(based on IS 7052-1973)

(Reaffirmed 2012)

*Indian Standard*

**TEST CODE FOR HUSKER SHELLER FOR MAIZE**

**0. FOREWORD**

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on xxxxxxxxxxx, after the draft finalized by the ~~Agricultural Machinery and Tractors Sectional~~ Committee had been approved by the ~~Agricultural and Food Products Division Council~~.

0.2 Power operated husker sheller for maize are being extensively manufactured and used in the country for removing husk / sheath and separation of grains / kernels from cobs. This test code is a guide for evaluating objectively the performance and constructional durability of maize husker shellers. This code, covering type tests as well as routine tests, is also intended to help the manufacturers to develop, and various purchasing agencies to select, suitable power operated maize husker shellers to meet their requirements.

0.3 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\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**1. SCOPE**

1.1 This code prescribes method of testing of power operated maize husker shellers to evaluate their performance and durability.

**2. REFERENCES**

For the purpose of this test code the following IS codes are referred.

|  |  |
| --- | --- |
| IS 6284: 1985 (Re-affirmed-1999) | Test code for power Thresher for cereals (Second Revision) |
| IS 3327: 1982 | Specification for pedal-operated paddy (First Revision) |
| IS 8122 (Part 1): 1994 | Test code for power combine harvester  Part 1-terminology (First Revision) |
| IS 15805: 2008 | Straw reaper-combine-test code  Part 1-terminology (First Revision) |
| IS 11234: 1985 (Re-affirmed-2001) | Test code for power Thresher for groundnut |
| IS 9020: 2002 (Re-affirmed-2004) | Power threshers - safety requirements. (First Revision) |
| IS 9020:2002 | Power threshers — safety requirements |
| IS 7501- 1973 ( Re-affirmed -2012) | Specifications for power operated maize shellers |
| IS 7502- 1973 ( Re-affirmed -2012) | Test code for power operated maize shellers |

**3. TERMINOLOGY**

**3.0 For this standard, the following definitions shall apply.**

**3.1 Prime Mover** - An electric motor or diesel engine or tractor power takeoff is used for running the husker sheller.

**3.2 Concave Clearance** -The maximum clearance between cylinder and concave.

**3.3 Screen Pitch** - Inclination of screen with the horizontal plane in degrees.

**3.4 Sieve Clearance** -The maximum vertical distance between two successive sieves.

**3.5 Clean Grain -** Shelled grain / kernel free from refractions [see IS: 4333 (Part I)-1967$].

**3.6 Cleaning Efficiency** - Clean grains (see 3.5) received at the specified grain outlet(s) with respect to total grain received at grain outlet(s) expressed as percentage by weight.

**3.7 Shelling efficiency –** Threshed/shelled maize kernel (after removal of dirt, husk, etc.) received at the outlet with respect to the total maize cob (un-threshed/shelled) fed at the inlet expressed as percentage by mass.

**3.8 Batch Test (Conformity of Production) -** The tests conducted on maize husker sheller which have already undergone initial commercial test and are being manufactured / sold commercially in the country.

**3.9 Commercial Test -** The tests conducted for establishing performance characteristics of maize husker sheller that are ready for commercial production or already in production.

**3.10 Composite Sample** - The sample of the grain, husk and shelled cobs formed by combining and blending the primary samples (see 3.19).

**3.11 Confidential Test -** The test conducted for providing confidential information on the performance of maize husker sheller whether ready for commercial production or not, or to provide any special data that may be required by the manufacturer / applicant.

**3.12 Evaluative requirements -** Requirement under this category are the ones which are mandatory for acceptance of the maize husker sheller for the purpose of commercial production/ availing government subsidies and or fiancé from financing Institutions. The testing agency will assess the performance of the maize husker sheller under test and release the report.

**3.13 Non Evaluative requirements -** Requirements under this category are the ones which are not mandatory for acceptance of the maize sheller for the purpose of commercial production/ availing government subsidies and or finance from financing Institutions. However, the authorized testing agency may observe the performance for these requirements and record in the test report.

**3.14 Initial commercial Test -** The tests conducted on indigenous or imported prototype maize husk sheller ready for commercial production.

