

A Review on Impact Testing Machine for Measuring Strength of Wooden Furniture

Deshpande Vaishali M.¹, Dr. Sheikh M.J.², Wade Komal P.³
S.Y.M.Tech Mechanical-CAD/CAM¹, Associate. Prof. BDCOE Wardha²,
Email: Vaishalimd1989@rediffmail.com¹

Abstract:- Nowadays, the product quality in furniture industry is more and more required for the competitiveness of the products on the market. The quality is defined through a high processing accuracy, high quality of the raw materials, good design and high quality of the finished surfaces. That means a controlled production process is completed by quality testing of finished product. The accuracy of the finished product is the result of the accuracy of the technological process and it is defined by the machine parameters used for the process operation and also by the tool type and quality. Thus for quality testing of finished products the impactor machine is planned to design for measuring strength of wooden furniture.

Index Terms- Wood industry, wooden properties, Impact loading,

1. INTRODUCTION

Today industrial growth is mainly depends upon two factor

- 1) Quality of product
- 2) Marketing strategy of the product

Here we are dealing with the quality of product, which should be measured before it comes into market, for that case, in-house analysis of product should be done. Wooden furniture is being widely used in all countries due to its convenience and being produced from the natural raw material. In furniture design esthetic, ergonomics and safety are the main criteria. Safety means the strength of furniture. Unfortunately, most of the time the strength of furniture is not taken into account in design as much as esthetic and ergonomics. This leads to the use of excess material meaning high cost or usage of less material causing some dangers in use.

As Spacewood Furnishers wants to increase their product quality, THE IMPACT TESTING MACHINE is planned to design for the impact testing of the beds and all the furniture products to measure the strength of furniture. Thus the impact testing machine will check durability and stability of bed and other furnitures. It gives extremely high accuracy and robust enough for quality control testing. It offers ease of use and durable to withstand many years of use.

1. Principal of Impact Testing Machine.

The impact testing machine will design to operate by pneumatic transmission. Impact testing assembly would link with piston of pneumatic cylinder which reciprocates up and down and thus the impact assembly strikes the worktop of bed. It specifies mechanical safety requirements and testing for all types of fully erected domestic bed.

Impact test can be used as a quick and easy quality control check to determine if a material meets specific impact properties or to compare materials for general toughness.

2. Impact Strength of Wood:-

Wood is a natural material that, as a structural material, demonstrates unique and complex characteristics. Wood's structural properties can be traced back to the material's natural composition. Foremost, wood is a nonhomogeneous, non-isotropic material, and thus exhibits different structural properties depending on the orientation of stresses relative to the grain of the wood. The grain is produced by a tree's annual growth rings, which determine the properties of wood along three orientations: tangential, radial, and longitudinal.

- 2.1 Gi Young Jeong August, 2005 Toughness is an indication of the energy that a material can absorb before breaking and is usually measured by Izod and Charpy impact tests (Nielsen 1994). The impact strength depends on the composition and structure as well as the testing method.
- 2.2 Gi Young Jeong The August, 2005 basic tenet of fracture mechanics is that the strength of most real solids is governed by the presence of flaws and, since the various theories enable the manner in which they propagate under stress to be analyzed mathematically, the application of fracture mechanics to crack growth in polymers has received considerable attention. Two main, interrelatable, conditions for fracture are proposed. First, the energy criterion arising from studies like Griffith (1920), and later Orowan (1948), which suggested that fracture occurs when sufficient energy released from the stress field by growth of the crack to supply the requirements of the new fracture surfaces. The energy released comes from stored elastic or potential energy of the loading system and can, in principle, be calculated for any type of test pieces.

methods to be directly correlated. The contributions of various components

3. Wood species:-

Structural lumber can be manufactured from a variety of wood species; however, the various species used in a given locality are a function of the economy, regional availability, and required strength properties. 3.1 A wood species is classified as either hardwood or softwood. *Hardwoods* are broad-leafed deciduous trees while *softwoods* (i.e., conifers) are trees with needle-like leaves and are generally evergreen.

