# TESTING CHARPY AS PRACTICAL HELP IN LEARNING THEORY AND ENGINEERING

**Vinicius Souza Morais, vinicius.souza.morais@gmail.com**
UCDB – Dom Bosco Catholic University – Av. Tamandaré 6000 – Campo Grande - MS

***Abstract.*** *The impact test was devised to determine if a material could be used as cutting tools. Sometime after Augustin Charpy modifications made in the first test developed by directing the body-of-proof in a different position, but keeping the same principle of the method of impact. The impact test allows us to predict how a material behaves when it is subjected to a load with dynamic characteristics, the tensile tests and bending now allows us to predict the behavior of the material when subjected to static loads. Equipment of this type is essential in university laboratories for practical lessons that may occur, so the students assimilate how and why these types of tests run, facilitating the teaching of teachers. The machines drop weight impact and are popular, especially in aerospace, ballistic impact tests in which it can reach high speeds and simulate, for example, the impact of birds on airplanes. This work aims to build a machine Charpy impact test for small impact energies, with the sizing and detailing of components such as design, drawings and machining. Through the equality between potential and kinetic energy of the pendulum was able to extract the main variables that allowed estimating important dimensions such as time of abandonment of the pendulum and its radius of gyration. With the previous choice of energy absorbed and impact velocity, it was possible to determine the mass and dimensions of the pendulum hammer.*

***Keywords****: charpy, classroom teaching, prototype*

## 1. INTRODUCTION

During the first half of the twentieth century, a metallurgist named Izod invented a type of impact test to determine the ability to use some metals such as cutting tools. The test involved a pendulum with known mass impacting body to which the test piece that was clamped in a vertical position (Silva, 2004).

Some years later another metallurgist named Charpy Augustin in Budapest in France, made changes in the Izod test, directing the body of the test piece in a horizontal position, but keeping the same principle of the method of impact (Duarte, 2006).

## 2. IMPACT TESTING

The tensile and flexural not allow us to predict how a material behaves when it is subjected to dynamic load, because these trials evaluating the response of the material on to a static load (Martins and Lucena, 2007).

The impact is an effort of a dynamic nature, the load is applied suddenly and abruptly, in this case is not only the force applied to account another factor is the speed of application of that force associated with speed translates into energy (McMichael and Fischer, 1989).

## 3. BODY OF EVIDENCE

Impact tests, the specimens are notched samples of materials to be submitted to impact on temperatures known in a horizontal position in a pendulum machine, the results are obtained in the form of energy absorbed by the specimen during impact.

Figure 1 shows the specimens for Charpy impact tests have a variety in geometry, but are standardized by ASTM E 23 (American Society for Testing and Materials).

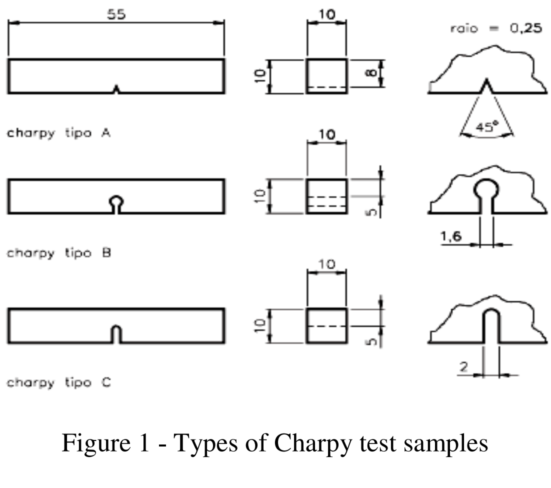


Figure 1 - Types of Charpy test samples

The illustration of Figure 2 shows a Charpy destructive testing machine during the displacement of the pendulum.

Figure 2 - Movement of a Charpy
http://www.boulder.nist.gov/div853/Charpy%20website/index.htm?mgiToken=1SFN7PI54D0194J196

The difference of potential energies for the heights of the hammer will result in the disruption of energy absorbed by the specimen (Morais, 2011). Figure 3 and 4 shows a comparison between the CAD and project execution in the mechanical workshop of the project.