**3.15 Repeat Test -** The tests conducted on maize husker sheller, to validate the performance in case of not meeting the evaluative requirements of this standard or to ascertain the re-occurrence of breakdown / defects observed in earlier tests, for the same parameter and on the same sample under the test after rectifying the defects or after replacing the defected part/sub-assembly by new part of the same specifications.

**3.16 Type Test -**Tests carried out on husker sheller to prove the conformity with the requirements of relevant standard. These are intended to prove the general qualities and design of a particular type of sheller.

**3.17 Routine Tests -** Tests carried out on each husker sheller to check the requirements which are likely to vary during production.

**3.18 Sample -** The quantity of maize grain / kernel taken from the outlet at a particular time period.

**3.19 Primary Sample** - The weight of the grain, husk and shelled cobs taken from the outlets for a specified period of time.

**3.20 Final Sample** -The sample drawn from the composite sample (see 3.10) for analysis.

**3.21 Foreign Matter** - Includes inorganic and organic matter. The inorganic matter comprises sand, gravel, dirt, pebbles, stones, lumps of earth, clay, mud, iron chips*, etc*. The organic matter comprises chaff, straw, weed seeds and other inedible grains.

**3.22 Grain Mixture** - The mixture of clean, broken, un-threshed grains / kernel and foreign matter coming out of the main grain outlet(s).

**3.23 Feed Rate**-The weight of the maize cobs fed into the husker sheller per unit time.

**3.24 Input Capacity** - The maximum feed rate at which the power requirement is minimum and total losses and efficiencies are within the specified limits (see 5.1, 5.2 and 5.3 of IS: 7051- 1973 - Specification for power maize shellers; 4.1, 4.2 and 4.3 – IS: --------- Specification for Husker sheller for maize).

**3.25 Output Capacity -** The weight of the grains received at the specified grain outlet(s) when collected at input capacity (see 3.24).

**3.26 Un-shelled / un-threshed Grain**- Grains/ kernel still in the cobs after the shelling / threshing.

**3.27 Percentage of Blown Grain** — The clean grain lost along with the husk / sheath / impurities with respect to total grain input expressed as percentage by mass.

**3.28 Percentage of Broken Grain** — The broken grain collected from all grain outlets with respect to total grain input expressed as percentage by mass.

**3.29 Percentage of Spilled Grain** — The clean grain dropped through the sieve and over-flown from sieve along with tailings with respect to total grain input, expressed as percentage by mass.

**3.30 Percentage of Un-threshed Grain** — The un-threshed grain from all outlets with respect to total grain input, expressed as percentage by mass.

**3.31 Total Loss-**The sum of the following losses in a sheller expressed in percentage.

3.31.1 *Blown Loss* -The clean grain (see 3.5) lost along with the husk with respect to total grain input, expressed as percentage by weight.

3.31.2 *Cracked and Broken Grain Loss* - Cracked and broken grains from the specified grain outlet(s) with respect to total grain received at outlet(s) expressed as percentage by weight.

3.31.3 *Sieve Loss* -The clean grain (see 3.5) dropped through the sieve, left over sieve and stuck in the sheller with respect to total grain input, expressed as percentage by weight.

3.31.4 *Un-shelled Loss –* Un-shelled grain (see 3.26 ) from all outlets with respect to total grain input, expressed as percentage by weight.

\*Rules for rounding off numerical values ( revised ).

$Methods of analysis for food grains: Part I Refractions.

**4. SELECTION AND SPECIFICATION OF HUSKER SHELLER FOR TEST**

4.1 Selection of husker sheller - the maize husker sheller shall be selected at random from the series production by the testing authority with the agreement of the manufacturer.

4.2 Specification and other literature - the manufacturer shall supply all literature, operational manual and schematic diagram of material flow of the sheller. The manufacturer shall also supply the specification sheet duly filled in as given in Appendix A, as well as any further information required to carry out the tests.

NOTE - Operational manual shall include maintenance and adjustments schedule and safety precautions.

