

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) through the project “Multicrop Processing Machines for `Commercialization” funded by the Department of Science and Technology (DOST) through its Technology Innovation for Commercialization (TECHNICOM) Program and monitored by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

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:

AMTEC Test and Evaluation Report MARVEL Corn Mill Model MCM 8-10

AMTEC Test and Evaluation Report SULTANA Rice/Corn Mill (For Corn) Model: SM-1.8

AMTEC Test and Evaluation Report VIRIÑA Hammer mill (for arrow root)

ASAE Standard: ASAE S319.1 Method of Determining and Expressing Fineness of Feed Materials By Sieving

Bautista, O. K. and H. B. Aycardo. Ginger: Its Production, Handling, Processing and Marketing with Emphasis on Export. Department of Horticulture, College of Agriculture, University of the Philippines Los Baños. 1979.

CIGR Handbook of Agricultural Engineering- Volume IV- Agro-Processing Engineering. Published by American Society of Agricultural Engineers. 1999.

Malinis, Arnulfo P., et al. Development of the Integrated Multicrop Processing System (Zero Waste Ginger Processing Technology). 2004.

PAES 226:2005 Agricultural Machinery – Micromill-Specifications

Agricultural Machinery – Multicrop Micromill– Specifications

1 Scope

This standard specifies the fabrication and performance requirements of multicrop micromill used in grinding/milling of dried meals of ginger, arrow root, taro, cassava, sweet potato, potato, carrot, onion, garlic, pandan and lemon grass.

2 References

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

AWS D1.1:2000 Structural Welding Code - Steel

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

PAES 103:2000 Agricultural Machinery – Method of Sampling

PAES 239:2008 Agricultural Machinery: Multicrop Micromill – Methods of Test

3 Definitions

For the purpose of this standard the following definitions shall apply:

3.1**collecting bin**

part of the machine where the ground/milled products are being discharged

3.2**cyclone**

part of the machine (usually made of cheesecloth) where the small or powdered solids are being separated and protected from the air

3.3**flour**

finely ground or powdered foodstuffs from grains or other starchy plant foods used mainly in baking

3.4**food seasoning**

an ingredient (as condiment, spice or herb) added to food primarily to enhance its flavor

3.5

input capacity

weight of material per unit loading time into the hopper, expressed in kilogram per hour

3.6

milling chamber

part of the multicrop micromill where milling/grinding takes place (*See Fig. 1*)

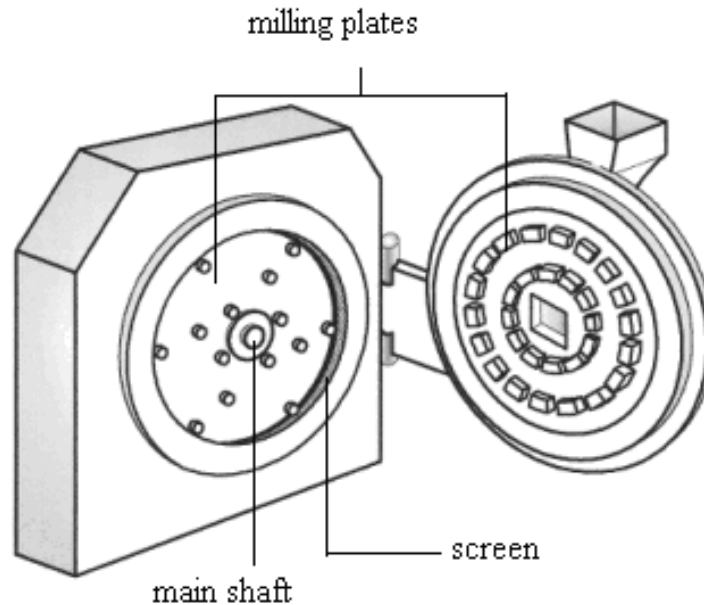


Figure 1. Grinding/Milling Chamber

3.7

milling efficiency

ratio between the amount of acceptable ground/milled product and the total milling recovery, expressed in percentage

