Modelling and Analysis of Hammer of Impact Testing Machine

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Abstract*— The Impact Testing Machine is very important for testing and calculating the impact energy required to bent or to break the different types of materials by conducting Charpy and Izod test. The aim of the project is to model, and Analyse hammer of Impact Testing Machine. 3- dimensional model of hammer of impact testing machine will be created corresponding to the practical dimensions using PRO-E software and using ANSYS software the analysis of hammer have done. It will very beneficial for proper use of machine to find out energy require to break or bent the particular type of material in engineering field. Different principles for interaction with users having wide ranges of experiences and knowledge have discussed.

***Keywords:* Creo-parametric and Ansys Software, Analysis, Simulation.**

I. INTRODUCTION

The Impact Testing Machine is very important for testing and calculating the impact energy required to bent or to break the different types of materials by conducting Charpy and Izod test.

Figure 1.1: Impact Testing Machine

II. OBJECTIVES OF PEOJECT

- Modeling of hammer of impact testing machine.
- To find out the most stress part of hammer.
- Software analysis of most stress part using different materials.

III. RESEARCH METHODOLOGY

- From literature review, different types of forces, loading and stresses will be studied.
- Using PRO-E software, model of the hammer will be created.
- Different types of boundary conditions will be decided.
- By using ANSYS software, hammer will be analyzed.

IV. EXISTING CAD MODEL (HAMMER OF I.T.M.)

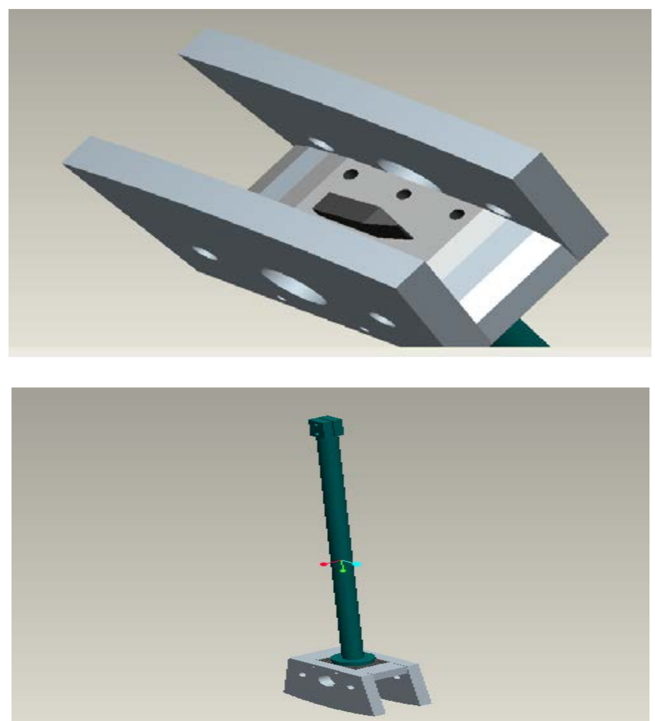

Figure 4.1 CAD model of existing impact machine

V. STATIC STRUCTURAL ANALYSIS

(FORCE OR IMPACT ANALYSIS)

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A static structural analysis determines the displacements, stresses, strains, and forces in structures or components caused by loads that do not induce significant inertia and damping effects. Steady loading and response conditions are assumed; that is, the loads and the structure's response are assumed to vary slowly with respect to time. The types of loading that can be applied in a static analysis include:

a) Externally applied forces and pressures

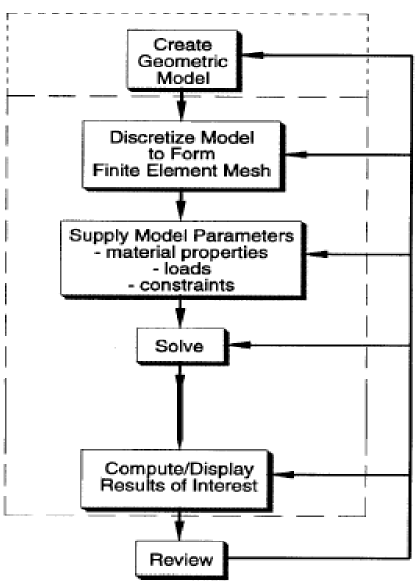
b) Steady-state inertial forces (such as gravity or rotational velocity)

c) Imposed (nonzero) displacements

d) Temperatures (for thermal strain)

VI. PROCEDURE FOR FINITE ELEMENT ANALYSIS

Certain steps in formulating a finite element analysis of a physical problem are common to all such analyses, whether structural, heat transfer, fluid flow, or some other problem. The steps are described as follows.



