USING CAD SYSTEMS IN ECODESIGN

Lecturer PhD Eng. HARAGA Georgeta[1]
Assoc. Prof. PhD. Eng. GHELASE Daniela[2]
[1] "Politehnica" University of Bucharest
[2] "Dunarea de Jos" University of Galati

ABSTRACT

This paper has as principal objective to point out the aspects related to ecodesign and 3D modelling of a trolley for firewood that can be realised using CAD systems. From these, the CATIA program has been chosen. The main purpose of the trolley is to provide an ecological means of transporting firewood, without using fuel.

KEYWORDS: modelling, ecodesign, trolley, firewood, CATIA

1. Introduction

Appearance of the oil crisis in the early '70s led to human awareness of the limited natural resources available worldwide. Later, in the '80s, environmental disasters caused by man have highlighted the importance of implementation of a "ecodesign" term. The ecodesign means a product designed taking into account environmental criteria with the objective of reducing the negative impact of environment during the product life. Minimizing waste and consumption of energy and materials are just some of the main ecodesign requirements. Population growth leads to greater industrialization and high levels of resource use and pollution. Excessive consumption of these energy sources has a devastating effect on the environment, the planet life and thus on the quality of life, both present and future.

In this paper we have presented in a synthetical way some steps of modelling a trolley for firewood transport, highlighting the importance of integrating the ecodesign notion. This type of trolley can been realised using any graphic software. In this case, we have chosen CATIA program that is a popular graphic software from CAD systems. It is frequently used by a very great number of users thanks to its numerous advantages.

CATIA permits exact modelling of the trolley which leads to a quick testing of numerous geometrical-constructive variants. Thus, we can eliminate a large part of the stage of experimental testing, an expansive and time consuming process. So, we can reduce the periods and costs of new products projecting [4], [7].

2. Working type

In this article it is highlighted the ecological character of a trolley for firewood transport proposed for 3D modeling as shown in Figure 1.
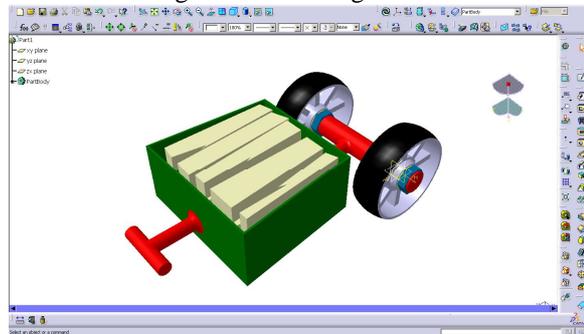
Fig.1. The 3D modeling of the trolley full of firewood

A great importance consists in choosing the correct number of wheels. A four-wheeled trolley has the advantage of requiring less human effort and having a good maneuverability. Nevertheless, the following deficiencies have been noticed in using a four-wheeled trolley: more weight and more material; expensive cost; transportation difficulties for rough roads. For a three-wheeled trolley, similar conclusions can be found. At a trolley with one wheel, a much improved maneuverability can be seen but at the same time, this can lead to loss of balance. In conclusion, a two-wheeled trolley is considered to be the best choice, for these types of trolley.

CATIA is one of the products of Dassault Systèmes Company which in present is one of the most used CAD/CAM/CAE Systems, supplying a large variety of integrated solutions to satisfy all the aspects related to design and manufacture. This program gives us a variety of tools that allow us to easily document designs during any stage of drawing production [6].

CATIA is especially made for technical drawing generation and ensures an excellent representation, detailed describing, annotations and quotations which automatically correspond to the used quotation standard. It is divided in more modules, namely the Sketcher, Part Design and Drafting ones being emphasized in a special way. CATIA Part Design is used to construct individual part models [8]. Part models are constructed by adding and removing material from a base feature.

At the beginning, as a first step, we will open the following application: Start → Mechanical Design → Part Design. We open the Sketcher and we will construct all profiles necessary for realization of the final trolley.

