## Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled "Enhancing the Implementation of AFMA Through Improved Agricultural Engineering Standards" which was funded by the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA).

This standard has been technically prepared in accordance with PNS 01-4:1998 (ISO/IEC Directives Part 3:1997) – Rules for the Structure and Drafting of International Standards.

The word "shall" is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word "should" is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that certain course of action is preferred but not necessarily required.

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

Society of Automotive Engineers (SAE) J608:1958 Minimum Identification markings for small air-cooled engines

Hunt Donnel. Farm Power and Machinery Management 7th Ed. IOWA State University Press, Ames, Iowa. 1977.

Stone A.A. and H.E. Gulvin. Machines for Power Farming 3rd Ed. John Wiley and Sons Inc, USA.1977.

Republic Act No. 7394 otherwise known as "The Consumer Act of the Philippines" enacted on July 22, 1991.

# Agricultural Machinery – Small Engine – Specifications

## 1 Scope

This standard specifies the requirements for construction and performance of fully equipped internal combustion engines with one or two cylinders of up to 20 kW rating used for agricultural purposes.

## 2 References

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

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

PAES 103:2000, Agricultural Machinery – Method of Sampling

PAES 117:2000, Agricultural Machinery – Small Engines – Methods of Test

## 3 Definitions

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

**3.1**
**air-cooled**
direct cooling system
system wherein air is used to remove excess heat from the engine through metal fins or shrouds which are located around the cylinder thus creating the flow of air to the engine body in order to maintain its operating temperature

**3.2**
**cycle**
series of events occurring one after the other in a definite order and repeats the events after the last one has occurred

**3.2.1**
**four-stroke**
piston requires four movements to complete one cycle

NOTE One movement of piston for each of the events such as intake, compression, power and exhaust.

**3.2.2**
**two-stroke cycle**
piston requires two movements to complete one cycle

NOTE One downward movement of piston for the events exhaust and intake and one upward movement of piston for the events compression and power

**3.3**
**engine**
heat engine
mechanical device that converts heat energy produced by combustion of fuel into mechanical energy

**3.4**
**internal combustion engine**
type of engine where the combustion of fuel takes place inside the cylinder

**3.4.1**
**compression ignition engine**
diesel engine
engine in which combustion is achieved by compressing the air until a high temperature is achieved to initiate combustion of fuel

NOTE As the compressed air inside the cylinder reaches a high temperature, atomized fuel is injected in the combustion chamber, it ignites on contact with high temperature air to generate power.

**3.4.2**
**spark ignition engine**
gasoline engine
engine in which combustion occurs through the initiation of a spark on the compressed fuel and air mixture

NOTE Fuel and air mixture is first introduced inside the cylinder in gaseous condition. It is then compressed and ignited resulting to the generation of power.

**3.5**
**overhead valve (OHV)**
I-head arrangement
arrangement of valves wherein the intake and exhaust valves are located in the cylinder head

**3.6**
**side valves (SV)**
L-head arrangement
arrangement of valves wherein the intake and exhaust valves are located on one side of the cylinder block

**3.7**
**water-cooled**
liquid-cooled
indirect cooling system
system in which water/liquid-coolant serves as the cooling medium which circulates in the water jackets to absorb the heat of the engine

## 4 Classification

The classification of internal combustion engines shall be based on the following:

**4.1** Type of fuel used

**4.1.1** Gasoline

**4.1.2** Diesel

**4.2** Type of fuel ignition system

**4.2.1** Spark ignition

**4.2.2** Compression ignition

**4.3** Orientation of engine cylinder

**4.3.1** Vertical

**4.3.2** Horizontal

**4.3.3** Inclined/Diagonal

**4.4** Type of cooling system

**4.4.1** Water-cooled

**4.4.2** Air-cooled

**4.5** Arrangement of valves and camshaft

**4.5.1** Side valves (SV)

**4.5.2** Overhead valve (OHV)

**4.6** Number of cycle

**4.6.1** Two-stroke

**4.6.2** Four-stroke

**4.7** Type of starting system

**4.7.1** Hand cranked

**4.7.2** Electrically started

## 5 Performance Requirements

The engine when tested in accordance with PAES 117 shall conform to the following requirements:

**5.1** The engine shall be easily started as indicated in PAES 117.

**5.2** At least 80% of the rated maximum output power shall be attained during the varying load test.

**5.3** A performance curve, which shows output power, torque, fuel consumption and specific fuel consumption plotted against engine shaft speed at full throttle setting, shall be provided.

**5.4** The rated continuous output power of the engine specified on the nameplate or 80% of the rated maximum power (if no rating on continuous power is indicated) shall be attained at rated engine speed.

**5.5** The engine shall have no breakdowns/malfunctions (i.e. overheating, failure of components, etc) during 5-hr continuous running test.

**5.6** The noise emitted by the engine measured 50 mm away from the operator's ear level shall not be more than 92 db (A). [*]

## 6 Other Requirements

**6.1** The fuel tank shall have a capacity which shall not require replenishment of fuel for at least two hours of operation at rated continuous power.

**6.2** The base shall be durable and have provision for easy mounting of the engine.

**6.3** There shall be provisions that will orient the exhaust away from the operator.

**6.4** The engine shall be equipped with cooling system suitable for tropical operations.

[*] Allowable noise level for six (6) hours of continuous exposure based on Occupational Safety and Health Standards, Ministry of Labor. Philippines.1983.

## 7 Workmanship and Finish

**7.1** Castings shall be free of shrink holes, blowholes, cracks, scales, blisters and other similar injurious defects. The surface of castings shall be cleaned by sandblasting, shot blasting, pickling or any other standard method.

**7.2** The engine shall be free from sharp edges and surfaces that may injure the operator.

**7.3** Any uncoated metallic surfaces shall be free from rust and shall be painted properly.

## 8 Warranty for Construction and Durability

**8.1** Warranty against defective materials and workmanship shall be provided for parts and services except for consumable maintenance parts (i.e. spark plug, air cleaner element, etc) within six (6) months from the purchase of the engine.

**8.2** The construction shall be rigid and durable without breakdown of its major components within six (6) months from purchase by the first buyer.

## 9 Maintenance and Operation

**9.1** Each engine unit shall be provided with the following basic hand tools: two (2) pieces open wrenches, one (1) piece adjustable wrench and one (1) piece each of Philips and flat screw-driver. For gasoline engines, a spark plug wrench shall also be provided.

**9.2** An instruction manual, which conforms to PAES 102, shall be provided.

## 10 Sampling

Engines shall be sampled in accordance with PAES 103.

## 11 Test Method

The sampled engines shall be tested for performance and durability in accordance with PAES 117.

## 12 Marking and Labeling

Each engine shall be marked in English language with the following information using a plate, stencil or by directly punching it at the most conspicuous place:

**12.2.1** Registered trademark of the manufacturer

**12.2.2** Brand

**12.2.3** Model

**12.2.4** Serial number

**12.2.5** Name and address of manufacturer

**12.2.6** Name and address of the importer, if imported (optional)

**12.2.7** Country of manufacture (if imported) / "Made in the Philippines" (if manufactured in the Philippines)

**12.2.8** Output power (kW) at rated speed

**12.2.8.1** Maximum

**12.2.8.2** Continuous

**12.2.9** Displacement (cc)

**12.2.10** Safety/precautionary markings