Overall Steps in FEA Solution

VII. PRE-PROCESSING

The pre-processing includes

a) Define the geometric domain of problem.

b) Define the element type(s) to be used.

c) Define the material properties of elements.

d) Define geometric properties of elements.

e) Define the element connectivity's (mesh the model).

f) Define the physical constraints (boundary conditions).

g) Define the loading.

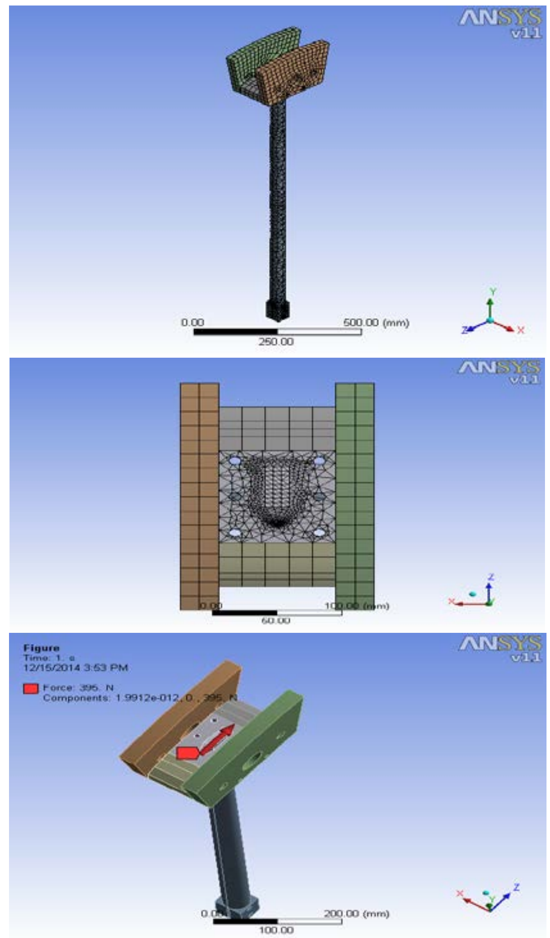


Figure 5.2 Finite element meshed body of hammer of impact machine

VIII. SOLUTION

During the solution phase, finite element software assembles the governing algebraic equations in matrix form and computes the unknown values of the primary field variable(s). The computed values are then used by back substitution to compute additional, derived variables, such as reaction forces, element stresses, and heat flow. As it is not uncommon for a finite element model to be represented by tens of thousands of equations, special solution techniques are used to reduce data storage requirements and computation time. For static, linear problems, a wave front solver, based on Gauss elimination, is commonly used.

IX. POST PROCESSING

Analysis and evaluation of the solution results is referred to as post processing. Postprocessor software contains sophisticated routines used for sorting, printing, and plotting selected results from a finite element solution. Examples of operations that can be accomplished include:

a) Sort element stresses in order of magnitude.

b) Check equilibrium.

c) Calculate factors of safety.

d) Plot deformed structural shape.

e) Animate dynamic model behavior.

f) Produce color-coded temperature plots.

X. RESULTS

TABLE 1. RESULTS OF ALL MATERIALS USED FOR STRIKER

Sr. No.	Parameters	Materials			
		EN 8	**EN 24**	**ALSI**	**Hardox 400**
1.	Total Deformation	5.0324e-004 mm	6.4687e-004 mm	1.8427e-003 mm	2.7218e-005 mm
2.	Equivalent Stress	13.628 MPa	13.366 MPa	13.105 MPa	12.481 MPa
3.	Maximum Principal Stress	17.07 MPa	17.228 MPa	17.4 MPa	17.875 MPa
4.	Shear Stress	1.1361 MPa	1.107 MPa	1.0806 MPa	1.25 MPa
5.	Life	1e6	1e6	1e6	1e8

XI. CONCLUSION

- Among the four used material the Hardox 400 is best as compared to the EN8, EN24 and Aluminum alloy steel for existing impact testing machine (hammer).

- The results from the significant factor and their interaction indicate that material is the most significant factor of charpy and Izod impact value. Change in weight and height has no significant effect on the impact value of Charpy and Izod impact test.

- In that way we can improve machinability of the impact testing machine. Also we can find the mechanical properties and improve its of various materials and increase the life of impact testing machine.

XII. FUTURE SCOPES

- In this research work, the material used is EN8, EN24, Aluminum alloy and HARDOX 400. The experimentation can also be done for the other material (plastic, polymer, ceramics and composite) to see the parameters of impact value.

- The strike angle of standard charpy impact test specimen can be varied 140^0 to conduct the test and the other effect can be studied.

- Izod and Charpy impact test can be conducted at different temperature of specimen and effect can be studied.

- The composition of varies alloying elements can be varied and effect of alloying element can be studied and microstructure can checked.

- The dimensions of the specimen can be varied and can be studied like thickness of the specimen.

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