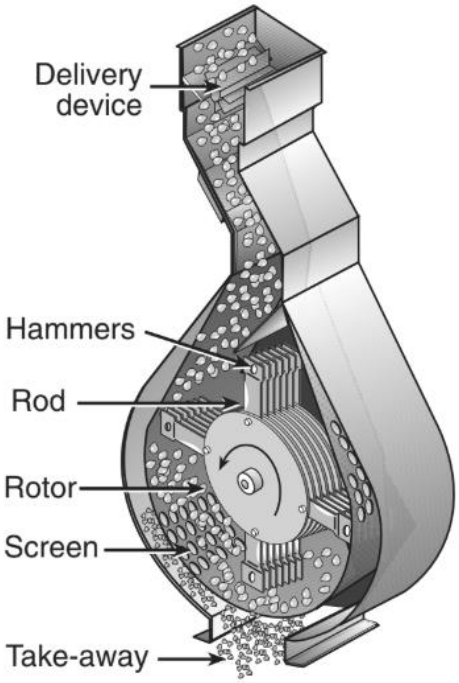

Figure 2 – Hammer type Pulverizer
[SOURCE: Koch (200)]

4.2 Attrition-type

It consists of two roughed plates, one stationary and the other rotating. The size of the dried agricultural commodity is reduced by crushing and shearing.

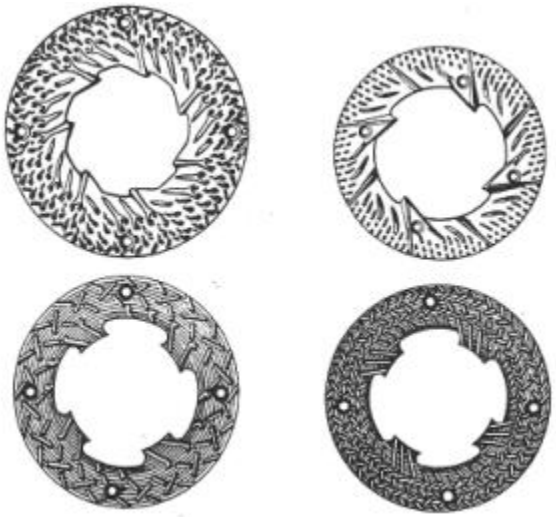

Figure 3 – Attrition-type Pulverizer

4.3 Roller-type

It consists of rollers, with or without serrated surfaces. It reduces the size of the dried agricultural commodity by pressing or squeezing.

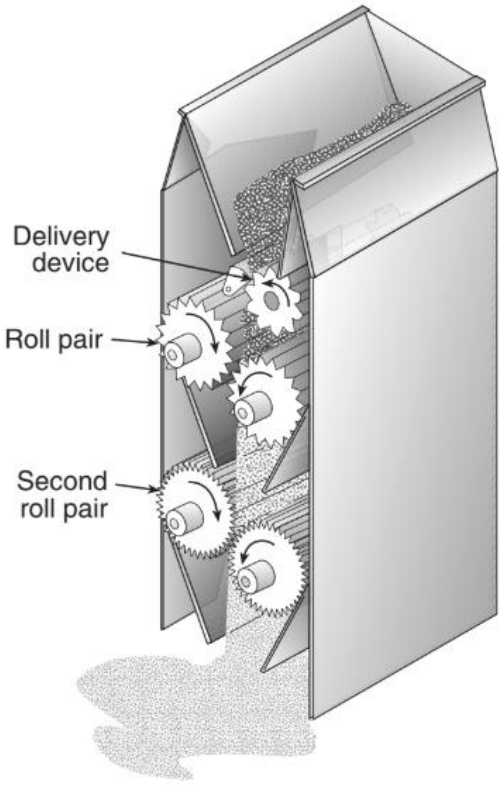

Figure 4 – Roller-type Pulverizer
[SOURCE: Koch (200)]

4.4 Conical-type

It consists of conical shaped pulverizing surface capable of pulverizing dried agricultural commodities. This type is usually found on low speed and gear reduction pulverizers.

