

Tom 58(72), Fascicola 1, 2013

Modeling Eco-Friendly Products in CAD Systems

Georgeta HARAGA¹

Abstract: Ecodesign represents an approach to design products with integrating environmental concerns during its whole life cycle. Reducing materials, waste and energy are just some of the main ecodesign requirements. 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. The solution of these problems found by designers is creating and modelling some eco-friendly products using CAD systems.

Keywords: eco-friendly, ecodesign, environmentally, modeling, CAD systems.

1. INTRODUCTION

Beginning the 1970s, due of the oil crisis, environmental problems of the world have begun to focus out towards the human awareness for environmental conservation.

By the middle of the 18th century, in during the Industrial Revolution, people have benefited from the richness as a result to the mass production and mass consumption, having a continuous growth with a progress of industrialization, industrial technology, and advanced material. These activities based on material growth causes major global environmental issues such as destroy of the ozone layer, global warming, acid rain, waste disposal and so on.

In the 21st century, due to rapid industrialization, the society is ruled by the environmental sustainability criteria. Thus, all countries with high consuming by natural resources have a negative impact on the environment.

Ecodesign is an approach to design of a product with special consideration for the environmental impacts of the product during its whole life cycle. Ecodesign can also be applied to everyday products. Today, term like "eco-friendly" has become one of the words frequently used in environmental design. Knowing and understanding the true meaning of eco-friendly, involves implementing some alternatives practices that will lead to healthier living for the planet and its inhabitants. A good designer takes into account environmental aspects but one important problem in green design is to create products which are lasting with possibility of recycling. [8]

2. WORKING TYPE

In this paper we have presented in a synthetical way some steps for modeling some eco-friendly products, highlighting the importance of integrating the ecodesign notion. For realizing this type of product has been used the CATIA program that is one of the most popular software from CAD systems.

At the beginning, is modeled a simple stool, using the commands: Pad, Edge Fillet and Chamfer from CATIA part module as shown in Fig. 1.

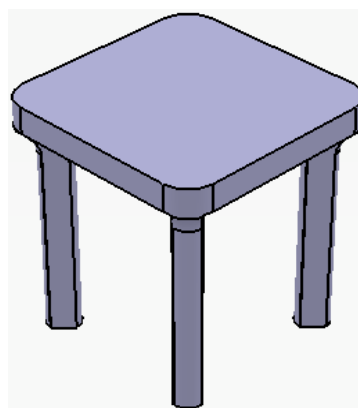


Fig.1 Modeling a simple stool

One good way to improve the model of Fig. 1 is to add new elements as seen in Fig. 2.

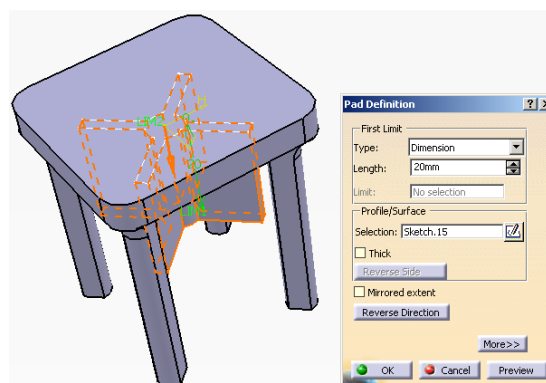


Fig.2 Creating of a new element with Pad command

The Mirror command creates a mirror image of an existing object along a line of symmetry specified by the user as can be seen in Fig. 3.

¹ „Politehnica” University of Bucharest, GIDI Department, Splaiul Independentei Street, No. 313, 060042, Bucharest, Romania, g_haraga@yahoo.com

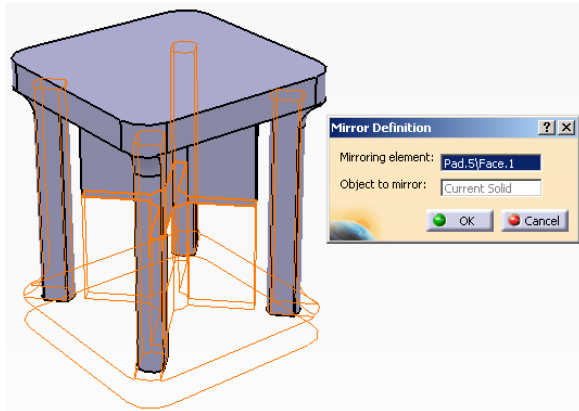


Fig.3 Using the Mirror command

3D Modeling of a stool using CATIA is illustrated in Fig. 4.

