DESIGN OF SOUND-ABSORBING PANELS CASTING MOLDS

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Abstract
Studying sound-absorbing panels for indoor ambient environment noise attenuation aims to improve the noise absorption phenomenon by analyzing the design process of plaster sound-absorbing panel casting molds. The coffered plates, ceilings and upper surfaces made of plaster-α with polymer blends and even metal flakes characterized by extremely good absorption or diffusion, depending on the reinforced material, are applied as insulating layers in the reflecting points connected to primary sound sources, in order to reduce the reflected waves level, reducing thus the acoustic comb filters effects on the signal the receiver perceives. This study describes certain elements pertaining to the design process of the plaster sound-absorbing panels casting molds.

Key words: sound-absorbing panels, manufacture, mold, noise

INTRODUCTION

The design phase consists of the 3D designing of the Al casting mold using the SolidWork 2008 software. The sound-absorbant plaster panel casting mold represents the negative mold of the sound-absorbing panel shape.

Figure 1 shows the 3D drawing of the Al mold, while Figure 2 presents the silicone mold shape the sound-absorbing panel is to be cast in.

The mold is made of 6061 aluminum, its dimensions being 300x210x20mm; the sound-absorbing panel will comprise a combination of simple geometric shapes (Ungur P. A., 2010).

MATERIAL AND METHODS

In order to make the mold, a CNC machine tool was chosen for the manufacturing process. The technological program was carried out by using CAM software. The program phases are listed, below.

The phases of the manufacturing process are as follows:

a. blank choice
b. choice of manufacturing technology
c. workpiece origin choice;
d. cutters choice

The previously designed workpiece, by using SolidWorks software, opens in the Solid CAM window and the types of the operations that have to be performed are selected (Figure 3).

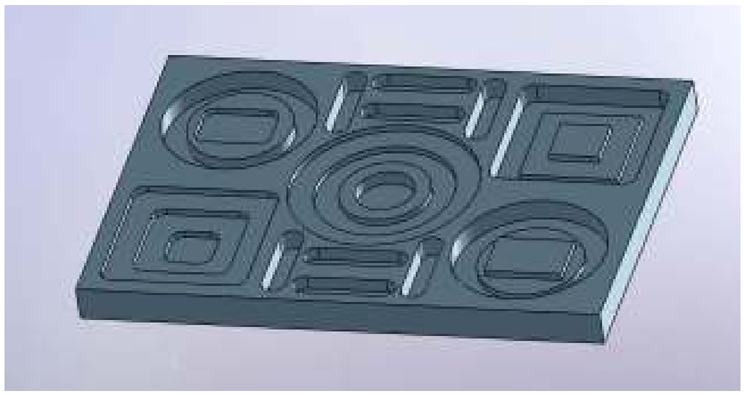

Fig. 1. 3D Al mold cast

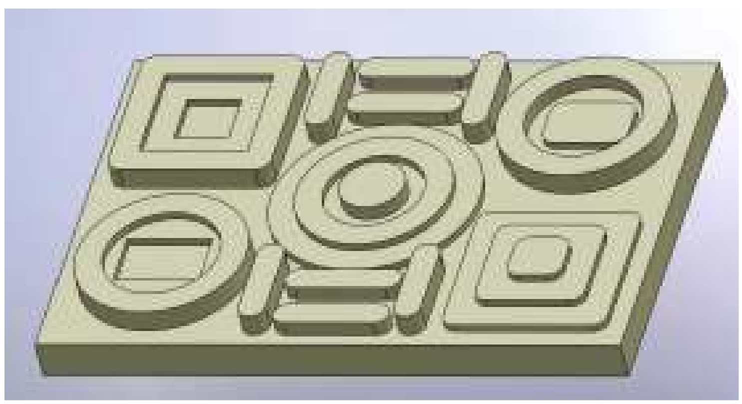

Fig. 2. 3D silicone mold cast

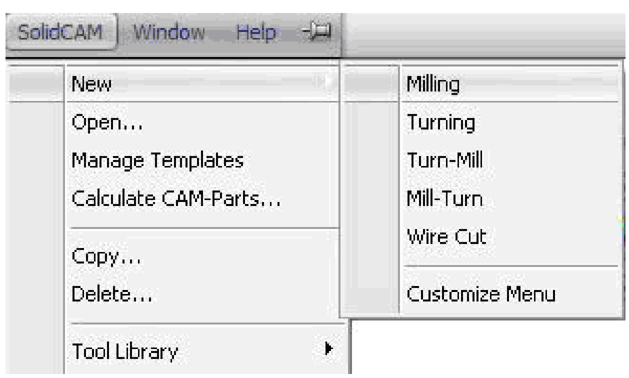

Fig. 3. Operation selection meniu

Then, the new CAMpart is defined. This means that the workpiece is created a directory for the storing of all the module files. This directory can be implicit; a new one might be created as well (Pantea I., 2002).