**5. TESTS**

**5.1 Type Tests**

*5.1.1 General*

a) Checking of specification (see 7.1)

b) Checking of material (see 7.2)

c) Visual observations and provision for adjustments (see 7.3)

*5.1.2 Test at No Load*

a) Power consumption (see 8.1)

b) Visual observations (see 8.2 )

*5.1.3 Test at Load*

a) Short run tests (see 9.1):

1) Total losses [see 9.1.8 (f)]

2) Shelling efficiency [see 9.1.9 (a)]

3) Cleaning efficiency [see 9.1.9 (b)]

*4)* Power consumption (see 9.1.10)

*5)* Input capacity (see 9.1.11)

*6)* Output capacity (see 9.1.12)

*7)* Corrected output capacity (see 9.1.13)

*8)* Visual observations (see 9.1.4.6)

b) Long run test (see 9.2)

**5.2 Routine Tests**

5.2.1 *Essential*

a) Visual observations and provisions for adjustments (see 7.3 )

b) Test at no load (see 8.1 and 8.2 )

5.2.2 *Optional*

a) Checking of specification (see 7.1)

b) Checking of material (see 7.2)

**6*.* PRE-TEST OBSERVATIONS**

**6.1 Determination of Grain - Cob Ratio -**Take ten samples of the de-sheathed (after removal of husk / sheath) cobs at random. Each sample shall be not less than one kg in weight. Separate the grain / kernel from the cobs manually for each sample. Take the weight of grain / kernel and shelled cob separately for each sample, and calculate their ratio. The average of the ten samples shall be taken as grain - cob ratio.

**6.2 Moisture Content of Grain -**Take suitable samples of grain (see 6.1) and test them in accordance with IS: 4333 (Part II)-1967\* for moisture determination.

**6.3 Running-in and Preliminary Adjustments -**The sheller shall be new and run-in before commencing the test by the manufacturer in accordance with the instructions and in collaboration with the testing authority for atleast one hour. The adjustments for the speed of different shafts, concave clearance, speed of the prime mover, screen pitch, etc, shall be done according to manufacturer’s recommendations.

**7. GENERAL TESTS**

**7.1 Checking of Specification-** Check all the dimensions and specification mentioned by the manufacturer (see 4.2) and record the data in proforma as given in Appendix A.

**7.2 Checking of Material** - Check the material for all components and record the data in proforma as given in Appendix B.

**7.3 Visual Observations and Provisions for Adjustments** – Record the observations and adjustments according to Appendix C.

**8. TEST AT NO LOAD**

**8.1 Power Consumption**

8.1.1 Install the husker sheller on level and preferably on hard surface. Remove the pneumatic wheels if provided to the husker sheller.

8.1.2 Set the clearances, screen pitch, etc, in accordance with manufacturer’s recommendations. Use electric motor of appropriate power, duly fitted with an energymeter for running the sheller. If fitted with diesel engine or attached to PTO of tractor, have provision to measure the fuel consumption.

8.1.3 Run the sheller at no load for at least half-an-hour at the specified revolution of shelling unit and record the readings of the energymeter at interval of 5 minutes. The difference between two consecutive readings shall give power consumption for 5 minutes. Calculate power consumption at no load for one hour. If uses diesel as fuel measure the consumption during the time of run, at least for 30 minutes and record.

8.1.4 Record the data according to item (1) of Appendix D.

**8.2 Visual Observations** - During and after completing power consumption test (see 8.1), the observations given in item (2) of Appendix D shall be made visually and recorded.

**9. TEST AT LOAD**

**9.1 Short Run Tests**

9.1.1 Install the sheller on level and preferably on hard surface with its wheels removed, if any, and set the speed, clearances, screen pitch, *etc*., as per manufacturer’s recommendations.

9.1.2 Take sufficient quantity of maize cobs of the same variety free from plant leaves, stalk, *etc.* The cobs should, as far as possible, be of the same size. The moisture content of the grain shall be 10 to 18 percent d.b.

9.1.3 Attachment of Prime Mover and Husker Sheller *-* Attach the sheller with a suitable prime mover, preferably electric motor. An energymeter or some form of transmission dynamometer shall be fitted. The power delivered to the sheller may be supplied in following ways:

a) Direct coupling the prime mover with the main axle of the sheller, and

b) Connecting the prime mover with the help of flat or V-belt and pulleys with the main axle of the sheller.