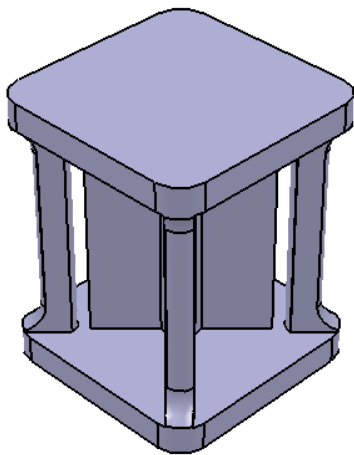


Fig.4 3D Modeling of a stool using CATIA

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. 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 Fig. 4. [1, 2, 6]

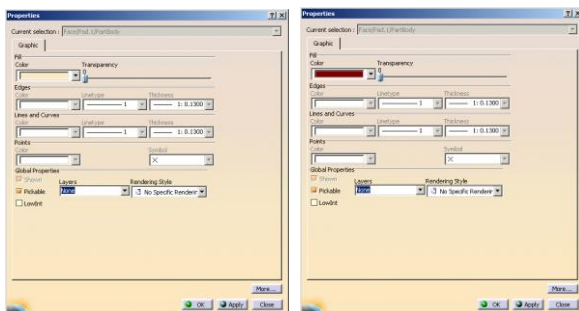


Fig.4 The Properties command

The ecological materials play an important role in ecodesign to minimize environmental impacts, enhance the recyclability of materials, and to increase energy.

In this case, the model chosen is made of wood that is considered one of the best ecological material. In addition, the wood is a material which can be recycled in a 100% .

We apply to the two chosen models on 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 Fig. 5. We choose in both cases the wood material.

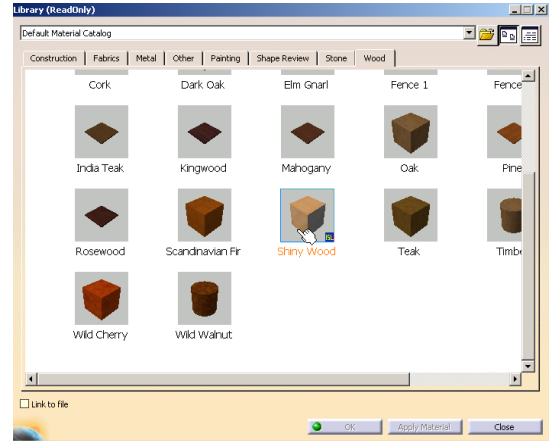


Fig. 5 Applying the material from the Library dialog box

In Fig. 6, The Properties and Apply Material commands can be visualized.

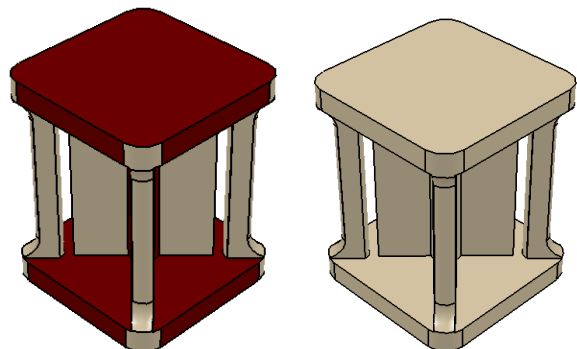


Fig.6 The Properties and Apply Material commands

Minimizing waste and consumption of energy and materials are just some of the main ecodesign requirements. Designers should aim to minimize material for creating of a eco-friendly product. Thus, the objective must be to use as little material as possible.

A good designer can create new elements from existing elements by minimizing consumption of material. Accordingly, we removed a portion of material from initial product using the Pocket command.

After removing material, the figure 6 can become a shelf, as shown in Fig. 7a. Similarly, we apply the properties of color and texture the final shelf model as shown in Fig. 7b. One of the eco-friendly products which satisfy ecodesign requirements can be this shelf.

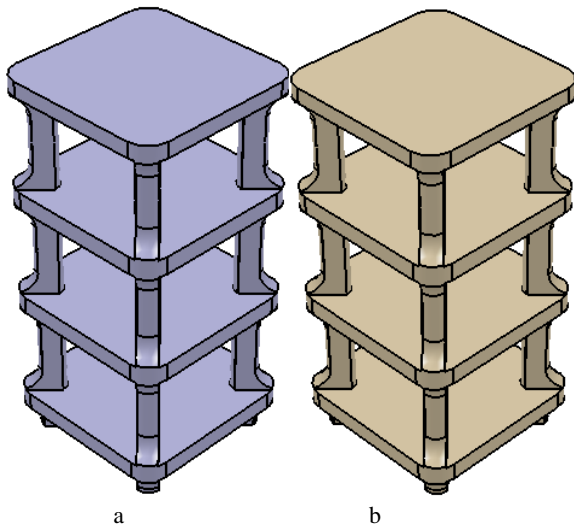


Fig.7 Modeling of a shelf

The next step we will create a vase using the Shaft command as can be seen in Fig. 8.

