Revision of ANTAM Standard Code for Testing of Power Tillers (001-2022)

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POWER TILLER

- a self-propelled agricultural machinery used for field operations (tilling, seeding, plant protection, harvesting etc.) and haulage having a single axle, in which the direction of travel and its control are performed by the operator.

POWER TILLER – CODE REVISIONS

- Scope
- Terminology - Maximum Engine Power
- Terminology - Tyre Rolling Radius
- General Guidelines - Running in
- Fuels and Lubricants
- Atmospheric Conditions
- Temperature
- Tolerances
- Engine Test – General, Test at Full Load and Varying Speed, Varying Load Tests
- Presentation of Results
- Drawbar Test
- Parking Brake Test – Procedure
- Noise Test – Measurement at bystander position, and at operator's ear level
- Waterproof Test

POWER TILLER – CODE REVISIONS

1. SCOPE

This Test Code covers the terminology, general guidelines, and tests to be conducted on power tillers with diesel engine excluding mini tillers. It also covers methodology for checking of machine specifications, engine performance, rotary shaft performance, vibration level, drawbar performance, turning ability, parking brake ability, noise measurement, waterproof ability, and basic safety requirements.

The tests are conducted for establishing performance characteristics of power tillers that are ready for commercial production or already in production. The manufacturer must specify whether the test is confidential or for commercial purpose.

This publication supersedes the previous ANTAM Standard Code for testing of Power Tillers (ANTAM 001-2018).

POWER TILLER – CODE REVISIONS

3. TERMINOLOGY

3.2 Maximum Engine Power

Maximum sustainable engine power available at the crankshaft or PTO.

3.5 Tyre Rolling Radius

The effective tyre rolling radius is the average distance travelled by the power tiller in one rotation of the driving wheels divided by 2π, when the power tiller is driven without drawbar load at a speed of approximately 2 km/h. The mass of power tiller with full tank and radiator; and the mass of seated operator (if applicable) shall be reported separately.

POWER TILLER – CODE REVISIONS

4. GENERAL GUIDELINES

4.2 Running-in

The manufacturer/applicant shall run-in the power tiller before the test under their responsibility and in accordance with the procedure prescribed or agreed with the manufacturer/applicant and in any case in ordinary. The running-in shall be carried out in collaboration with the testing authority. If this procedure is impracticable due to the power tiller being an imported model, the testing authority may run-in the power tiller in accordance with the procedure prescribed or agreed to with the manufacturer/applicant.

4.6 Fuels and Lubricants

Fuels and lubricants shall be selected from the range of products commercially available in the country where the equipment is tested and shall conform to the minimum standards approved by the power tiller manufacturer. If the fuel or lubricant conforms to a national or international standard, it shall be mentioned, and the standard stated (OECD Code 2-2020, or updated version).

POWER TILLER – CODE REVISIONS

4. GENERAL GUIDELINES

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Fuels and lubricants shall be selected from the range of products commercially available in the country where the equipment is tested and shall conform to the minimum standards approved by the power tiller manufacturer. If the fuel or lubricant conforms to a national or international standard, it shall be mentioned, and the standard stated (OECD Code 2-2020, or updated version).

4.9.2 Temperature

For power tests, the normal ambient temperature shall be from 16 to 34 ^{o}C (5.2.3 GB/T 6229-2007). Ambient air temperature shall be measured approximately 2 m in front or side depending upon the location of suction or blower device of power tiller and approximately 1.5 m above the ground (IS 9935:2002).

Note – No correction shall be made to the test results for atmospheric conditions.

POWER TILLER – CODE REVISIONS

5. MEASURING TOLERANCES

k) Fuel consumption (overall for the apparatus used):	
1) Engine test (g/h or l/h)	± 1.0 %
2) Rotary shaft test (g/h or l/h)	± 1.0 %
3) Drawbar test (g/h or l/h)	± 2.0 %

POWER TILLER – CODE REVISIONS

8. ENGINE TEST

8.1 General

The various tests shall normally be carried out continuously.

The angle of the connection of the shaft connecting the crankshaft to the dynamometer shall not exceed 2^{o} (5.2.2 GB/T 6229-2007).

If an exhaust gas discharge device for the test area is used, it shall not change the engine performance.
The governor control shall be set at maximum speed and full throttle.

POWER TILLER – CODE REVISIONS

8. ENGINE TEST

8.2.3 Test at Full Load and Varying Speed

The hourly fuel consumption, torque and power are measured as a function of speed. To plot the curves, the test shall go down to an engine speed at least 15 per cent below the speed at which maximum torque occurs or to an engine speed at least 50 per cent of rated engine speed, whichever speed is lower. This is subject to any limitations such as safe operation of the power tiller and test equipment or as stated by the manufacturer in agreement with the test station (OECD Code 2:2020 or updated version).

