Importance of testing of tractor:

Agricultural machines are mostly being manufactured by the small scale manufacturer except established manufacturers of tractors. Testing of Agricultural machinery including tractors is the only solution to make the manufacturers clear about performance and durability of the equipment for proper/efficient utilization along with the technical information available to the farmers for proper selection of the required equipments.

Testing is defined as analysis of behaviour of machine when compared with standard codes/norms under ideal and repeatable conditions. On the other hand evaluation involves measurement of performance under actual field/working conditions. Testing deals with measurement, variation and computation of various indices as per norms prescribed by an authorized institution. Testing of farm machines with a standardized set out procedure has a major role in the judicious selection. Testing provide an important means not only for making an appraisal of an equipment but also for in-building the requisite level of quality by exercising proper checks during production.

2. Importance of testing:

Testing of a machine means systematic determination of functional performance, structural strength, durability, power requirements and capacity by running the test under a wide range of conditions in the laboratory and field. Testing is useful for all the stakeholders like manufacturers, consumers/farmers, exporters, export inspection agencies as well. How testing is important for

Manufacturers:

- Streamlining of production processes and introduction of quality control system.

- Independent audit of quality control system by BIS

- Reaping of production economies accruing from standardization

- Better image of products in the market both internal and overseas

- Winning for wholesaler’s retailers and stockiest consumer confidence and goodwill

- Preference for standard marked products by organized purchasers agencies of Central and State government, local bodies, public and private sector undertaking etc. Some organized purchases offer even higher price of standard marked good.

- Financial incentives offered by the Industrial Development Bank of India (IDBI) and nationalized banks.

- To know where his machine stands in comparison with similar types of machines in the market, and he can improve his product.

- It enables him to add more information to the technical literature relating to the machine.

Consumer

- Conformity with Indian standards by an independent technical national level organization.

- Helps in choosing a standard product

- Free replacement of standard marked products in case of their being found to be of substandard quality

- Protection from exploitation and deception

- Assurance of safety against hazards to life and properly

- The knowledge of the comparative performance of similar type of machinery will help the user to choose an appropriate machine to his requirement at the lowest cost

Organized purchasers

- Convenient basis for concluding contracts

- Elimination of the need for inspection and testing of goods purchased saving time, labour and money

- Free replacement of products with Standard Mark found to be substandard

Exporters

- Exemption from pre-shipment inspection wherever admissible.

- Convenient basis for concluding export contracts

Export Inspection Authorities

- Elimination of the need for exhaustive inspection of consignments exported from the country, saving expenditure time and labor.

3. Authority for testing:

Testing of tractors is being conducted since 1919, when the Nebraska Tractor Test Law took effect in USA. The idea for official tractor testing at the University of Nebraska, Lincoln (UN-L) was started when Polk County farmer purchased a lemon back in 1916. Tractors were something new on the farm then, just beginning to replace real, live, oats-powered horsepower. Farmer bought a "Ford B" tractor to replace his mule team, from the Minneapolis, Minnesota Ford Tractor Company. New purchased tractor gave him so much trouble that he demanded a replacement from the company, but the replacement tractor was no better than earlier one. A representative of every model of tractor rated at 40 horsepower or more sold in USA, must be tested at the Nebraska Tractor Test Laboratory (NTTL) on East Campus. Today, NTTL is the only officially designated agriculture tractor testing lab in the Western Hemisphere, elevated to worldwide status as a sanctioned testing station for the Paris-based Organization for Economic Cooperation and Development (OECD). There are other active testing facilities in Germany, France, Italy, Spain, Japan and China for instance, but for U.S. farmers and tractor owners, it all comes down to the track of concrete at UN-L. Central Farm Machinery Training and Testing Institute, Budni (MP) is responsible for testing of the locally manufactured tractors in India.

OECD Tractor Codes allow participating countries to perform tractor tests according to harmonized procedures, and to obtain OECD official approvals which facilitate international trade. The codes cover the testing of:

- Tractor performance - All tested tractors must complete compulsory tests of: engine power output and fuel consumption; drawbar power output and fuel consumption; hydraulic power output; hydraulic lift capacity. In addition, the manufacturer can complete optional test procedures including: braking performance, turning area and turning circle; low temperature starting; centre of gravity location; external noise level; axle power; engine (bench) test); waterproofing test; performance in a hot atmosphere.
- Noise levels at the operator's driving position
- Operator safety - Roll-over Protective Structures (ROPS) and Falling Object Protective Structures (FOPS)

4. Major testing and evaluation centers in India for Agricultural Machinery

Following organizations are involved in testing of agricultural machinery. But CFMTTI, Budni is involved in tractor testing as a main authority in India.