3.8

multicrop micromill

machine that grinds dried product meal of various crops into finer particles suitable for the purpose of food seasoning or as flour (*See Fig. 2*)

3.9

prime mover

electric motor or internal combustion engine used to drive the multicrop micromill

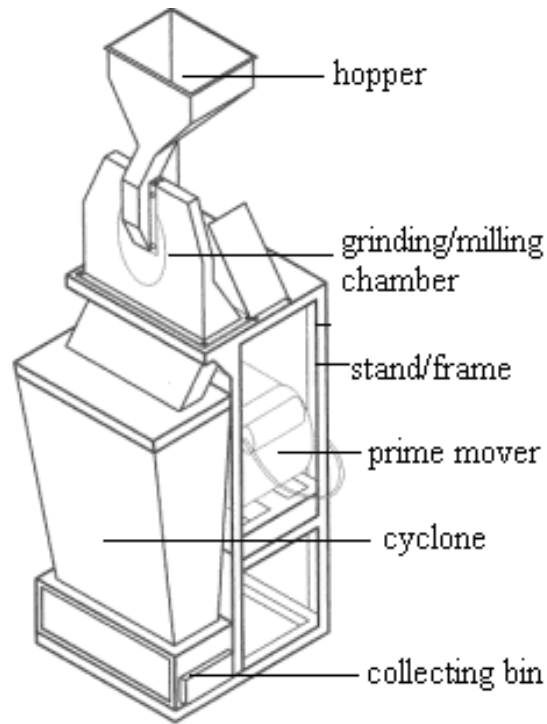


Figure 2. Typical design of a multicrop micromill

4 Classification

The classification of multicrop micromill shall be based on the type of milling mechanism as follows:

4.1 Hammer mill

It consists of a rotating beater and a heavy perforated screen. Size reduction of materials is done due to impact (*See Fig. 3*).

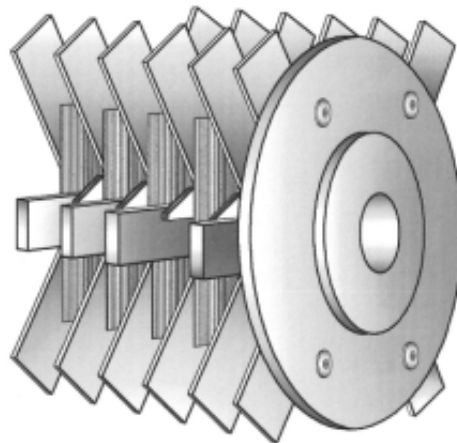


Figure 3. Rotating beater of hammer mill

4.2 Attrition mill

It consists of two roughed plates, one stationary and the other rotating. The material is reduced by crushing and shears (*See Fig. 4*).

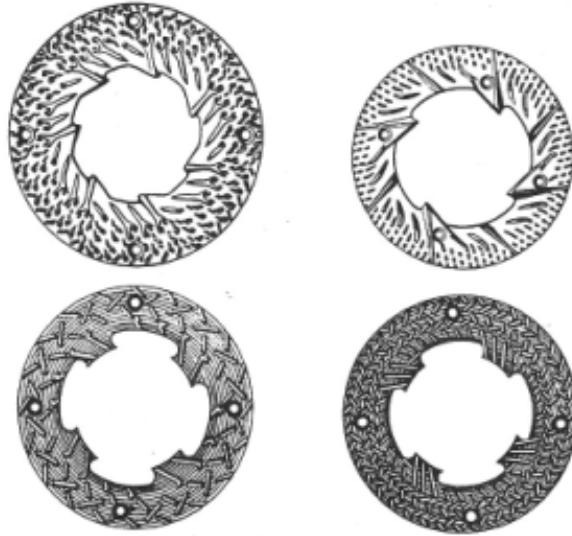


Figure 4. Attrition mill plates

4.3 Roller mill

It consists of rollers, with or without serrated surfaces. It reduces the material by pressing or squeezing until the material breaks (*See Fig. 5*).



Figure 5. Rollers used in grinding/milling

5 Fabrication Requirements

5.1 In general, the multicrop micromill should consist of hopper, milling chamber, cyclone, collecting bin, prime mover and stand/frame.