The blank is selected so that its entire surface, that is to splintered, presents a certain amount of surplus material following the manufacturing process. Figure 4 provides the definition of the working directory with the option of working within the piece directory.

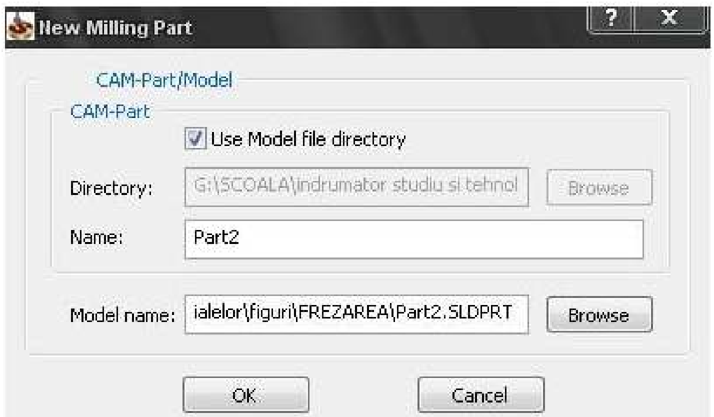

Fig. 4. Working directory meniu

In order to make the entire workpiece one needs to define two coordinate systems due to the fact that, at some point during the manufacturing technology, a lower part processing of the workpiece will be required.

Choosing the second coordinate system is done in a similar manner as the first, as there are no other aspects to be pursued. The only aspect to be taken into account is that when the lower part processing is required, the second coordinate system will have to be selected in the operation dialog box. The main coordinate system was chosen in the middle of the piece in order to facilitate the performance of a subsequent action on the piece.

The blank is a cuboid with the workpiece inscribed in; its dimensions are 2 mm larger on the positive z-axis and 10 mm larger on the negative z. The choice for the other directions is "0"; this means that the blank has the same dimensions as the workpiece (Figure 5).

Following the choice of blank’s dimensions, the "Stock model" (blank) and "Target Model" (target workpiece) are then defined.

Following the definition of all aspects pertaining to the preparation of the workpiece for manufacturing, the tools to be used for milling, drilling and other operations are selected from a tool table. Figure 6 presents the tool table Solid CAM software provides for the milling, drilling, boring and other operations.

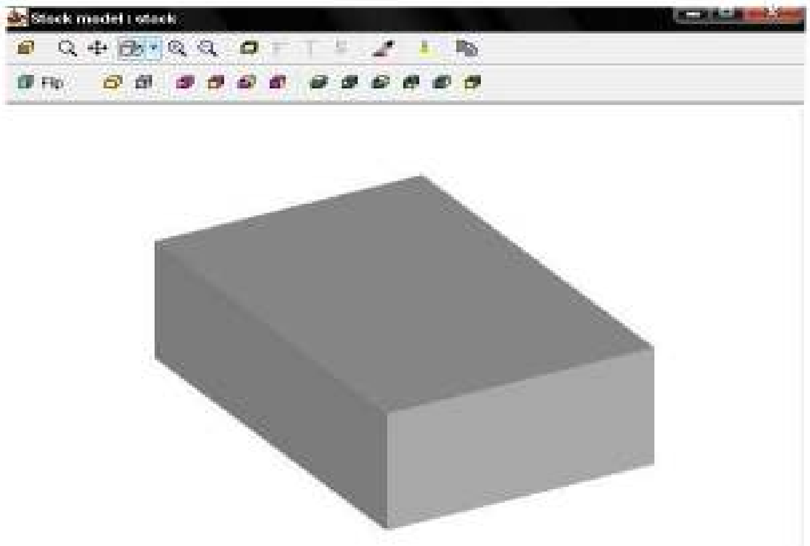

Fig. 5. Defining the blank.