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

9.1.4 Operation and Collection of Data *-* Operate the husker sheller at the specified speed of the shelling unit for one hour at a feed rate 50 percent of the specified value by the manufacturer.

9.1.4.1 During the run period collect the following samples and data:

a) Four sets of primary samples from grain empty (shelled) cobs and impurities outlet for a period of two minutes for each set; and

b) Record the speed of main shaft by a revolution counter or an accurately calibrated tachometer. The reading of energymeter or dynamometer shall also be taken at an interval of 15 minutes.

c) Record the diesel consumed if attached to diesel engine of tractor over a known running time and calculate the consumption per hour.

9.1.4.2 At the end of one hour feeding, run the sheller idle for some time, so that practically the entire material already fed comes out. At the end of the test, collect the material dropped through sieve, retained on sieve, the material stuck in the sheller and the grain received at grain outlet(s).

9.1.4.3 Repeat the test given at 9.1.4 for minimum of three times at various feed rates covering the maximum feed rate.

9.1.4.4 Conduct the above test at feed rate which has been determined as input capacity (see 9.1.11) at the following shelling unit speeds:

a) Speeds about 10 and 20 percent more than specified speed, and

b) Speeds about 10 and 20 percent less than specified speed.

9.1.4.5 Record the data according to Appendix E.

9.1.4.6 Visual observations*-*During and after the run tests, inspect the sheller visually, and record the observations according to Appendix E.

9.1.5 Preparation of Composite Sample - The primary samples [see 9.1.4.1 (a)] collected at a particular feed rate shall be thoroughly mixed and blended to constitute a homogenous composite sample for different outlets. The samples collected at sieve underflow, overflow and stuck in sheller should also be mixed thoroughly to form a composite sample.

9.1.6 Selection of Final Sample -Take one kilogram of final sample from each composite sample (see 9.1.5) of different outlets. If it is not possible to get one kilogram sample at impurities outlet, take total composite sample as a final sample.

9.1.7 Analysis of Final Sample - Analyze the final sample (see 9.1.6 ) obtained at different outlets for different feed rates by picking with hand separately for the following and record the data according to Appendix F:

a) Cracked and broken grain,

b) Refractions,

c) Unshelled grain, and

d) Clean grain.

NOTE - Analysis for cracked and broken grains shall be made only from the samples taken at specified grain outlet(s).

9.1.8 Determination of Total Losses

a) Total grain input = Feed rate x Grain content (see 5.1)

b) Percentage of unshelled grain = 100 (Quantity of unshelled grain obtained from all outlets in kg) / Total grain input in kg.

c) Percentage of cracked and broken grain = 100 [Cracked and broken grain from specified grain outlet(s) in kg] / Total grain received at grain outlet(s) in kg

d) Percentage of blown grain = 100 (Quantity of clean grain obtained at impurities outlet in kg) / Total grain input in kg.

e) Percentage of sieve loss = 100 (Clean grain obtained at sieve overflow + Sieve underflow + Stuck grain in kg) / Total grain input in kg

f) Total losses = Sum of losses opined at (b), (c), (d) and (e) above.

9.1.8.1 Record the data according to Appendix G.

9.1.9 Determination of Efficiencies

a) Shelling efficiency = 100 - Percentage of unshelled grains

b) Cleaning efficiency = 100 [Clean grain received at grain outlet(s) in kg] / Total grain received at grain outlet(s) in kg

9.1.9.1 Record the data according, to Appendix G.

9.1.10 Determination of Power Consumption

a) In case of energymeter fitted prime mover, the difference between two consecutive readings [see 9.1.4.1 (b)] shall give power consumption for 15 minutes. Calculate the power consumption for one hour giving due allowances to type of drive (see 9.1.3).

b) In case of dynamometer fitted prime mover, the average of reading taken shall give the average torque required. Calculate the power requirement by the following formula:

Power in kW = (Torque in kgf. *m* x Speed in rev/min) / 973.363

9.1.10.1 Record the data according to Appendix G.

9.1.11 *Determination of Input Capacity -* Select the feed rate at which the total losses [see 9.1.8 (f)] and efficiencies (see 9.1.9) are within the specified limits (see 5.1, 5.2 and 5.3 of IS: 7051- 1973\*; see 4.1, 4.2 and 4.3 of IS: Specification for Husker sheller for maize) and power consumption is minimum. This should be achieved by drawing a curve for losses and efficiencies against various feed rates. Capacity in terms of energy consumed shall be calculated by dividing the capacity by power consumed (9.1.10).