3.2 Most structural lumber is manufactured from softwoods because of the trees' faster growth rate, availability, and workability (i.e., ease of cutting, nailing, etc.). A wood species is further classified into groups or combinations as defined in the NDS. Species within a group have similar properties and are subject to the same grading rules. Douglas Fir-Larch, Southern Yellow Pine, Hem-Fir, and Spruce-Pine-Fir are species groups that are widely used in residential applications

4.Impact test:-

Gi Young Jeong August, 2005 Impact tests are employed to measure the ability of a specimen or a finished component to withstand a sudden blow. In many applications, a satisfactory resistance to impact loading is an important performance requirement and, indeed, impact toughness is often the deciding factor in materials selection. The traditional method of assessing whether a plastic is brittle or tough is to carry out an impact test, with a fast rate of loading to promote brittle failure. The test is quick and easy to carry out and can provide data for comparing different materials under the conditions of test. The main test factors are the amount of energy available for breaking the specimen, the test temperature, stress concentrations and fiber orientation. Over the years a large number of empirical impact tests have been devised to measure the impact strength of materials and components. However, the impact strength is not a fundamental material property apart from depending upon the specimen geometry as it also depends upon the particular test method employed. Thus, it is difficult to correlate the results obtained from different test techniques and extremely difficult to correlate the results from impact tests on specimens of the material to the impact performance of the manufactured article. This is the main reason why many investigators spend a great deal of time on conducting impact tests on the finished component. An interesting development, therefore, is the application of fracture mechanics theories to impact tests, notably by Brown (1973), Marshall *etal.*(1973), and Plati & Williams (1975), which has enabled two of the standard test

5. Scanning Electron Microscopy Examination on Fracture Surface:-

The fracture surfaces of the specimens broken by impact loading were subjected to scanning electron microscopy (SEM) to determine the fracture path and the fracture modes in relation to its microstructure. Such information is valuable in identifying the fracture mechanism for analyzing the effect of fiber orientation to the load direction.

6. Work Improvement In impact testing Machine

.Leijten, Ad. J. M.(4) The starting point for the determination of many engineering timber properties is the standard short duration test where failure is expected within a few minutes. During the last decades much attention is given to study the behaviour of timber and timber joints with respect to damaging effect of sustained loads, the so-called duration of load effect (DOL). In the design process of timber structures this DOL effect is taken into account by prescribed (reduction) factors. However, there are a number of load cases such as earthquakes and single blasts where timber is exposed to substantially higher loading rates than in the standard short duration test.

Several machines were and still are used to measure the toughness and are based on a pendulum impact hammer. The difference between the energy of the pendulum before and after contact is the energy required to produce failure. "because different types of machines gives different values standardisation is required and at the moment there is no satisfactory method available to convert data from one test to the other".

7.Conclusion

This paper provides an overview of the research principles, methods, technology, systems, and standards which are being adopted in typical modern day wooden factories.

After studying this literature, we have conclude that, still there is a scope to do work on automation in impactor machine to obtain the value of exact sustainable load which determines the quality assurance of finished furnitures ..

8.REFERENCES

- [1] Arnold M., “The influence of wind-induced compression failures on the mechanical properties of spruce structural timber”. Steiger R. 2007 .
- [2] DESIGN OF WOODEN FRAMING
- [3] Gi Young Jeong, “Fracture Behavior of Wood Plastic Composite” B.S., Chonnam National University, 2004, August, 2005.
- [4] Leijten, Ad. J. M.1, “Literature review of impact strength of timber and joints ”.
- [5] Camelia Boieriu, “Dimensional and Shape Quality Control. Modern Equipment”, Transilvania University of Brasov, B-dul Eroilor 29, 500036 Brasov
- [6] Samuel J. Kecord, “The Mechanical Properties of Wood”, Yale University 1914.