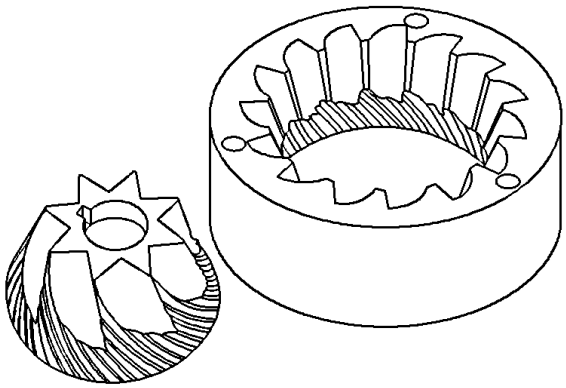

Figure 5 – Conical-type Pulverizer

4.5 Blade-type

It consists of metal blades wherein size reduction of the dried agricultural commodity is achieved by the shearing actions.

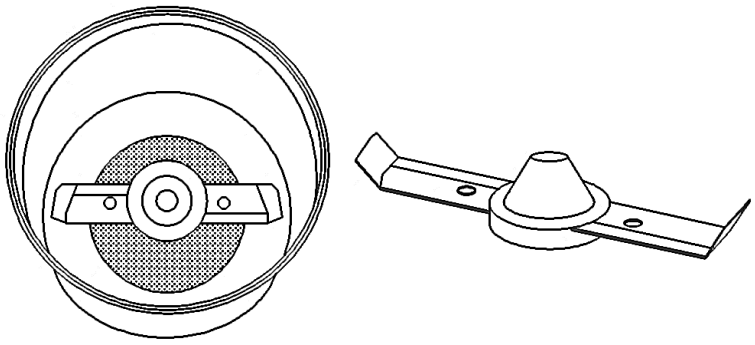

Figure 6 – Blade-type Pulverizer

4.6 Pin Mill-type

It consists of two plates with rod protrusion (pins), one stationary and the other rotating. The size of the dried agricultural commodity is reduced by crushing and shearing.

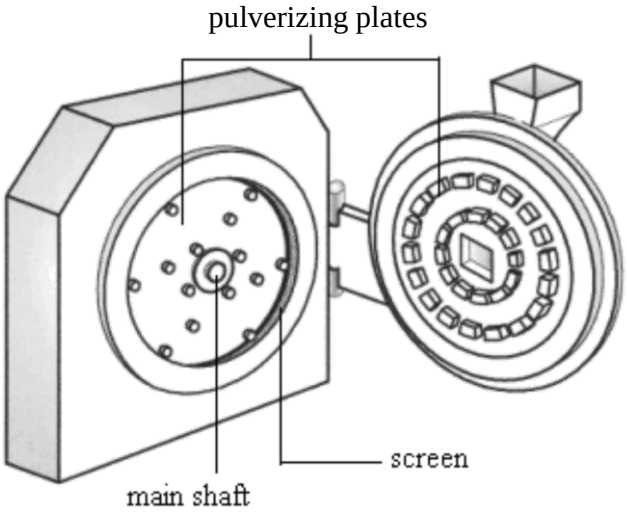

Figure 7 – Pin Mill-type Pulverizer

4.7 Cross Beater-type

It consists of a rotating wide beater mounted radially on the shaft, toothed pulverizing insert, baffled plate and a heavy duty perforated replaceable screen/sieve. Size reduction of the dried agricultural commodity is done by impact and shear.

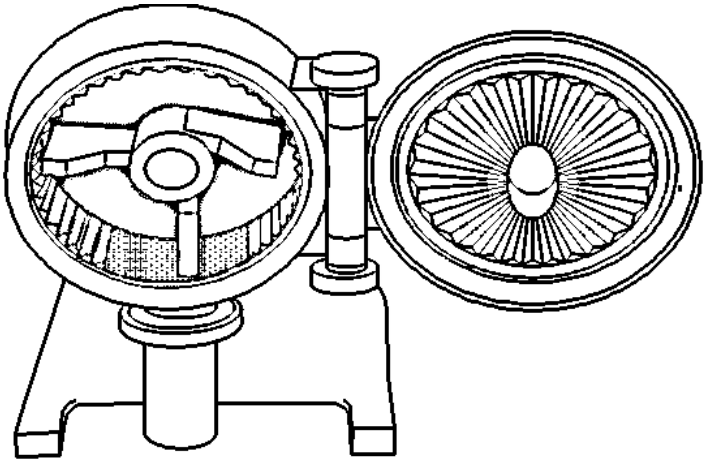

Figure 8 – Cross Beater-type Pulverizer

5 Fabrication Requirements

5.1 In general, the multicrop pulverizer should consist of hopper, pulverizing chamber, cyclone collector, prime mover and stand/frame.