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 Fig. 9. Revolved feature can be revolved between 0° and 360°. In this case, we choose the 360° [3, 4].

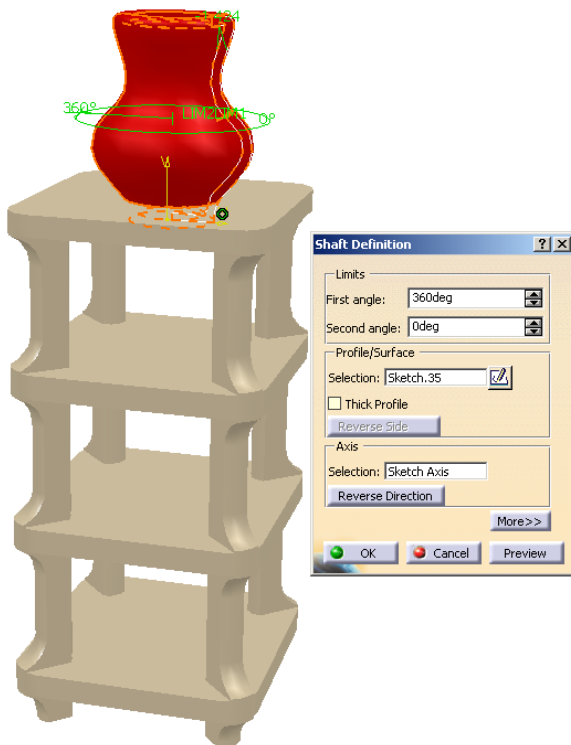


Fig.8 The Shaft command

With Pad command will be extruded the rectangular profile. The move from CATIA Part Design in a CATIA Sketcher module will be the Exit Workbench from Workbench toolbar can be seen in Fig. 9.

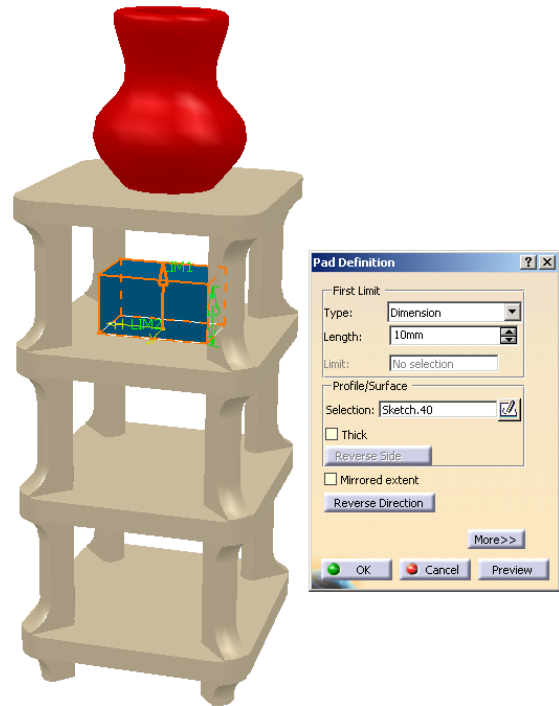


Fig.9 Extruding a rectangle using the Pad application

The Shading command displays the selected element in shading mode. Results of the Shading command are presented in Fig. 8 and 9. The Fig. 10 shows activation of the Shading icon.



Fig.10 The shading icon

For a good visual effect, we must change the white color of the background in a darker color, using the Options command, as seen in figure 11. In this conditions, we selected for the background of the drawing window, the blue grey color [5].

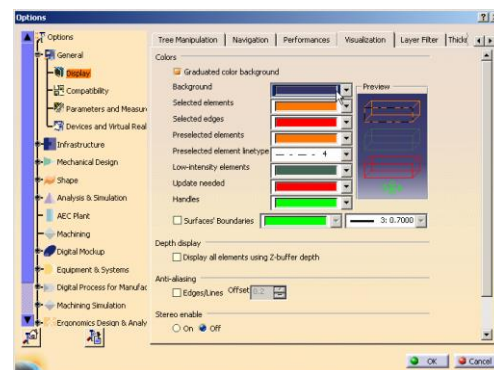


Fig. 11 The Options command

The Fig. 12 presents various decorative shapes realized in CATIA that can be placed on the shelf.

