CONSIDERATION ABOUT USING 3D SOLIDS MODEL IN MECHANICAL DESIGN

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Abstract: *Solids modelling is most useful in mechanical design giving us major benefits. In this paper we propose a technique of obtaining solids using 2D projections of the objects in AutoCAD2002, and secondly, by applying AME system of this program. We can assure a most efficiency administration of the technical documentation by using the insertion of the parts' original drawings in the ensemble drawing, like external references.*

Key words: *solid, model, 2D, 3D.*

1. INTRODUCTION

In the classic design, the objects are represented in 2D projections, views and sections, having in mind the 3D image of the objects. We are using conventions and rules of representation in according with we represent the objects by theirs orthogonal projections obtained on one, two, three or more projection planes.

It is easier to understand the form of the objects if they are in a 3D solids form, using the possibilities of the Computer Aided Design.

This paper proposes a technique of obtaining solids model using 2D projections of the objects.

2. THE ANALYZE OF 2D DRAWINGS

Depending on the complexity of the objects, we establish how many plan views and sections are necessary to present all the form's details and dimensions of the objects. The main projection, plan view or section, must contain the most important form's details and, also, must respect the functioning position of the part in ensemble. Also, the number of the projections must be the minim necessary for clear representation and understanding. We chose the most representative views and sections of the objects.

Improving the design activity, more frequent the designers are using the 3D solids Advanced Modelling Extension of CAD programs, having multiple final possibilities of plan representations.

In the following, starting from 2D views, with simple methods, we obtain 3D solids of the objects with medium complexity.

3. THE OBTAINING OF 3D SOLIDS USING TWO OR THREE ORTHOGONAL PROJECTIONS

The machine parts that can be represented in two or three orthogonal projections have the geometrical form prismatic or combination between a revolution form and a prismatic one. In these cases, we obtain the solids using the commands **EXTRUDE** and **REVOLVE**

(of AutoCAD2002 utilitarian program) applied on two directions, figures 1, 2, 3 and 4. The solids form are completed after we are using Boolean operators, such as: **UNION**, **INTERSECT** and **SUBTRACT** applied on primitives: Cylinders, Cone, Boxes, Wedge, Torus, Sphere. Also, we can use the editing commands **CHAMFER** and **FILLET** to generate the final geometrical parts' form.

