

CREATING A MODEL OF THE PRODUCTION HALL USING 3D PRINTING

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Abstract: The aim of this article is to create a scale model of the production hall using 3D printing as a visualization tool. The article describes the process of creating and preparing 3D models in the SolidWorks modelling program. Visualization is handled by Twinmotion architectural software, where the production hall also includes a machine park approaching the real image of the original hall.

1 Introduction

For the production of the 3D model, we chose the production hall of a company based in Bardejov, which deals with the execution of orders for the engineering industry and locksmith production. After a thorough familiarization with the premises of the production hall and the adjacent objects in which spraying, paint application, and chipping of the surface of materials and material warehouses are carried out, they took pictures of the individual spaces. After taking photos of the production premises of the hall and the land, we set ourselves the goal of creating a 3D model of the main production hall with machinery in order to effectively fill the space and present the company's basic machine park.

Design of the hall

We used the SolidWorks program to create individual models. In total, the hall consists of several machines: scissors, small scissors, a press, a bending machine, 2 saws, a stand drill, a grinder, a lathe, 4 tables, and 4 screens, the overall structure of the bridge crane, and including bridge pillar with rails, winch and hook. All models were drawn simply and then printed separately for better printability. At the initial stage of the creation, it was important to create the area of the plot so that we could lay out the individual buildings with the hall and the fencing of the plot. After measuring and correcting the creation of this land area, we started with the creation of the hall itself, to which we will later add offices. The hall itself has dimensions of 510 mm in length and 360 mm in width. After modelling, we added windows as in the original plan of the hall. When we

modelled the hall, we started to create individual machines (Figure 1).

The process of creating a physical model using 3D printing

After the overall creation of the models and all the parts of the hall, we checked all the models afterward so that we would not have a problem connecting them when they were printed. Subsequently, we could save the models in STL format, which need to be created and used for processing in our chosen Kisslicer. The transformation of STL files is possible in this program created in 3D software, in our case SolidWorks, to the necessary gcode for printing. We also use this program to enter the necessary information for printing (Figure 2), which was performed on the TRILAB DeltiQ 2 and TRILAB DeltiQ 2 Plus printers.

After approval and checking of all parameters, we proceeded to print individual models. After completing all the actions necessary to start printing, we entered the already generated gcode into the printing process. We then waited to see if all the values we had chosen would be reached. In some cases, it was necessary to increase the temperature of the nozzle and the printing pad due to system incompatibility. Each model had a different print time and differed in the amount of filament used. Each model had to be cleaned of support without which it would we were not able to print these models.

When creating the model of the hall, we used plexiglass with a thickness of 3 mm. After cutting the plexiglass, we got 2 side walls with dimensions of 350x300 and another 2

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walls with dimensions of 506x300. The floor plan of the hall has dimensions 500x350 mm (Figure 3).