The move from CATIA Sketcher in a CATIA Part Design module was made with the Exit Workbench from Workbench toolbar.

A revolved feature is created by revolving a 2D profile around an axis of revolution. In the Part Design workbench, we can create two types of revolved features: a shaft which adds material and a groove which removes material. By using the Shaft command, we will revolve the first profile as shown in Figure 2. Revolved feature can be revolved between 0° and 360°. In this case, we choose the 360° [3].
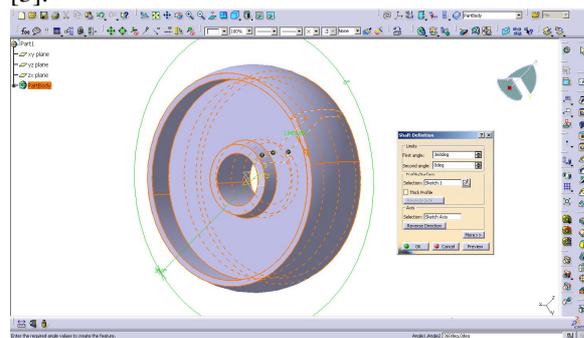
Fig.2. The Shaft command

Then, we will apply the Pocket command that allows us to extrude a profile and to remove the material resulted by extrusion. We will create a pocket feature that is extruded in both directions from sketching plane. Further on, we will activate the Mirror command and we will copy the feature previously created with Pocket command. Then, we will apply more the Pad commands. Modelling the trolley first wheel and other components are presented in Figure 3.
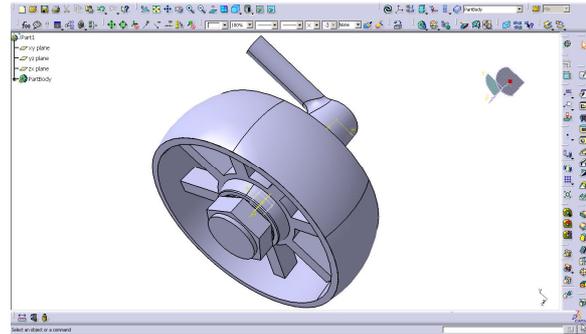
Fig.3. Modelling the trolley first wheel and other components

In Figure 4.a.b, the Mirror command can be visualized. They guide us to the first part of the proposed model construction.
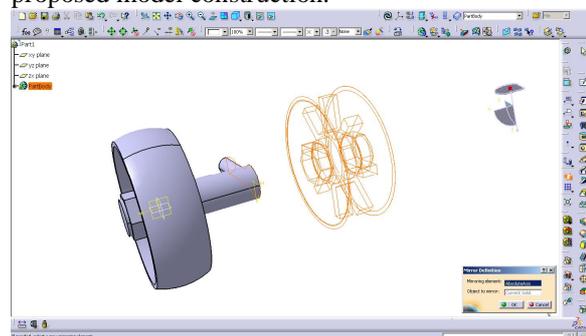
a.
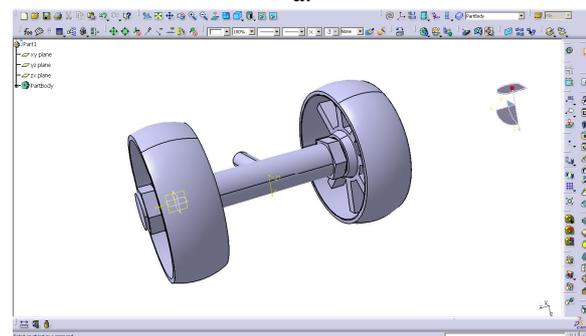
b.