1. Central Farm Machinery Training and Testing Institute, Budni, Madhya Pradesh-
2. Northern Region Farm Machinery Training and Testing Institute, Hisar, Harayana
3. Southern Region Farm Machinery Training and Testing Institute, Anantpur, Andhra Pradesh
4. Eastern Region Farm Machinery Training and Testing Institute, Biswanath Chariali, Distt. Sonitpur (Assam),
5. BIS Testing Laboratory, Sahibabad, Uttar Pradesh
6. BIS Centers of Tractor, Power Tiller, Diesel Engine, Electric Motor, Irrigation Pumps
7. ICAR Institutes
8. Agricultural Universities
9. Central Food Technology Research Laboratory, Mysore, Karnataka

Procedure for testing and standard code for testing of tractor performance:

The International Organization for Standardization (ISO) is the apex body in the area of standardization at international level and has its membership on National Standards Bodies of various countries. In the context of farm machinery, it has been observed that acceptance of farm machinery by the farmers largely depends on their quality. Hence, in order to reap the benefits of standardization including manufacture of high quality products, a need was felt for preparation of India Standards for agricultural machinery. Organized efforts in this direction were made by the Bureau of Indian Standards (BIS) in late 50's by way of setting up a Technical Committee for formulation of standards for this group of industry. The committee is generally consisted of representatives of Government department, research, education and testing institutions and the manufacturing industries.

2. Procedure of testing

BIS. has published standards on machine/components for the machines used in the country. Mostly testing of the particular machine is undertaken as per relevant clauses of the code. In case, the standard has not been published for the machine, code and procedure is developed by the testing center and same used for testing purpose. These test procedures help in formulation of test codes by BIS. The complete testing of a machine involves:

i. Checking of specifications

ii. Development of test facilities and instrumentation

iii. Conduct actual tests

iv. Analysis of the data

v. Presentation of data and report writing

vi. Product certification marks scheme

i. Checking of specifications: Generally the test codes include few important specifications of the machine/equipment those are mandatory to meet a specific requirement. Few specifications have to be specified by the manufacturer and the testing center has to verify such dimensions within the tolerance limits.

ii. Development of facilities and instrumentation: The test codes give a guide line for development of test set up required for carrying out a specific test in the machine/equipment/component. The testing center has to develop a setup which should meet the requirements specified in the test procedure of the test center. As far as possible the high quality instrumentation should be included in the test set ups.

iii. Conduct actual tests: The actual tests should be carried out on the machine as per the test procedure specified and data recorded in the given blank tables.

iv. Analysis of data: The data obtained during testing is analyzed for presentation in the required format. Use of computer should be encouraged.

v. Presentation of data and report writing: The report should include the sections for the clauses those comply with the standard and those do not conform to the standards.

vi. Product Certification Marks Scheme: The Bureau operates a certification marks scheme under the Bureau of Indian standards Act, 1986 and the Rules and regulations framed there under. The Bureau's standard Mark (ISI) on an article

certifies that the article complies with the requirements specified in the relevant Indian standards and also guarantees that the manufacturer operates a quality control system in his production which is monitored in terms of regular inspections and checks in such a form as to give assurance that the article will comply with the requirements of the relevant Indian standards. The Certifications Marks schemes also provide an inbuilt mechanism for ensuring the quality of the product right from the raw material stage to the finished product. The BIS Certification Marks Scheme is operated on voluntary basis.

3. Tractor Tests Eligible for OECD Approval :

Compulsory Tests: Approval shall require checking as follows:

- Main power take-off and five extra points for calculating fuel consumption characteristics
- Hydraulic power and lifting force
- Drawbar power and fuel consumption (un ballasted tractors)

Tractors without a main power take-off or with one that cannot transmit the full engine power can be tested at the engine flywheel or by drawbar tests. The testing station in agreement with the manufacturer shall make the choice between the two methods. Tractors without a lifting system and/or without a hydraulic service coupling remain eligible under the Code. However, the design of these tractors shall be specified in the test report. Optional tests may be performed and reported in any combination provided they are requested simultaneously with the compulsory tests

Optional Tests: Approval of any optional tests shall require checking as follows:

- Engine test
- Additional Power take-off ratio (economy)
- Reagent consumption during Power take-off and Drawbar Power testing
- Hydraulic power: optional tests
- Performance at the belt or the belt pulley shaft
- Performance in a hot atmosphere
- Low temperature starting test

- Additional drawbar tests
- Ten-hour test (ballasted tractors)
- Axle power determination
- Turning area and turning circle
- Centre of gravity
- Braking (wheeled tractors only)
- External noise level (wheeled tractors only)
- Waterproofing test

Repeats of Any of the Compulsory or Optional Tests at Different Settings: Approval shall require checking as follows:

- Eligibility for the same category
- Compliance with test conditions under the Code
- Clear specification of differences from original tests and caveat
- Compliance with Specimen Test Report
- Results.

Other Tests: Tests performed according to other internationally recognized methods, to be reported and clearly marked as not being subject to the OECD approval procedure. Such test methods would have to be mentioned in the report and made available to the OECD in a published form, in either of the official languages of the Organisation.

4. Bureau of Indian Standards (BIS) for Tractors:

Tractor Test:

The brief outline of various types of tests performed by Center of Farm Machinery Testing and Training Institute (CFMTTI), Budni (MP) are as under. Tractor test is carried out in accordance with Indian Standard (IS):5994-1998 as amended from time to time. A tractor is subjected to the following tests & evaluation

Laboratory Tests

- Checking of specifications
- PTO performance test
- Belt pulley test(optional)
- Drawbar performance test
- Power lift & hydraulic performance test
- Brake test
- Air cleaner oil pull over test
- Noise measurement
- Mechanical vibration measurement
- Location of centre of gravity
- Turning ability
- Visibility

Field tests: - For Initial commercial tests (ICT) for 35 h and for batch test of 35 h. (if there is any major breakdown during the ICT) of field tests with the following implements

Plough/ Rotavator(20 hrs. for I.C.T & 20 hrs for Batch Test)

Puddling test of 10 Hrs. duration under actual field conditions followed by Water Proof Test of 5 h for ICT and batch test if applicable.

Haulage test: This is done with 2/4 wheel trailers and the gross load recommended by the manufacturer. Components & assembly inspection is done to assess the wear, breakdowns, etc.

Power Tiller Test

Performance evaluation of power tiller is conducted in accordance with Indian Standard (IS):9935-2002 as amended from time to time. A power tiller is put into the following tests and evaluation:

Laboratory Tests

- Specification checking.
- Engine performance test.
- Rotary shaft performance test.
- Drawbar performance test.
- Parking brake test.
- Noise measurement.
- Air cleaner oil pull over test.
- Mechanical vibration measurement.
- Turning ability test.
- Chemical composition test and wear characteristics test of rotavator blades.

Field tests: For Initial commercial tests & batch test 35 h, of field tests with the following implements

- Mould board ploughing (20 hrs. for I.C.T. only) dryland
- Dry rotavation (35 hrs. for I.C.T. & 35 hrs. for Batch tests)
- Puddling under actual field condition (15 h for I.C.T. & Batch test both)

Haulage test: Components and assembly inspection is done to assess the wear, breakdowns, etc.

5. Quality system

The organizational structure, responsibilities, procedures, processes and resources used to implement quality policy and objectives are collectively referred to as quality systems. To cope with the growing change of competitiveness, ISO 9000 series of standards has been formulated by ISO to provide for quality management systems. Indian has adopted ISO 9000 series of standards as IS/ISO 9000 series of standards. These standards provide not only guidance and criteria for formal control of products and services by the company but also give an assurance to the purchaser and the set of stated requirements

ISO 9000 series of standards are generic in nature and applicable to the wide arena of business activity covering all the four main heads: Hardware, Software, Processed materials and Services

ISO 9001 is applicable to those manufacturers who have design, development and production facilities.

ISO 9002 is applicable to those manufacturers who have only production in facilities.

ISO 9003 is suitable only for trade houses.

In common usage the concept of quality is linked to excellence which is subjective in nature. Thus the perception of quality varied from person to person, what may be of good quality to one, may be of poor quality to the other or vice versa, depending upon the individual needs, wants and desires. Quality should not be defined in comparative terms as poor, fair, good or excellent. Quality is an absolute entity and viewed from the point of customers. Quality is the goal of each and every business. So, the objective definitions of quality are:

- Fitness for use
- Fitness for purpose
- Conformance to requirements
- Conformance to specifications
- Customer satisfaction
- Product satisfaction
- Product designed and made to work properly
- Worth for money