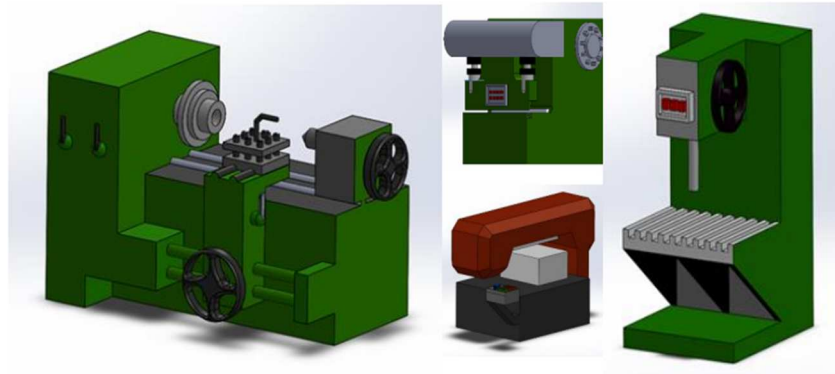


Figure 1 Modelled machines

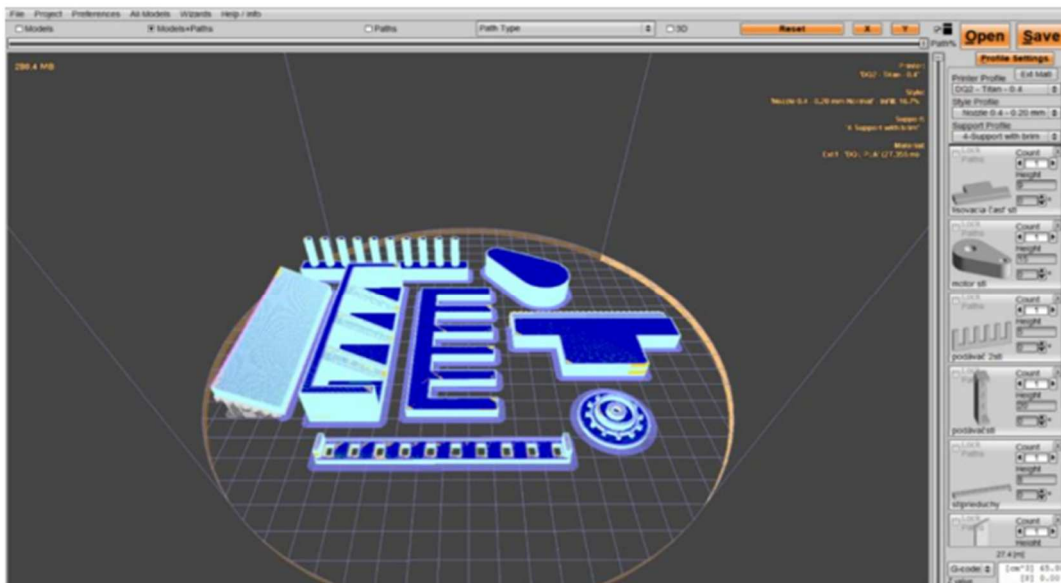


Figure 2 Working with models in the Kisslicer program



Figure 3 The printing process and the final model of the hall

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Creation of visualization

During visualization, we gradually started with the creation of a hall with machines and then with the creation of the entire complex. We used models that were created in SolidWorks and then transformed into obj. format so that we can subsequently transfer the models to the TwinMotion program and gradually start editing them (Figure 4). TwinMotion is a 3D architectural visualization software that takes us into virtual reality in real-time. It allows us to create high-quality images of our work, but

also to be transported into this reality with the help of 360° VR videos, which are made in high quality and the rendering time is significantly shorter compared to other software. Another option is to enter the already created simulation environment with the help of VR glasses at any time according to our choice. In addition to a lot of editing and post-production of the environment, Twinmotion has a wide range of materials that really respond to the set lighting conditions of the scene with their display.