8.2.4 Varying Load Tests

Torque, engine speed, hourly fuel consumption, and shall be recorded at the following loads (OECD Code 2:2020 or updated version):

POWER TILLER – CODE REVISIONS

8. ENGINE TEST

8.2.6 Presentation of Results

The observed data in 8.2.1 to 8.2.5 shall be reported in tabular form for each test condition (**Annex D-6**). If also presented in graphical form (which is optional), the following, covering the full range of engine speeds tested, shall be included:

a) Power as a function of speed (kW);
b) Torque as a function of speed (Nm);
c) Fuel consumption (mass or volume*) and specific fuel consumption (mass or volume*) as a function of speed (g/h or l/h);
d) Specific fuel consumption (mass or volume*) as a function of power (g/kWh or l/kWh);
e) No-load maximum engine speed (rpm).

*Indicate the density of the fuel

POWER TILLER – CODE REVISIONS

8. ENGINE TEST

8.3 High Ambient Test (Optional)

8.3.2 Test at Full Load and Varying Speed

The hourly fuel consumption, torque and power are measured as a function of speed. To plot the curves, the test shall go down to an engine speed at least 15% below the speed at which maximum torque occurs or to an engine speed at least 50% of rated engine speed, whichever speed is lower. This is subject to any limitations such as safe operation of the power tiller and test equipment or as stated by the manufacturer in agreement with the test station (OECD Code 2:2020 or updated version).

POWER TILLER – CODE REVISIONS

8. ENGINE TEST

8.3 High Ambient Test (Optional)

8.3.3 Presentation of Results

The observed data in 8.3.1 to 8.3.2 shall be reported in tabular form for each test condition (**Annex D-6**). If also presented in graphical form (which is optional), the following, covering the full range of engine speeds tested, shall be included:

a) Power as a function of speed (kW);
b) Torque as a function of speed (Nm);
c) Fuel consumption (mass or volume*) and specific fuel consumption (mass or volume*) as a function of speed (g/h or l/h);
d) Specific fuel consumption (mass or volume*) as a function of power (g/kWh or l/kWh);
e) No-load maximum engine speed (rpm).

*Indicate the density of the fuel

POWER TILLER – CODE REVISIONS

9. ROTARY SHAFT TEST

9.2 Natural Ambient Temperature Test

During the test, the surrounding temperature will be within the range of 16 to 34 ^{o}C.

9.2.1 Varying Speed Test

Measure the power, torque, and fuel consumption as a function of speed at full governor at approximately 1-2% speed decrements. Readings shall be taken between no load rpm and speed at maximum torque (maximum power, rated power, maximum torque readings shall be taken). The minimum speeds at which measurements are made will be at the speed of maximum torque and, if possible, 15% below that speed (IS 9935:2002).

POWER TILLER – CODE REVISIONS

10. DRAWBAR TEST

10.1.3 During the drawbar performance test, the governor control shall be set at maximum speed and full throttle.

10.1.4 The test shall not be conducted in the gear for which the forward speed exceeds the safety limit of the power tiller as stated by the manufacturer and in the testing equipment.

10.1.5 The test shall be made at least in the speeds, from one giving a travel speed immediately faster than in the gear in which the greatest maximum power is developed and one immediately slower than the gear setting allowing maximum pull to be developed (4.4.1.7 OECD Code 2-2020 or updated version).

POWER TILLER – CODE REVISIONS

12. PARKING BRAKE TEST

12.2 Procedure

12.2.1 The power tiller shall be placed out of gear on a slope of 18 %. Additional voluntary tests can be made on higher slopes up to the maximum slope stated by the manufacturer. The power tiller shall be placed first facing up and then down the slope, the rotation of the braked wheel shall be observed. The observation along with the factors allowing the rotation of the wheels shall be stated in the test report (IS 9935: 2002).

13. NOISE TEST

13.2 Measurement at By-stander Position (IS 12180-2:2000)

13.2.1 The noise shall be measured with instrument of A weighted expressed in decibels set on fast level.

13.2.2 The measurement shall be made with the power tiller stationary on dry concrete surface and/or during field operation.

POWER TILLER – CODE REVISIONS

13. NOISE TEST

13.3 Measurement at Operator Ear Level (IS 12180-1:2000: ISO 5131:1996)

13.3.1 The noise measurement test shall be conducted at the operator's ear level during the drawbar pull test. The test will be applicable to power tillers on which drawbar test is conducted.

13.3.7 The noise should be measured and when noise exceeds the national limit protective equipment should be supplied to the operator.

Note – National limits will be used as reference.

POWER TILLER – CODE REVISIONS

15. WATERPROOF TEST

15.1 General

15.1.1 The waterproof test is conducted to determine the effectiveness of the seals of the power tiller when operated under lowland condition.

15.1.2 The power tiller shall be fitted with puddling wheels as per recommendation of manufacturer and with no implement attached.

15.1.3 The power tiller is classed as “waterproof power tiller,” if after the test described below, there is no water penetration into axle, brake, and clutch system (4.9.1 OECD Code 2-2020 or updated version).

END OF PRESENTATION
Thank you!