9.1.11.1 Record the data according to Appendix G.

9.1.12 *Determination of Output Capacity* -Take the weight of shelled grain received at specified grain outlet(s) and record the data according to Appendix G.

9.1.13 *Determination of Corrected Output Capacity-*Toavoid the variation of moisture content of grain and grain – cob ratio, the output capacity as obtained under 9.1.12 should be corrected at 12 percent moisture and 40 percent grain - cob ratio by the following formula:

*W1* = [*W*- {*W* (*M*-12)}/88] (40/R)

where

*W1 =* corrected output capacity, kg/h

*W =* output capacity (see 9.1.12), kg/h

*M* = observed moisture content (see 6.2), percent d.b. and

*R =* observed grain –cob ratio in percent (see 6.1),

9.1.13.1 Record the data according to Appendix G.

**9.2 Long Run Test** - Operate the sheller for at least 20 hours which should be covered by continuous run of at least 5 hours. If facilities are available it may be run for 50 hours. Record the major breakdowns, wear and tear, defects developed and repairs made, according to Appendix H.

**10. SUMMARY REPORT**

10.1 For the guidance of the users, compile a summary report on the proforma as given in Appendix J.

\*Specification for power operated maize shellers.

**APPENDIX A**

**(Clauses 4.2 and 7.1)**

**SPECIFICATION SHEET**

To BE FILLED BY

*Manufacturer Testing Station*

1. General:

a) Make

b) Model

c) Type

d) Year of manufacture

e) Name and address of manufacturer

2. Power Unit:

a) Provision

b) Type of prime mover

c) Recommended power, kW or hp

d) Type of drive

3. Main Drive:

a) Type

b) Size of belt

c) Size of pulley

d) Diameter of main shaft

4. Dehusking and shelling Unit:

a) Type

b) Constructional features

c) Diameter

d) Width

e) Recommended speed

f) Number and size of beaters/ projections/bars

*5.* Concave:

a) Type

b) Diameter

c) Length

d) Concave clearance range

e) Recommended concave clearance

f) Clearance adjustment provision

To BE FILLED BY

*Manufacturer Testing Station*

*6.* Sieve:

a) Type

b) Number

c) Total length and width

d) Effective length and width

e) Number of holes per cm2 or 100 cm2

f) Size of hole, mm

g) Sieve clearance, mm

h) Screen pitch range, mm

j) Recommended screen pitch, mm

k) Any mechanism to clean the sieve perforation

7. Shaker:

a) Type

b) Number of strokes per minute

c) Stroke length, mm

8. Blower:

a) Number

b) Type

c) Number of blades

d) Size of blades, mm

e) Diameter, mm

f) Recommended speed, rpm

g) Recommended air displacement, m3/min.

h) Provision for changing air displacement

9. Elevator:

a) Type

b) Capacity, kg/h

c) Grain spout size

d) Height above ground level, m

10. Hopper:

a) Type / shape

b) Capacity, kg

c) Method of feeding

d) Recommended maximum feed rate, kg/h

11. Transport:

a) Type

\*b) Number of wheels

\*c) Size of wheels

12. Fly Wheel Size

13. Overall Dimensions:

a) Length, m

b) Width, m

c) Height, m

d) Total weight, kg

14. Tools, Accessories and Manuals Provided

NOTE 1 -The items which are not applicable in a particular sheller shall be crossed while filling.

NOTE 2 -If any other items are provided, their details shall be filled in.

\*In case wheels are not provided, details of alternative provision shall be given.

