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Mazdoor Kisan Shakti Sangathan
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Jawaharlal Nehru
“Step Out From the Old to the New”

IS 10507 (1998): Paddy Separator [FAD 20: Agriculture and Food Processing Equipments]
Indian Standard

PADDY SEPARATOR — SPECIFICATION

( First Revision )

ICS 67.060:53.100
FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Produce Processing and Milling Machinery Sectional Committee had been approved by the Food and Agriculture Division Council.

With the modernization of rice milling industry in the country, paddy separators are being increasingly used and manufactured. In order to maintain and evaluate the quality of the separator, this standard was first published in 1983. In order to include various safety parameters, moisture content of test material for measuring performance requirement and updating of referred standards, a need was felt to revise it.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
Indian Standard
PADDY SEPARATOR — SPECIFICATION
( First Revision )

1 SCOPE
This standard specifies the constructional and other requirements of paddy separator.

2 REFERENCES
The following standards contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

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<td>210 : 1993</td>
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<td>4454 (Part 1) : 1981</td>
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3 TERMINOLOGY
3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Brown Rice
Paddy from which husk only has been removed. It is also known as dehusked rice.

3.2 Feed Rate
The quantity of the mixture (brown rice and paddy obtained from dehusker after separation of husk) fed into the paddy separator per unit time.

3.3 Feed Regulating Mechanism
The mechanism which regulates the feed rate to the paddy separator.

3.4 Paddy Separator
A machine which is used for the separation of brown rice from the paddy-brown rice mixture.

3.4.1 Compartment Type Paddy Separator
A paddy separator which works on the principle of differences in specific gravity, buoyancy and surface characteristics of the paddy and brown rice; and separation occurs in compartments moving to-and-fro horizontally.

3.4.2 Tray-Type Paddy Separator
A paddy separator which works on the principle of differences in specific gravity and length of the paddy and brown rice; and separation occurs in the dimpled trays which have both horizontal and vertical motions.

4 TYPES
The paddy separator shall be of following types:

a) Compartment type (see Fig. 1), and
b) Tray type (see Fig. 2).

5 MATERIAL
The material of construction of main components of the different types of separators shall be declared by the manufacturer in the operator's manual. The material may be selected from following depending upon usage:

a) Cast iron (see IS 210),
b) Mild steel (see IS 2062),
c) Wood (see IS 399),
d) Galvanized steel sheet (see IS 277),
e) Spring steel (see IS 4454 (Part 1)).

6 PERFORMANCE REQUIREMENTS
6.1 When tested in accordance with the method given in Annex A, the separators shall conform to the
following requirements:

a) The percentage of paddy in brown rice after separation shall be not more than 0.05 percent (w/w) of brown rice, and

b) The percentage of brown rice in paddy shall be not more than 10 percent if this portion comes back to the separator for reseparation otherwise it shall not be more than 5 percent.

6.1.1 The separator shall withstand the test given under A-3 and A-5.

7 CONSTRUCTIONAL REQUIREMENTS

7.1 The sheet used in construction of various parts shall be of minimum 0.5 mm thickness.

7.2 The dimples in dimpled trays shall be uniform in size.

7.3 All the wooden components of the compartment type separator shall be of minimum 15 mm thickness.

7.4 Suitable system for transmitting the power shall be provided. It may consist of V-belt and pulley, gears or sprocket and chain.

7.4.1 Transmission guards shall be provided to prevent accidental contact of persons or parts of clothing being caught in the transmission system, unless the system is so constructed or placed as to be safe without guards.

7.4.2 The guards shall be so designed as not to hinder in easy adjustment, servicing and operation of separator.

7.4.3 It is preferable that all guards shall be either permanently attached or firmly secured to prevent their removal without the aid of tools. The servicing and adjustments should be possible without complete removal of the guards.
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7.4.4 The guards shall have sufficient strength to support load of 1 200 N applied at any point over an area of 0.1 m² without permanent set.

NOTE — Depending upon space available, the area and load may be correspondingly increased or decreased for testing purposes.

7.5 The shafts and eccentrics shall be supported on ball or roller bearings at both the ends.

8 OTHER REQUIREMENTS

8.1 The axle shaft shall be finished to close tolerance at the bearings and shall be properly aligned.

8.2 Provision shall be made for lubrication of bearings and these shall be dustproof.

8.3 Operation and maintenance manual along with safety instructions shall be supplied by the manufacturer.

8.4 The provision for belt tightening shall be made.

8.5 Various controls, shall be accessible easily and capable of being locked at selected position.

9 WORKMANSHIP AND FINISH

9.1 The components of the separators shall be free from cracks, pits, holes and other visual defects which may be detrimental for their use.

9.2 The welding, if done, shall not be porous and shall be smooth (see IS 816).

9.3 A protective coating against rusting shall be applied on the steel components.

10 MARKING AND PACKING

10.1 Marking

Each separator shall be marked with the following particulars:

a) Manufacturer's name, address and recognized trade-mark, if any;

b) Type;

c) Power rating, kW;

d) Drive details like number of oscillations and rev/min of the main shaft;

e) Batch or Code number, if any;

f) Model No.;

g) Year of manufacture;

h) Energy requirement, kW/kg of feed (see A-4.3);

j) Grading effectiveness (see A-4.4); and

k) Performance index (see A-4.3).

