

PHILIPPINE NATIONAL STANDARD

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**Agricultural machinery – Mist Blower –
Methods of Test**



BUREAU OF PRODUCT STANDARDS

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National Foreword

This Philippine Agricultural Engineering Standards PAES 156:2010, Agricultural machinery – Mist Blower – 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) under the project entitled “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:

New Zealand Qualifications Authority. 2007. Operate a knapsack motorised mist blower for agrichemical application. 4 pp.

Philippine Agricultural Engineering Standard 113: 2000 - Agricultural Machinery – Lever-Operated Knapsack Sprayer – Methods of Test

Record, L.1969. Needed: adequate management equipment. USGA Green Section.

Sidde Gowda, D.K., B. V. Patil and S. Yelshetty. 2007. Performance of different sprayers against gram pod borer, *Helicoverpa armigera* (Hubner) on chickpea. Karnataka J. Agric. Sci., 20(2): (261-264).

World Health Organization. 1990. Equipment for vector control. Third Edition.

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Agricultural Machinery – Mist Blower – Methods of Test

1 Scope

This standard specifies the methods of test and inspection for a mist blower. Specifically, it shall be used to:

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

1.2 determine the performance of the equipment; and,

1.3 report the results of the tests.

2 References

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

PAES 155:2010 Agricultural Machinery – Mist Blower – Specifications

3 Definitions

For the purpose of this standard, the definitions given in PAES 155 and the following shall apply:

3.1**blower range**

distance from the nozzle at which spraying could be carried out

3.2**number median diameter**

diameter of a droplet which will divide the number of sample droplets into two equal halves

3.3**volume median diameter**

diameter of a droplet which will divide the volume of sample droplets into two equal halves

4 General Conditions for Test and Inspection

4.1 Role of manufacturer/dealer

The manufacturer shall submit the operator's manual of the mist blower and shall abide by the terms and conditions set forth by an official testing agency.

4.2 Role of the operator

An officially designated operator shall be skilled and shall be able to demonstrate, operate, adjust and repair matters related to the operation of the equipment.

4.3 Test site conditions

The site where the mist blower shall be tested shall have a space greater than the maximum reach of the equipment as specified in the operator's manual.

4.4 Test instruments/equipment

The suggested list of minimum test materials needed to carry out the mist blower test is shown in Annex A.

4.5 Termination of test for mist blower

If during the test, the mist blower encounters major component breakdown or malfunction, the test engineer shall terminate the test.

5 Test and Inspection

5.1 Verification of the manufacturer's technical data and information

This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the mist blower in comparison with the list of manufacturer's technical data and information. All data shall be recorded in Annex B.

5.2 Performance test

5.2.1 This is carried out to obtain actual data on overall performance of the equipment.

5.2.1.1 The noise emitted by the mist blower shall be measured 50 mm away from the operator's ear level. This shall be recorded in Annex C.

5.2.1.2 The fuel consumed by the engine of the mist blower shall be obtained. This can be done by measuring the volume of fuel refilled after the test. The tank shall be filled to full capacity before and after each trial.

5.2.1.3 The cut-off valve shall be preset at the maximum setting.

- 5.2.1.4** The air velocity of the mist blower shall be obtained at the outlet using an anemometer. The velocity shall be recorded in Annex C.
- 5.2.1.5** Discharge rate of the mist blower shall be obtained either by directly using a graduated cylinder and getting the time or by measuring the volume of liquid required to refill the mist blower after spraying and getting the total time to consume the liquid. Discharge rate shall be computed in Annex D.
- 5.2.1.6** The blower range shall be obtained by determining the distance of the mist blown from the nozzle. The operator shall measure the longest reach of the mist from the tip of the outlet. Wind speed in the test site shall be measured and recorded.
- 5.2.1.7** The mist blower shall be tested for uniformity of droplet sizes. The cut-off valve shall be preset depending on the desired setting. The mist blower shall then be operated and shall be allowed to pass over a series of magnesium oxide coated glass slides. The slides shall be examined under a microscope. Droplet sizes shall be recorded. In the absence of magnesium oxide coated glass slides, the tank shall be filled with a solution of dye. The mist shall pass over a series of collecting paper or glass slides. The dried paper, slides or their photographs shall be examined under a microscope. The mean diameter and percent error shall be computed using the formula in Annex D. The volume median diameter (VMD) and the number median diameter (NMD) shall be obtained. The ratio of the VMD to the NMD shall be obtained.
- 5.2.1.8** For backpack type, tilt and inversion test shall be conducted to check for any leak on the blower. It shall be filled with water and shall be tilted at an angle of 90 degrees for five minutes on each side. The mist blower shall then be inverted for five minutes. No leak from any part of the mist blower shall occur.
- 5.2.1.9** The mist blower shall be evaluated for ease of operation. Two operators shall operate and evaluate the mist blower. The mist blower shall be evaluated according to the following: adaptation to back of the operator (for backpack type), accessibility, ease of actuating the cut-off device, ease of dismantling, assembly and maintenance of the mist blower, ease of filling and cleaning the tank, convenience in fixing the straps and provisions for adjusting strap length.
- 5.2.1.10** Evaluation for operator's safety shall be conducted for the mist blower. The mist blower shall be subjected to different safety tests such as the following:
- 5.2.1.11** A full capacity mist blower standing on a level surface shall be pushed until it tips over, observation shall be made if the tank filler cap is removed. The different components of the mist blower shall be checked regarding any injury that the operator may encounter while using the mist blower. Items to be measured shall be recorded in Annex C.
- 5.2.1.12** All data shall be recorded in Annex C.