**APPENDIX B**

**(Clause 7.2)**

**MATERIAL OF CONSTRUCTION DATA SHEET**

1. Date of Test

2. Material of Construction:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl. No.  (1) | Component  (2) | Material  (3) | Size  (4) | Weight  (5) |
| 1 | Frame |  |  |  |
| 2 | Hopper |  |  |  |
| 3 | Cylinder/Disc cover |  |  |  |
| 4 | Cylinder/Disc |  |  |  |
| 5 | Beater/Projection/Bar |  |  |  |
| 6 | Concave |  |  |  |
| 7 | Blower |  |  |  |
| 8 | Main shafts |  |  |  |
| 9 | Blower shaft |  |  |  |
| 10 | Fly wheel |  |  |  |
| 11 | Sieve |  |  |  |
| 12 | Shaker |  |  |  |
| 13 | Elevator |  |  |  |
| 14 | Transport wheel |  |  |  |
| 15 | Pulleys |  |  |  |
| 16 | Others |  |  |  |

NOTE 1 - Delete the component which is not applicable to a particular sheller and add if any other component is provided.

NOTE 2 - Co1umn 4 and 5 should be recorded wherever feasible.

**APPENDIX C**

**(Clause 7.3)**

**DATA SHEET FOR VISUAL OBSERVATIONS AND PROVISIONS FOR ADJUSTMENTS**

1. Observations:

1. Adequacy of marking of inlet and outlets
2. Adequacy of marking of direction of rotation of husker shelling unit
3. Adequacy of protection of bearings against the ingress of dust
4. Adequacy of safety arrangements, specially at moving points
5. Provision for lubrication of moving parts
6. Provision for belt tightening
7. Provision for transportation
8. Provision for easy changing of components requiring frequent replacement
9. Provision for easy replacement and cleaning of screens
10. Provision for anti-corrosive coatings
11. Tightness of bolts and nuts and other fasteners
12. Balancing of husker shelling unit
13. Welding of seams
14. Other observations

2. Provision for Adjustments of:

a) Feed rate

b) Concave clearance

c) Speed

d) Screen pitch

e) Sieve clearance

f) Air displacement

Testing Engineer

**APPENDIX D**

**(Clause 8.1.4 and 8.2)**

**TEST AT NO LOAD DATA SHEET**

1. Power Consumption:

a) Source of power

b) Type of drive

c) Total time of run

d) Energymeter readings at interval of 5 minutes

e) Fuel consumed, if operated by engine / tractor in 30 minutes

e) Average power consumption for one hour

2. Observations:

1. Presence of any marked oscillation during operation
2. Presence of undue knocking or rattling sound
3. Frequent slippage of belts
4. Smooth running of shafts in their respective bearings
5. Any marked unusual wear or slackness in any component
6. Any marked rise in temperature in bearings or in any other components
7. Other observations

Testing Engineer

**APPENDIX E**

**(Clauses 9.1.4.5 and 9.1.4.6)**

**TEST AT LOAD DATA SHEET**

1. Source of Power
2. Power Rating
3. Type of Drive
4. Variety of Maize
5. Grain – Cob Ratio
6. Moisture Content, percent d.b.
7. Concave Clearance, mm
8. Screen Pitch, mm
9. Sieve Clearance, mm

10. Test Data\*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl. No. | Date | Starting time | Stopping time | Duration of operation | $ Speed (rev./min) | Feed rate (quintal/h) | Power required (kW) or fuel consumed (litre/h) | No. of primary samples | Quantity (kg) of primary samples from | | | Total quantity of grain at grain outlet(s) (kg) | Total quantity at sieve under flow (kg) | Total quantity of material stuck in sheller (kg) |
| Grain outlet(s) | Impurities outlet | Shelled cobs outlet |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|  |  |  |  |  |  |  |  | i) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | ii) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | iii) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | iv) |  |  |  |  |  |  |

\* The data shall be collected for every test conducted on different feed rate.

$ Test shall be conducted at specified speeds 10 and 20 percent and more than specified.