Fig.4.a,b. Modelling the first components of the trolley after applying Mirror commands

The 3D modelling of the chosen trolley is represented in Figure 5 where we used several operations with Pad, Mirror and Properties commands. All these, can be seen in Figure 5.
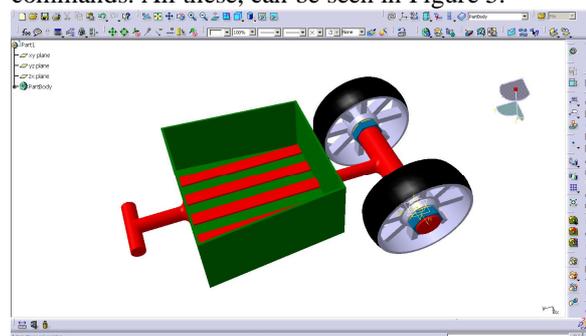
Fig.5. Modelling the trolley for firewood

For this, as a first step, we apply to the two chosen models one of the materials that can be found in the Library dialog box. This can be accessed by activating Apply Material icon. So, we apply material properties on the created parts. Thus, we use the Apply Material icon which opens the material database box as shown below in Figure 6. In this case, we choose, for each component, different materials.
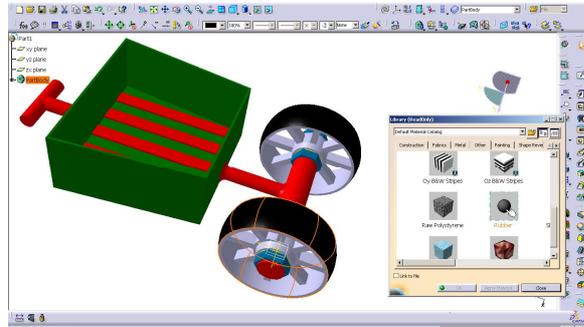
Fig. 6. Applying the materials from the Library dialog box

The CATIA software contains commands that work together in managing part colors and styles. By applying texture or color on the entire surface, of the model or only on the desired surfaces the final product is obtained [5], [7]. For a high quality of the image in terms of color, the 3D models can be assigned a lot of distinct colors that are found by using Properties command as shown Figure 7.
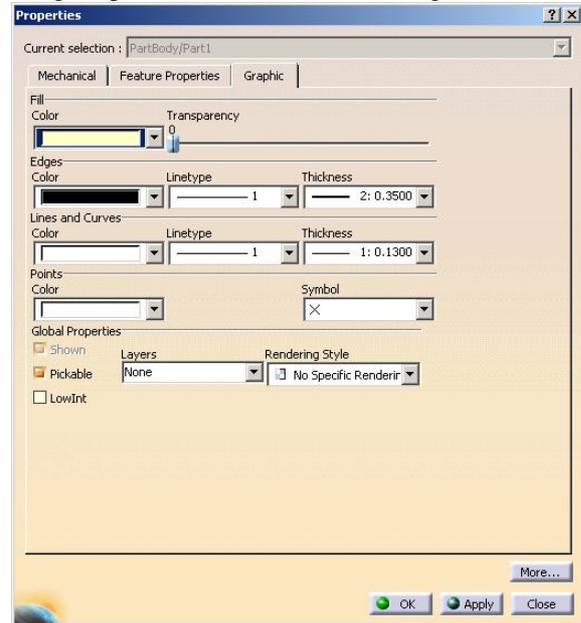
Fig. 7. The Properties command

Ecological materials are those materials that enhance the environmental improvement during the whole life cycle. These materials play an important role in material science and technology to minimize environmental impacts, enhance the recyclability of materials, and to increase energy.

The wood is considered one from of the best ecological materials. In this case, we choose wood as an ecological material. For this, we must change the white color of the background in a darker color, using the Options command, as seen in Figure 8. In these conditions, we selected, for the background of the drawing window, the blue grey color.
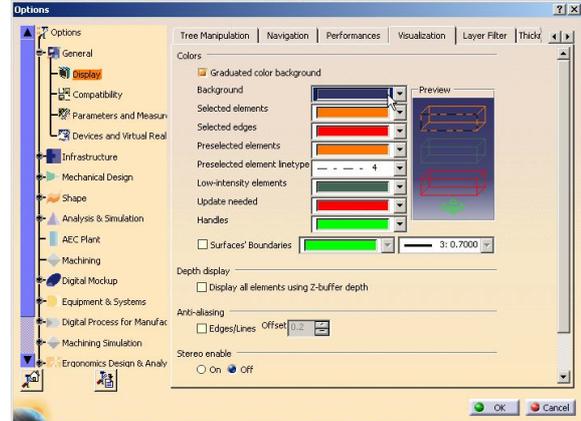
Fig. 8. The Options command