5.2 The hopper shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher).

5.3 The specific requirements for each type of mill shall be as follows:

5.3.1 For hammer mill type, the rotating beater shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher).

5.3.2 For attrition mill, plates/discs shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher) and can withstand the shearing strength of the material.

5.3.3 For roller mill, rollers shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher) and can withstand the bending strength of the material.

5.3.4 Screen size to be used should be of 50 or 60 mesh depending on the required fineness of the ground/milled product.

5.4 The collecting bin shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher).

5.5 Cyclone shall be made of food grade materials, e.g. Grade #50 cheesecloth.

5.6 Main shaft shall be made of non-corrosive and food grade materials, e.g. stainless steel (Grade 304 or higher) 25.4 mm in diameter.

5.7 Multicrop micromill shall be provided with a frame that can withstand its load, e.g. angle bars or channel bars.

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

6 Performance Requirements

The multicrop micromill when tested in accordance with PAES 239 shall conform to the following requirements:

6.1 The input capacity shall be as specified by the manufacturer.

6.2 For food seasoning purposes, the ground/milled product shall be retained on a 50 mesh sieve screen (particle size diameter of 0.297 mm).

6.3 For flour purposes, the ground/milled product shall be retained on at least 60 mesh sieve screen (particle size diameter less than 0.297 mm).

6.4 The minimum milling recovery shall be 95%.

- 6.5 The minimum milling efficiency shall be 90 %.
- 6.6 The operation shall conform to Good Manufacturing Practice (GMP) requirements.
- 6.7 The noise emitted by the multicrop micromill measured 50 mm away from the operator's ear level shall not be more than 96 db (A).

NOTE: Allowable noise level for four (4) hours of continuous exposure based on Occupational Safety and Health Hazards, Ministry of Labor, Philippines. 1983

7 Safety, Workmanship and Finish

- 7.1 All components shall be dynamically balanced for stable running with low noise levels.
- 7.2 The multicrop micromill shall be free from manufacturing defects that may be detrimental to its operation.
- 7.3 Any surfaces not in contact with the material shall be free from rust and shall be painted / coated properly.
- 7.4 The multicrop micromill shall be free from sharp edges and surfaces that may injure the operator.
- 7.5 Presence of guard or cover for all rotating components and power transmission system.

8 Warranty for Fabrication and Durability

- 8.1 Warranty against defective materials and workmanship shall be provided for parts and services except for normal wear and tear of consumable maintenance parts such as belts within one year from the purchase of the multicrop micromill.
- 8.2 The fabrication shall be rigid and should endure normal use without breakdown of its major components (i.e. milling chamber, etc.) for at least one (1) year from the date of original purchase.

9 Maintenance and Operation

- 9.1 Each multicrop micromill unit shall be provided with a set of manufacturer's standard tools required for maintenance.
- 9.2 An operator's manual, which conforms to PAES 102, shall be provided by the manufacturers.
- 9.3 The multicrop micromill shall be easy to clean.

10 Sampling

The multicrop micromill shall be sampled for testing in accordance with PAES 103.

11 Testing

Sampled multicrop micromill shall be tested in accordance with PAES 239.

12 Marking

12.1 Each multicrop micromill shall be marked in English with the following information using a stencil or by directly punching it on a plate and shall be positioned at a most conspicuous place:

12.1.1 Registered trademark of the manufacturer

12.1.2 Brand

12.1.3 Model

12.1.4 Serial number

12.1.5 Input capacity, kg/h

12.1.6 Power requirement, kW

12.1.7 Name and address of the manufacturer

12.1.8 Name and address of the importer, if imported

12.1.9 Country of manufacture (if imported) / “Made in the Philippines” (if manufactured in the Philippines)

12.2 Safety/precautionary markings shall be provided when appropriate. Marking shall be stated in English and Filipino and shall be printed in red color with a white background.

12.3 The markings shall have a durable bond with the base surface material.

12.4 The markings shall be water resistant and under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.