10.1.1 A minimum cautionary notice worded as follows shall be written in vernacular language legibly and prominently on the main body of the separator:

a) DO NOT WEAR LOOSE DRESS, BANGLES, WATCH, ETC, WHILE WORKING;

b) DO NOT WORK UNDER THE INFLUENCE OF INTOXICANTS LIKE LIQUOR, OPIUM, ETC;

c) CHILDREN AND AGED PERSONS SHOULD BE DISCOURAGED FOR WORKING ON SEPARATOR;

d) DO NOT CROSS OVER MOVING BELTS;

e) DO NOT OPERATE SEPARATOR WITHOUT GUARDS;

f) DO NOT MAKE ADJUSTMENT WHEN SEPARATOR IS WORKING; AND

g) DO NOT PUT OR TAKE-OFF BELT WHILE PULLEY IS RUNNING.

10.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10.3 Packing

The packing of the separator shall be done as agreed to between the purchaser and the supplier for safe handling in transit.
ANNEX A
(Clauses 6.1 and 6.1.1)

METHODS OF TEST FOR PADDY SEPARATOR

A-1 TEST MATERIAL

A-1.1 Sufficient quantity of brown rice-paddy mixture shall be taken. The moisture percent when determined in accordance with the method given in IS 4333 (Part 2) shall be not more than 14 percent.

A-1.2 The percentage of paddy in brown rice-paddy mixture shall be determined by analyzing five sets of samples of 100 g each. The paddy and brown rice shall be separated by hand picking. The average value shall be calculated from these analytical data and reported.

A-2 RUNNING-IN AND PRELIMINARY ADJUSTMENTS

A-2.1 The separator shall be installed on level and preferably on hard surface. All the adjustments shall be made in accordance with the manufacturer’s recommendation.

A-2.2 The separator shall be attached with a suitable prime mover preferably with an electric motor and auto voltage stabilizer. An energy meter or some form of transmission dynamometer shall be fitted. The power delivered to the separator may be supplied in the following ways:

a) Direct coupling the prime mover with the main shaft of the separator, and

b) Connecting the prime mover with the help of a flat or V-belt and pulleys with the main shaft of the separator.

A-2.2.1 In case of (a), the power delivered to the separator would be the power output of the prime mover, whereas in case of (b), the allowances for flat and V-belt drive losses may be taken as 6 and 3 percent respectively.

A-2.3 The separator shall be run-in without load before commencing the tests. The running-in shall be carried out in accordance with the manufacturer’s recommendation. In the absence of any recommendation by the manufacturer, the separator shall be run-in for 30 minutes. During the period of run-in, adjustment for various functional components may be done. All the adjustments done shall be in accordance with the instructions contained in the manual supplied by the manufacturer.

A-3 TEST AT NO LOAD

After the running-in is over, the separator shall be run at no load for 30 min at the specified speed. During and after no load run, the visual observation of the separator shall not show the following:

a) Presence of any marked vibration during the operation,

b) Presence of undue knocking or rattling sound.

c) Frequent slippage of belts,

d) Any marked unusual wear or slackness in any component, and

e) Any marked rise in bearing temperature.

A-4 TEST AT LOAD

A-4.1 Operation and Collection of Data

The separators shall be attached in a suitable rice mill having continuous operation or tested separately. It shall be operated at its specified speed for 30 min at a feed rate equal to the rated input capacity specified by the manufacturer. During the running period, the speed of the shaft shall be noted. Three sets of samples, at an interval of 10 minutes at the following outlets for 2 min, shall be collected:

a) Separated paddy outlet,

b) Brown rice outlet, and

c) Brown rice and paddy mixture outlet (if present).

A-4.2 Preparation and Analysis of Sample

The three sets of the samples obtained at various outlets shall be weighed separately and thoroughly mixed separately (from various outlets to form composite sample). Out of these composite samples, 100 g representative sample shall be taken and analyzed for the following:

a) Separated paddy outlet — to be analyzed for brown rice,

b) Brown rice outlet — to be analyzed for paddy, and

c) Brown rice and paddy mixture outlet — to be analyzed for brown rice and paddy.

A-4.2.1 The percentage of paddy in brown rice outlet as well as brown rice in paddy outlet shall be calculated.

A-4.3 Determination of Energy Consumption

The energy requirement for each feed rate shall be
calculated in accordance with A-4.3.1 and A-4.3.2.

A-4.3.1 In case of prime mover fitted with an energymeter, the readings taken shall be the energy consumption for 5 min. The energy consumption per hour giving due allowance to the type of drive shall be calculated and reported.

A-4.3.2 In case of prime mover fitted with the dynamometer, the readings taken shall indicate the torque required. The energy consumption giving due allowance to the type of drive (see A-2.2.1) shall be determined after computing the power output of the primemover by the following formula:

\[
P = \frac{T \times S}{973.363}
\]

where

\[P = \text{Power delivered by primemover, kW};\]
\[T = \text{torque, Nm};\]
\[S = \text{speed, rev/min}.\]

A-4.4 Grading Effectiveness

A-4.4.1 Grading effectiveness shall be computed using McCabe Smith's formula as given below:

\[
E = \frac{(X_r - X_i)(X_d - X_i) X_d (1 - X_i)}{(X_d - X_i)^2 (1 - X_i) X_r}
\]

where

\[X_r = \text{mass fraction of head rice in feed},\]
\[X_d = \text{mass fraction of head rice in overflow},\]
\[X_i = \text{mass fraction of head rice in underflow}.\]

A-4.5 Performance Index

A-4.5.1 Performance index shall be computed as follows:

\[
\text{PI} = \frac{\text{Capacity} \times \text{Grading effectiveness}}{\text{Power}}
\]

A-5 LONG RUN TEST

The separators shall be operated for a minimum period of 20 h at no load which could be covered by continuous run of at least 5 h. During and after the operation, no breakdown or defect shall develop in the separator.
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This Indian Standard has been developed from Doc : No. FAD 51 (772).

Amendments Issued Since Publication

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Printed at New India Printing Press, Khurja, India