5.2 All parts that are in direct contact to the dried agricultural commodities (input and output products) shall be made of corrosion resistant and food grade materials in compliance to the food safety standards.

5.3 Main shaft shall be made of non-corrosive and food grade materials, e.g. stainless steel.

5.4 The specific requirements for each type of pulverizer shall be as follows:

5.4.1 For hammer-type, conical-type, blade-type, and cross beater-type, the rotating beater shall be made of non-corrosive and food grade materials.

5.4.2 For attrition-type, and pin mill, plates/discs shall be made of non-corrosive and food grade materials and can withstand the shearing strength of the material.

5.4.3 For roller-type, rollers shall be made of non-corrosive and food grade materials and can withstand the bending strength of the material.

5.5 Multicrop pulverizer shall be provided with a frame that can withstand its load or support the machine during operation.

5.6 All welded parts shall conform to AWS D1.1:2000.

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

5.8 There should be provisions of magnets to prevent metallic materials from entering the pulverizing chamber.

5.9 The machine should have a mechanism for adjustment of the fineness of the output and provisions for belt tightening.

5.10 The prime mover to be used shall be electric motor for food production purposes while either internal combustion engine or electric motor for feeds production purposes.

6 Performance Requirements

6.1 Pulverizing capacity shall meet the manufacturer’s specification.

6.2 The minimum pulverizing recovery shall be 95%.

6.3 The pulverizing efficiency shall be the minimum indicated percentage pass on the specific US sieve number as follows:

Table 1 - Pulverizing efficiency

Agricultural Commodity	Performance Data, minimum
Edible Cassava Flour	Fine Flour: ≥90% shall pass No. 30 sieve Coarse Flour: ≥90% shall pass No. 16 sieve
Edible Sago Flour	≥95% shall pass No. 100 sieve
Soy Flour	≥97% shall pass No. 100 sieve
Sorghum Flour	Fine Flour: 100% shall pass No. 35 sieve Medium Flour: 100% shall pass No. 18 sieve
Pearl Millet	Fine Flour: 100% shall pass No. 35 sieve Medium Flour: 100% shall pass No. 18 sieve
Corn Flour	Not less than 98% shall pass No. 50 sieve and Not less than 50% shall pass No. 70 sieve
Other Commodities	90% shall pass No. 50 sieve

7 Safety, Workmanship and Finish

7.1 The noise level should conform with the provisions given in Annex A.

7.2 There shall be ear muffs or other ear protective device provided for the operators to use when 95 db (A) is exceeded during operation.

7.3 Mask and dust collector shall be provided.

7.4 The rotating components shall be statically and dynamically balanced for stable running. All rotating parts shall be provided with cover or guard.

7.5 No paints shall be used for the parts that are in direct contact with the dried agricultural commodity.

7.6 Any surfaces not in contact with the dried agricultural commodities shall be free from rust and shall be painted/coated properly.

7.7 Mechanism for emergency stop shall be provided.

7.8 There shall be foam, rubber or any other suitable material to seal the housing of the pulverizing mechanism to reduce the losses and avoid contamination.

7.9 The multicrop pulverizer shall be free from manufacturing defects that may be detrimental to its operation.

7.10 The external part of the multicrop pulverizer shall be free from sharp edges and rough surfaces that may injure the operator. Warning notices shall be provided in accordance with PAES 101:2000.

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 of the machinery. General requirements of the warranty shall conform to PAES 192:2016.

9 Maintenance and Operation

9.1 Each unit of multicrop pulverizer shall be provided with a set of manufacturer's standard tools required for maintenance.

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

9.3 The multicrop pulverizer shall be easy to clean and operate.

9.4 The multicrop pulverizer shall be provided with replaceable pulverizing mechanism if applicable.

10 Sampling

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

11 Testing

Multicrop pulverizer shall be tested in accordance with PNS/BAFS PAES 248:2018.

12 Marking and Labelling

12.1 Each unit of multicrop pulverizer shall be marked at a 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 (if imported) / “Made in the Philippines” (if manufactured in the Philippines)

12.1.8 Input capacity, kg/h

12.1.9 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 have a durable bond with the base surface material. It shall be water resistant and under normal cleaning procedures. It shall not fade, discolor, 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 2 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.

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

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 dB (A) peak sound
pressures level (maximum value).

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