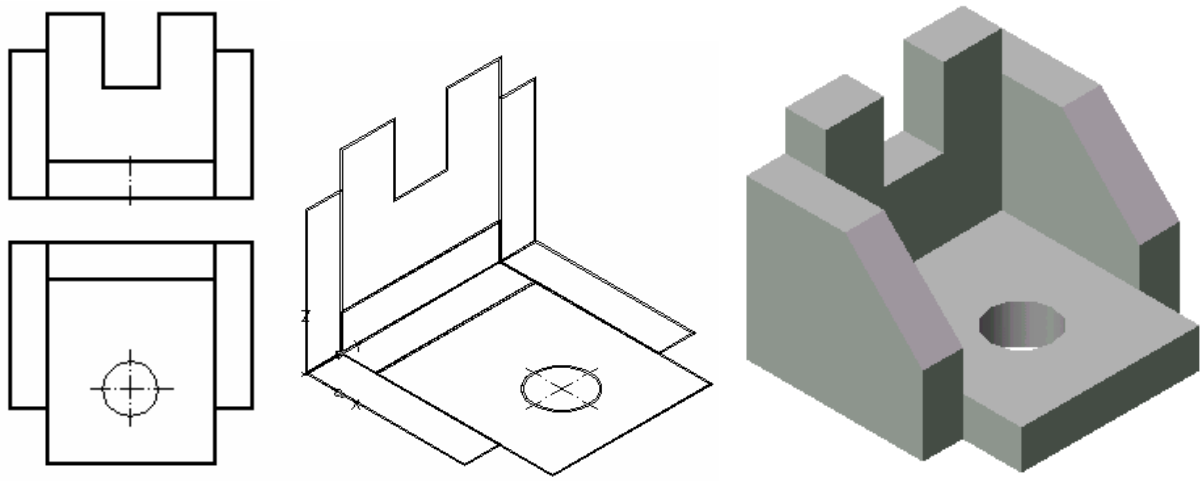

Figure 1

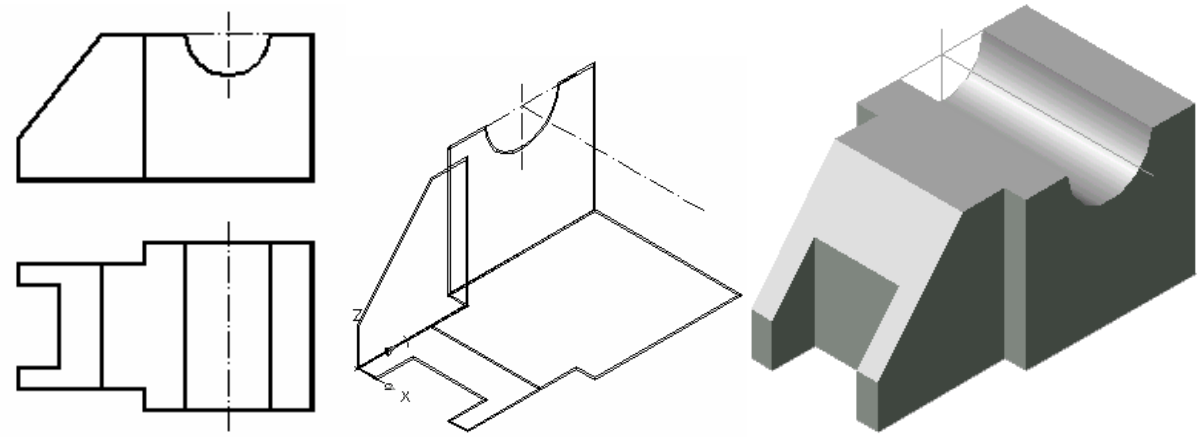

Figure 2

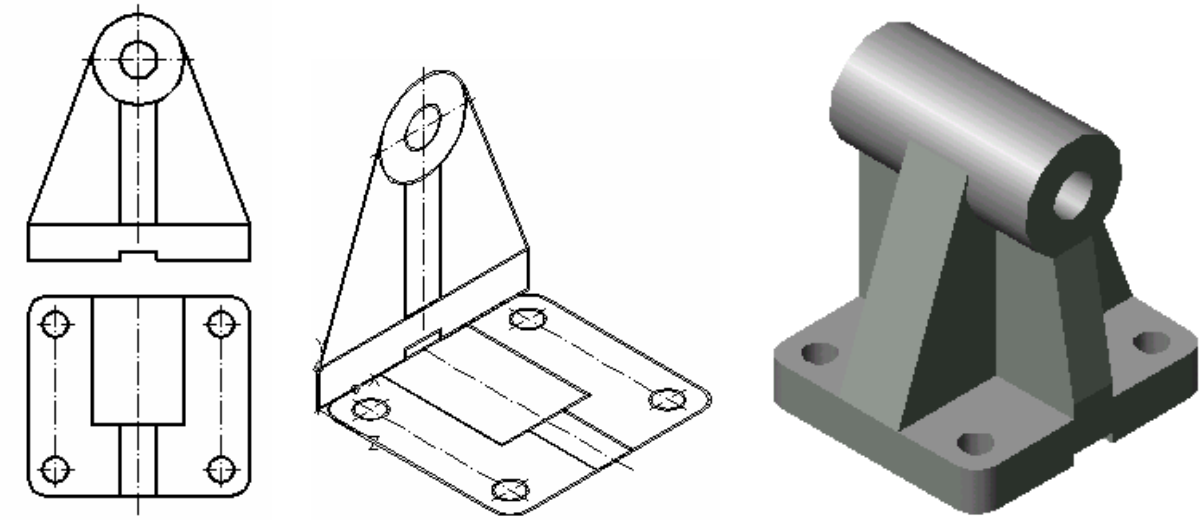

Figure 3

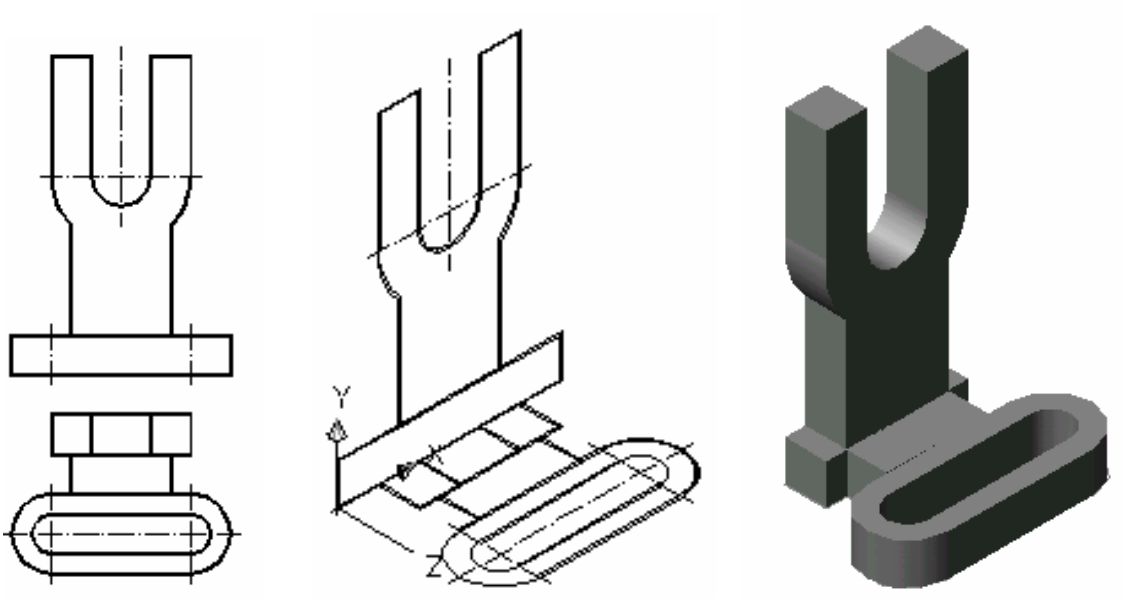

Figure 4

4. THE OBTAINING OF 3D SOLIDS USING ADVANCED MODELING EXTENSION OF AutoCAD 2002

In the construction of the solids, the geometry of the objects are obtained as a collection of primitive solids, organized as a tree whose nodes correspond to the Boolean operators that perform union, intersection and differences on volumes.

Using a solids model, we can calculate mass properties such as: weight, centre of gravity, moments of inertia. One of the best aspects of solid modelling is that we build a solid model in much the same way we would actually manufacture it.

Solid modelling is must useful in mechanical design because gives major benefits:

- it makes must easier to create a design and check it with other parts for fit and for functioning;
- it makes to create drawings for complex part, can resolve complex intersections and penetration;
- solids can quickly demonstrate conflicts and interference between components;
- when the solid model is ready, we can create the 2D drawings using the facilities of the commands: **SOLVIEW and SOLDRAW;**
- the 2D drawings can receive associative dimensions.

After we obtain de 3D solid models of the parts, figure 5, we can obtain the ensemble, figure 6, defining the original drawings of the parts to be **external references**, and, using insertion point, we obtain the ensemble drawing. Now on, we assure that all the modifications made on the original drawings of the parts, will be also relived in the final ensemble drawing.

5. CONCLUSION

With solids model we can resolve complex intersections and penetrations, so we can quickly track down the conflicts and interference between components, clarify the effects of mass, mass centre location, solid's inertia moments, skirt length, skirt geometry and eccentricity. Also, we can use solids model to transfer the results to 2D solids' drawings.