For a good visual effect, we used a change of most colors similar to wood ones. For this, we selected the Shiny Wood material from the Library dialog box as shown in Figure 9.
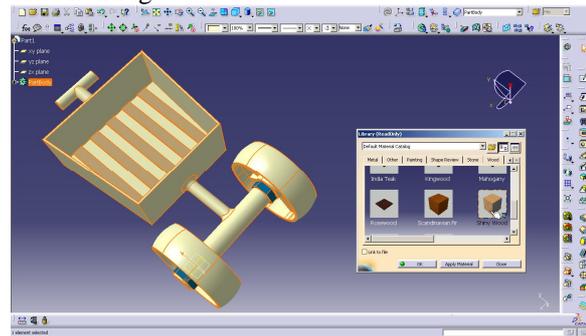
Fig. 9. Applying the Shiny Wood material from the Library dialog box

Figure 10 presents another possibility of applying the material from the Library dialog box. In this case, we select Shiny Wood as material.
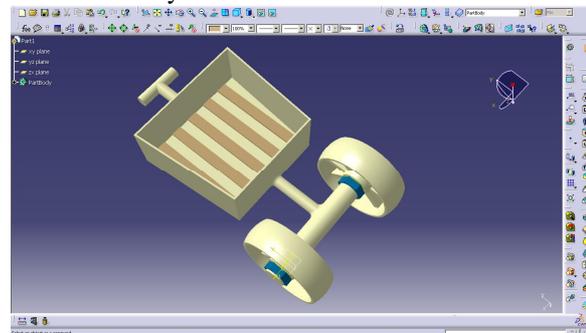
Fig.10. The trolley made of Shiny Wood

The trolley full of firewood made of Shiny Wood can be seen in Figure 11.
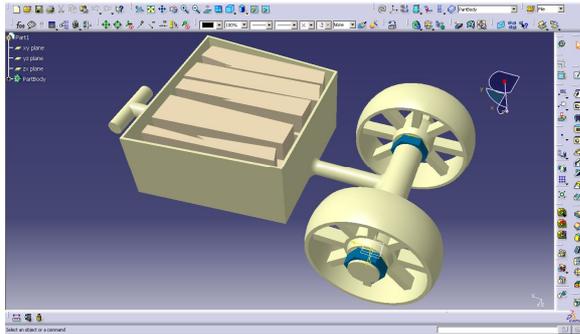
Fig. 10. The trolley full of firewood
made of Shiny Wood

3. Conclusions

The ecodesign represents a central role in the development of more sustainable products. It is a design for environment which, besides traditional design, takes into account reducing energy consumption and cost of materials, minimizing waste generation, use of ecological materials, elimination of negative effects on life throughout the product life cycle. And it is very attractive one from aesthetical point of view.

In this paper, we pointed out that the principal role of the trolley is to provide an ecological means of transporting firewood, without using fuel. We have designed a two-wheeled trolley for firewood transport using wood as base ecological material in its construction. This design is very simplified and easy to use. This type of trolley can be realised using CATIA software. This software permits the virtual product to be a mirror of that from reality. In this sense, any user can easily find information, can communicate, collaborate and visualize products in 3D [1]. Compared to technical drawings and handmade drawing graphics the use of CATIA software using has the following advantages: real scale projects can be achieved; implementation design accuracy is very high; execution time is reduced because there are libraries with standardized items that can be inserted in the design; the design quality is very good; execution costs are reduced; drawings can be exported, etc. [2].

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