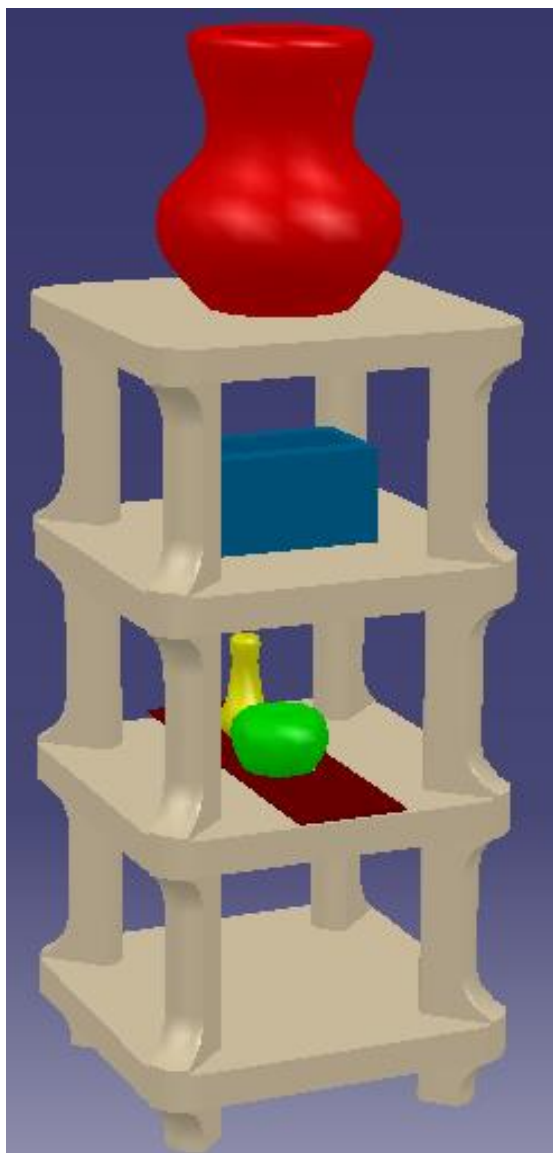


Fig. 12 Modeling final model

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 aesthetically point of view.

Eco-friendly products are becoming more widely used in our society and they have a central role to play in the development sustainable. Using eco-friendly products contribute to green living or practices that help conserve resources for the planet and its inhabitants. Eco-products are available in many categories of consumer goods in many countries.

One of the common materials used to modeling the eco-friendly products is the wood, which has many advantages. Wood is a material non-toxic, recyclable, renewable, easily worked and is commonly used for cabinets, shelving, floor, doors, furniture and other architectural elements [2, 7]. In this paper, ability and the originality concerning the aesthetical sense for proportion, line and style in realizing eco-friendly products can be observed easily using a CATIA system.

This design is very simplified and easy to use. CATIA 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. Compared to technical drawings and handmade drawing graphics, 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.

REFERENCES

- [1] A.M., Goanță, "Modern cad tools used in mechanical design", The Annals of "Dunarea de Jos" University of Galati, Fascicle XIV, Mechanical Engineering, CNCSIS code 220, „B+”, Indexed Journal BDI-CSA (Cambridge Scientific Abstracts) , ISSN 1224-5615, 2010, pp. 5-10.
- [2] G., Haraga, D., Ghelase, "Using CAD systems in ecodesign", The Annals of "Dunarea de Jos" University of Galati, Fascicle XIV, Mechanical Engineering, CNCSIS code 220, „B+”, Indexed Journal BDI-CSA (Cambridge Scientific Abstracts) ISSN 1224-5615, pp.51 -54, 2012.
- [3] G., Haraga, D., Ghelase, "Assembly modeling using Catia system", The Annals of "Dunarea de Jos" University of Galati, Fascicle XIV, Mechanical Engineering, CNCSIS code 220, „B+”, Indexed Journal BDI-CSA (Cambridge Scientific Abstracts) ISSN 1224-5615, pp. 67-70, 2010.
- [4] G., Haraga, Applications of CAD systems, ICEGD 2009 - International Conference on Engineering Graphics and Design, Series Applied Mathematics and Mechanics 52, Vol.Ia, ISSN 1221-5872, Technical University of Cluj-Napoca, Acta Technica Napocensis, 12-13 June 2009, pp.291-294.
- [5] G., Haraga, "Various decorative shapes with CATIA system", ICEGD IAȘI 2011 Sustainable Eco Design, Conferință Internațională de Grafică Inginerească și Design were published in Bulletin of the Polytechnic Institute of Iasi, published by the Technical University "Gheorghe Asachi" of Iasi, LVII (LXI), Fasc.5, Section of Machine Construction, Ed. POLYTEHNIUM, ISSN 1011-2855, CNCSIS code 500, „B”, type review, 2– 4 June 2011, Iasi, Romania, 2011, pp. 95-98.
- [6] E., Ioniță, "Creating 3D parts using CATIA V5 application", ICEGD 2007 - The 2nd International Conference on Engineering Graphics and Design, "Dunarea de Jos" University, Galati, Graphics, Mechanisms and Tolerances Department, ICEGD, ISBN 978-973-667-252-1, Ed. CERMI, 07-10 June 2007, pp.293-296.
- [7] <http://greenliving.nationalgeographic.com/ecofriendly-mean-2415.html>
- [8] <http://en.wikipedia.org/wiki/Ecodesign>