5.3 Test trial

There shall be at least three (3) trials to conduct the test.

6 Test Report

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

6.1 Title

6.2 Summary

6.3 Purpose and Scope of Test

6.4 Methods of Test

6.5 Description of the Machine

Table 1 – Machine Specifications

6.6 Results and Discussions

6.7 Observations (include pictures)

Table 2 –Performance test data

6.8 Name(s), signature(s) and designation(s) of test engineer(s)

Annex A

Suggested Minimum List of Test Equipment

Items	Quantity
A.1 timer accuracy: 0.10 s	1
A.2 anemometer	1
A.3 weighing scale	1
A.4 fuel consumption	
graduated cylinder capacity, 1000 mL	1
A.5 droplet size analysis microscope glass slides collecting paper magnesium oxide coated glass slides dye solution	1 as needed as needed as needed as needed
A.6 noise level meter	1

Annex B
(informative)

Specifications of Mist Blower

Name of Applicant/ Distributor: _____

Address: _____

Tel No: _____

GENERAL INFORMATION

Name of Manufacturer: _____

Make: _____

Classification: _____

Serial No: _____ Brand/Model: _____

Production date of mist blower to be tested: _____

Testing Agency: _____ Test Engineer: _____

Date of Test: _____ Location of Test: _____

Items to be inspected

ITEMS	Manufacturer's Specification	Verification by the Testing agency
B.1 overall dimensions		
B.1.1 height, mm		
B.1.2 length, mm		
B.1.3 width, mm		
B.1.4 weight, kg		
B.2 tank		
B.2.1 material		
B.2.2 thickness, mm		
B.3 tank cover		
B.3.1 material		
B.3.2 gasket		
B.3.2.1 material		
B.3.2.2 thickness, mm		
B.4 flexible hose		
B.4.1 material		
B.4.2 thickness, mm		
B.4.3 length, mm		
B.5 wand		
B.5.1 material		
B.5.2 thickness, mm		
B.5.3 length, mm		
B.6 nozzle		
B.6.1 diameter, mm		
B.6.2 material		
B.7 engine		
B.7.1 type		
B.7.2 power rating, kW		

ITEMS	Manufacturer's Specification	Verification by the Testing agency
B.7.3 type of starting		
B.8 mounting (for mounted type)		
B.8.1 type of mounting		
B.9 width of spray, m		
B.10 blower range, m		
B.11 angle of spray, deg		

ANNEX C

Performance Test Data Sheet

Items to be measured and Inspected

C.1 Test site conditions	Remarks
C.1.1 area, m ² .	
C.1.2 wind speed, kph	

C.2 Mist blower performance				
Items	Trials			Ave.
	1	2	3	
C.2.1 Noise level, dB				
C.2.2 Fuel consumption, mL				
C.2.3 cut-off valve setting				
C.2.4 air velocity, m/s				
C.2.5 discharge rate, Lpm				
C.2.6 blower range, m				
C.2.7 width of spray, m				

C.3 Tilt and Inversion Tests

Observations:

C.4 Droplet size analysis										
Sample	1	2	3	4	5	6	7	8	9	10
diameter, mm										
Mean diameter, mm:										
Percent error, %:										
Volume median diameter, mm:										
Number median diameter, mm:										
VMD/NMD:										

C.5 Other observations	Remarks
C.5.1 ease of use *	
C.5.2 safety of operator*	
C.5.3 presence of filtration system*	
C.5.4 detached welded parts	
C.5.5 loosened bolts	
C.5.6 miscellaneous:	

* rating: 1 – very good
 2 – good
 3 – satisfactory

4 – poor
5 – very poor

ANNEX D

Formula Used During Calculation and Testing

D.1 Discharge rate

$$Q = \frac{V}{t}$$

where:

Q	discharge rate of the mist blower, Lpm
V	total volume of liquid required to refill the mist blower, L
t	total time required to consume the liquid, min

D.2 Percent error for droplet size

$$\% \text{ error} = \frac{|D_m - D_p|}{D_p} \times 100$$

where:

$\% \text{ error}$	percent error, %
D_m	mean diameter, mm
D_p	actual diameter, mm

Philippine Agricultural Engineering Standards

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

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