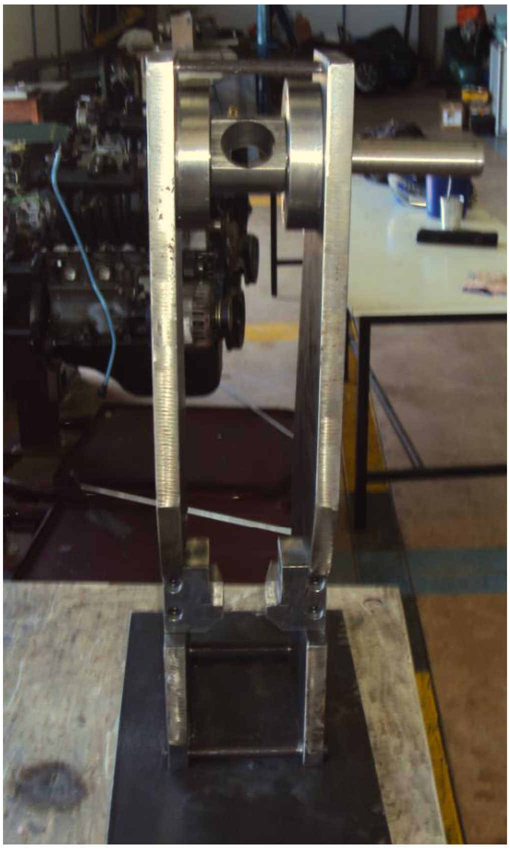

Figure 3 - Partially Assembled Set

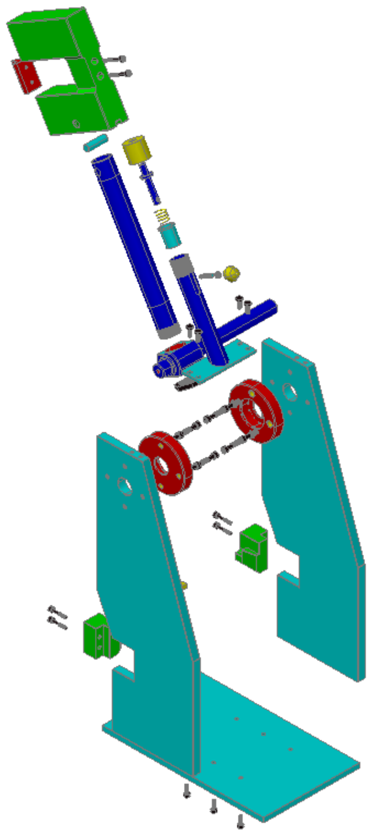

Figure 4 - Exploded view of machine

## 4. SETTING

After all the parts assembled there - if the machine settings which in turn is with clearances in the axial direction, and has no slack in the radial direction due to the bearing fits description of clearances and tolerances in the Annex, as follows in Figure 5 clearances were measured.

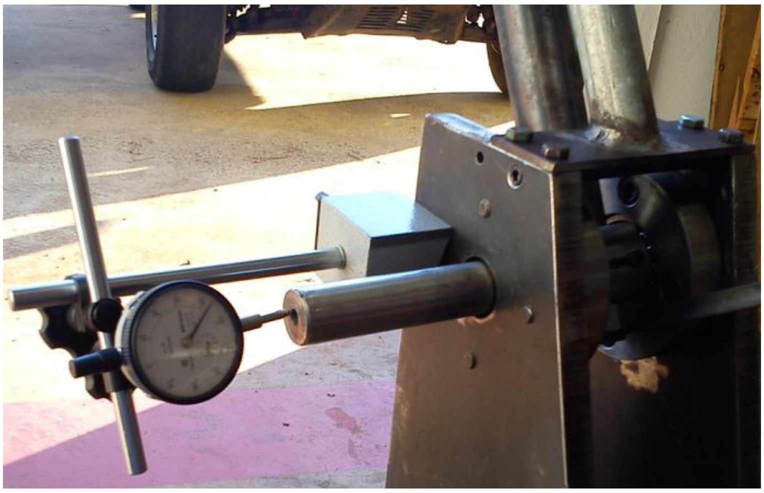

Figure 5 - gap axis

## 5. CONCLUSION

Presented in this paper the design and manufacture of a Charpy test machine applied to low levels of impact energy. From the standpoint of design, it was found that the physical model of the equipment is simple and based on the principle of energy conservation.

Through the equality between potential and kinetic energy of the pendulum could be extracted from the main variables that allowed estimating important dimensions such as time of abandonment of the pendulum and its radius of gyration. With the prior choice of the energy absorbed and the impact velocity was possible to determine the mass and dimensions of the oscillating hammer.

From the viewpoint of implementation of design, it was verified that the correct specification of material for each set number of determined the proper performance of the machine, eliminating variables such as vibrations in the structure and misalignment impacts on the post.

Notions of design, material selection, mechanical behavior, difficulties with machine tools and manufacturing were the basic topics discussed and are used by an industry professional.

## 5. ACKNOWLEDGEMENTS

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