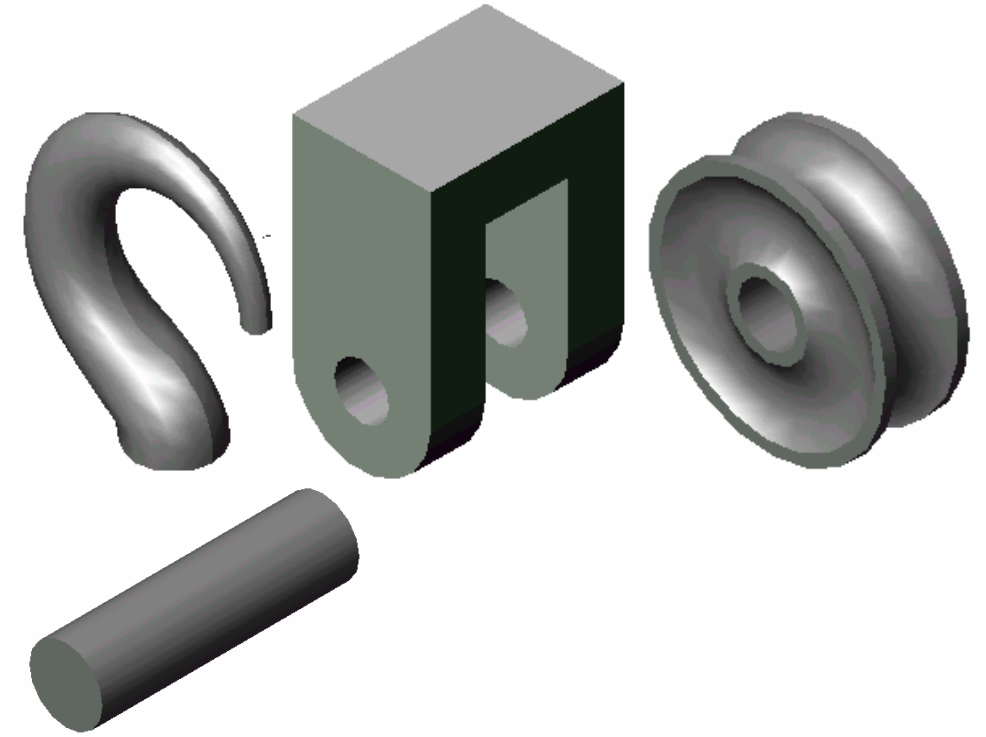

Figure 5

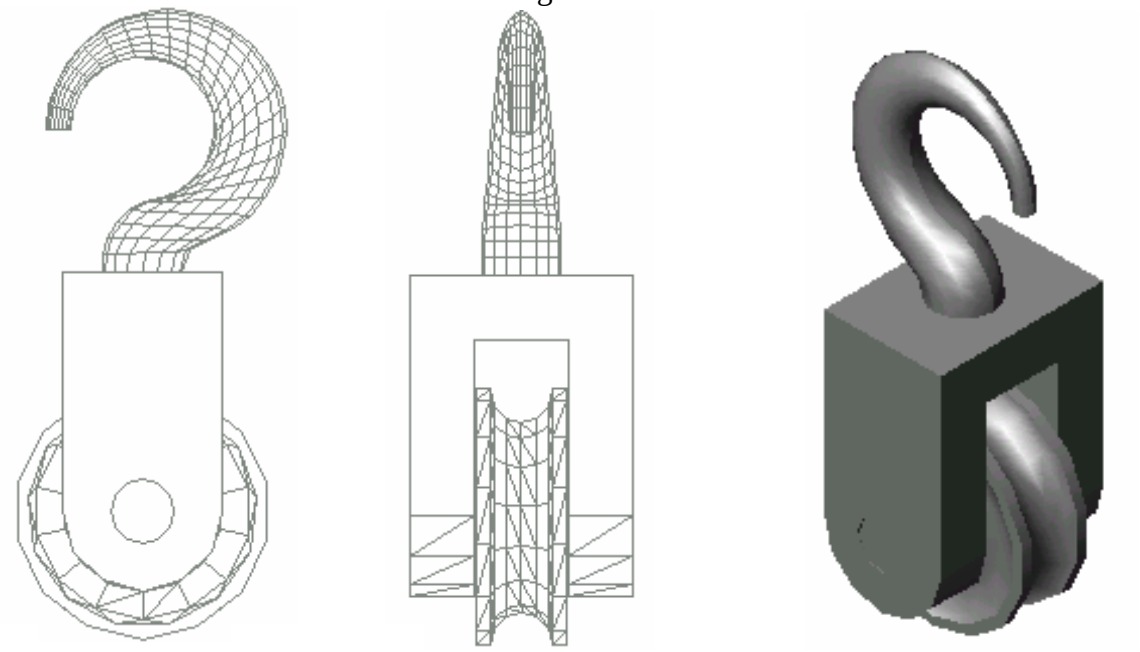

Figure 6

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