11. Observations:

1. Presence of any marked oscillation during operation
2. Presence of undue knocking or rattling sound
3. Frequent slippage of belts
4. Smooth running of shafts in their respective bearings
5. Frequent clogging of husker shelling units
6. Frequent clogging of sieve aperture
7. Smooth flowing of material through different components
8. Vibration free running of fan
9. Frequent clogging of grain in elevator unit
10. Any marked rise in bearing temperature
11. Any marked wear, deformation and breakdown
12. Frequent loosening of fasteners
13. Other observations (if any)

Testing Engineer

**APPENDIX F**

**(Clause 9.1.7)**

**DATA SHEET FOR ANALYSIS OF FINAL SAMPLES**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sl. No. | Feed rate | Shelling unit speed, rpm | Sample from | Weight of (kg) | | | |
| Unshelled grain | Cracked and broken grain | Clean grain | Other refractions |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  |  |  | 1. Grain outlet (s) |  |  |  |  |
|  |  |  | 1. Impurities outlet |  |  |  |  |
|  |  |  | 1. Shelled cobs outlet |  |  |  |  |
|  |  |  | 1. Sieve underflow |  |  |  |  |
|  |  |  | 1. Material stuck in sheller |  |  |  |  |

Testing Engineer

NOTE - For different feed rate and for different speed of shelling unit use the same proforma as above.

**APPENDIX G**

**(Clauses 9.1.8.1, 9.1.9.1, 9.1.10.1, 9.1.11.1, 9.1.12 and 9.1.13.1)**

**DATA SHEET FOR LOSSES, EFFICIENCIES, POWER REQUIREMENT AND CAPACITIES**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl. No. | Item | Test No. | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | Shelling unit speed, m/s (rpm) |  |  |  |  |  |  |  |  |  |  |
|  | Feed rate, quintal/h |  |  |  |  |  |  |  |  |  |  |
|  | Power required, kW / Fuel in litres/h |  |  |  |  |  |  |  |  |  |  |
|  | Total grain received at grain outlet(s) |  |  |  |  |  |  |  |  |  |  |
|  | Percentage of unshelled grain |  |  |  |  |  |  |  |  |  |  |
|  | Percentage of cracked and broken grain |  |  |  |  |  |  |  |  |  |  |
|  | Percentage of blown grain |  |  |  |  |  |  |  |  |  |  |
|  | Percentage of sieve loss |  |  |  |  |  |  |  |  |  |  |
|  | Percentage of total loss |  |  |  |  |  |  |  |  |  |  |
|  | Shelling efficiency, % |  |  |  |  |  |  |  |  |  |  |
|  | Cleaning efficiency, % |  |  |  |  |  |  |  |  |  |  |
|  | Input capacity, quintal/h |  |  |  |  |  |  |  |  |  |  |
|  | Output capacity, quintal/h |  |  |  |  |  |  |  |  |  |  |
|  | Corrected output capacity, quintal/h |  |  |  |  |  |  |  |  |  |  |

Testing Engineer

**APPENDIX H**

**(Clause 8.2)**

**LONG RUN TEST DATA SHEET**

1. Total Running Time

2. Continuous Running Time

3. Breakdowns in Shelling Unit

4. Breakdowns in Cleaning Unit

5. Breakdowns in Elevating Unit

6. Breakdowns in Body

7. Any Major Repairs Conducted

8. Any Other Observations

Testing Engineer

**APPENDIX J**

**(Clause 10.1)**

**SUMMARY REPORT**

1. Name of Manufacturer

2. Model Number

3. Name of Testing Station

4. Variety of Maize Used

5. Grain – Cob Ratio

6. Moisture Content, percent d.b.

7. Adjustments:

a) Speed

b) Screen pitch

c) Concave clearance

d) Sieve clearance

e) Air displacement

8. Power Requirement, kW / fuel requirement, litre/h:

a) At no load

b) At load on input capacity

9. Losses, percent:

a) Cracked and broken grain

b) Unshelled grain

c) Sieve loss

d) Blown loss

e) Total loss

10. Input Capacity, quintals/h

11. Variation on Input Capacity:

a) At 10 percent more than specified speed

b) At 20 percent more than specified speed

c) At 10 percent less than specified speed

d) At 20 percent less than specified speed

12. Input Capacity, quintals/kWh

13. Output Capacity, quintals/h

14. Output Capacity, quintals/kWh

15. Corrected Output Capacity, quintals/kWh; quintals/litre

16. Any marked Observation Affecting Performance

17. Any marked Breakdowns

18. Other Observations

Testing Engineer