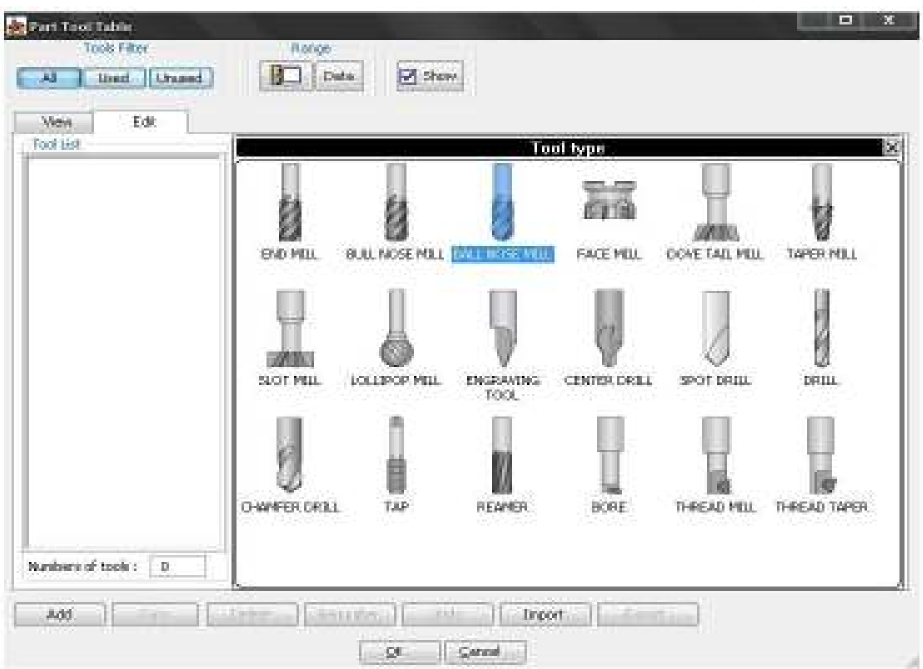

Fig. 6. Table of the mills as provided by Solid CAM software

The tools required for the following operations necessary to obtain the mold are selected and their parameters defined. These tools are listed below:

- Tool 1 - Drill Ø 12 mm;
- Tool 2 - Reamer Ø12 mm.

Knowing also the necessary phases to make the piece, one can proceed to the actual manufacturing of the piece in order to create a program that subsequently, will be transmitted to the machine tool, the physical workpiece being thus created.

Solid CAM provides several possibilities for the piece processing.

RESULTS AND DISCUSSION

Figure 7 presents the selected operations for the milling process of the workpiece. Their sequence takes into account the technological phases proposed for the workpiece manufacturing.

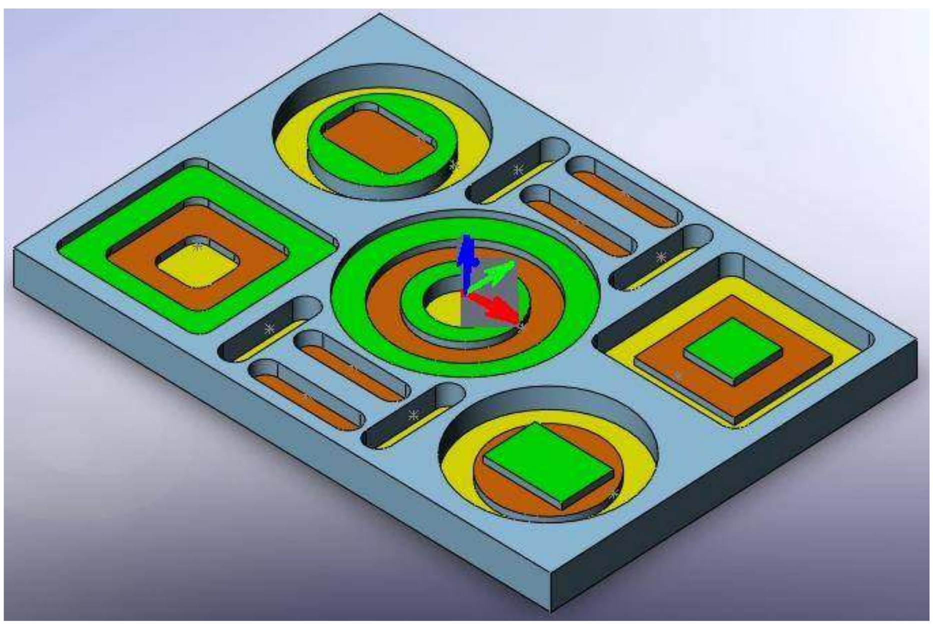

Fig. 7 Defining the level planes for the outlining process

CONCLUSIONS

This paper presented the sound-absorbing panel casting molds design methodology. The Al matrix was designed by using the SolidWork 2008, CAD software. Subsequently the CAM simulation software, CAM Solid, was used.

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