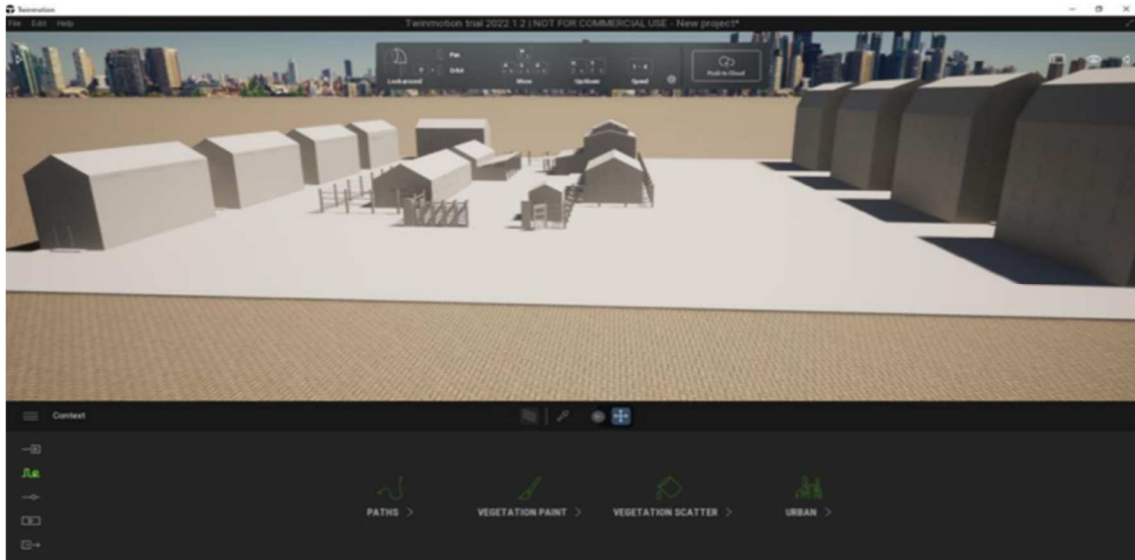


Figure 4 Initial model of the hall

After transferring this whole complex to our environment, it was necessary to solve the bad orientation of the object with respect to the basic position. In our understanding, the object was perpendicular to the surface of the virtual environment. After studying the individual

actions, we dealt with them and redirected the given model to a horizontal position. After orienting the object, we could proceed with the subsequent modifications of the surface, where we added the stone structure to it (Figure 5). Finally, we dealt with the remaining buildings (Figure 6).

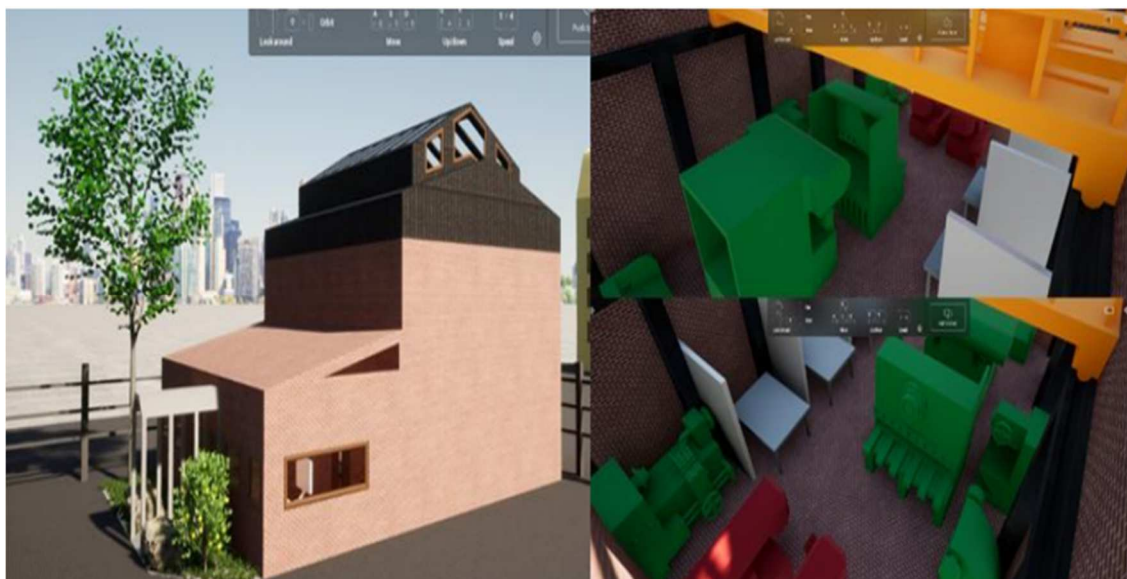


Figure 5 Model of the hall and its interior

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Figure 6 Visualization of the entire complex

2 Conclusions

The article presents the production of the production hall and its machinery. The article defines the production of 3D models of the machinery park. The individual models were made by the Rapid prototyping method with the FDM - Fused Deposition Modeling 3D printing method. The models were created in SolidWorks. In the process of creating 3D models, it is necessary to transport models from the SolidWorks program in the correct format, namely the stl format. In Kisslicer, we have set the printing parameters and properties. TRILAB DeltiQ 2 PLUS and TRILAB DeltiQ XL 3D printers were used to print machine models in the production hall. We chose the material for printing the models PLA and PET-G. After printing the models, we removed the support from all parts and then joined the individual models with the help of glue. We stacked the subsequent models in a plexiglass hall made by us, reinforced with the help of modelled L-profiles. Last but not least the council should not forget that in addition to the physical model of the hall, we also created its visualization. For this we used Twinmotion. The main advantage of creating this building with a hall is the possibility of using a large number of materials that this program offers in the library.

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Review process

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