

APIS COR – Technical Report



Company & development

The company was founded by a married couple, Anna and Nikita Cheniuntai. While Anna was studying Astrophysics in the Technical University of Irkutsk, she met a young self-made engineer with no university degree, Nikita.

Despite having no profound university level education, Nikita had years of experience within construction industry and machine building and a huge desire to start operating within the area of 3D printing. The first trial of 3D construction printing with the first version of the printer was done in Irkutsk, however, not finished. The next project to be started was in Texas, USA, but also not finished due to the financial problems of the partner, who was primarily in charge of the project.

The first and only successful project was completed in Moscow Region, Stupino city, where on the concrete factory, there is a small house, claimed to be built within the 24 hours.

Up-to-date, some of the main engineers in the company still lack university education. However, the official policy is that Apis Cor is interested in professionals with experience, who are able not only to draw future and plan the developments, but who have hands-on-experience and are able to conduct a reality check if needed.

Currently, Anna is playing a role of a Marketing Manager, Hr Manager and is in charge of communication with the partners, whereas Nikita is more concentrated on engineering type of work.

Originally, the company's idea was to sell printers, however, with the help of investment advisors, they have decided to change their focus to providing printing services for big construction companies instead of having their printers sold out.

Year of establishment

2014

Year of entering into construction 3D-Printing

2015

Number of employees

Current number of employees of the company is currently growing and is estimated to be 15, including all the engineers, technicians and business support.

Targeted market

The company has its own printers, and provides printing services of houses at the customer request. Particularly, they are targeting large construction companies, that are ready to do market research and support the business operations on spot. Apis Cor, however, in its turn will be providing the technology, namely, the printer.

Development stage of printers

The company claims that they have 3 fully functional printers. It is a known fact that the newest built printer is currently in Dubai, whereas the other is located in the USA. The location and the stage of development of the third printer is yet to be known.

Development stage of printed materials

Apis Cor is currently using a modification of classical concrete mixtures, that are being slightly altered for the purpose of 3d printing. In Dubai, for instance, they contacted local producers that easily made the needed mixture.

However, currently, Apis Cor are exploring new materials, which includes geopolymer-based printing mixtures, such as Geobeton (Geoconcrete). They latter are trying to make the materials less expensive and it is claimed that as long as it is done, Apis Cor is planning to move its production to Geoconcrete due to its ecological and environmental characteristics.

Patent(s) status

The current status of all the patents that the company or its owner has is yet to be further investigated in details.

It is known that the patent is pending in the United States of America and there was always a plan to patent the product particularly in the States.

Largest print up to date (by size)

The size of the largest printed part or building up to date is 100 m³, a house in Stupino, Moscow Region.

Largest print up to date (by category)

The same house is believed to be the largest print up to date, since there are no particular details on the printed building in Dubai, the latest commercial project of Apis Cor.

The house



The house has a location, approximately 112 km away from Moscow. It is located on a big concrete field factory, the main company of the town. The location was chosen primarily due to its smaller cost.



Normally, the house is covered with tent and has no heating on. The coverage was made due to the high interest of the house from the workers of the factory.



The showing is not done due to the marketing reasons. Apis Cor are afraid that by letting in a lot of media and companies some fake news and unwanted reports will be provided. Therefore, they are showing the house by request of the company, that has proven their interest in further partnership.



The interiors of the house was provided by several companies, that Apis Cor had found during their first house presentation. At that point, they promised to show a ready-made house, but instead, people came were only able to see the 1/3 of the house. However, this lead Apis Cor to finding partners to supply the furniture and other in-house equipment, like the oven, the fridge and the TV.



The windows were done by the company one of the engineers was working in previously, completely for free in exchange of advertising.



The ceiling was also done by company's partners for free. The type of ceiling is tension (strength) ceiling, typical for Russian construction industry.



The provided TV fit perfectly to the wall, that has the same curve, particularly to fit the TV.



Due to the time limit, the interior was not done properly, and it is possible to see some scratches and cracks on the walls.



The house is widely claimed to be printed within 24 hours, which is not quite accurate. The house was built in 23 hours, however, all the time on solving the software problems and printer bugs were excluded in calculation as well as all the interior works. In other words, in order to print just walls for the house it took the company more than two days granting the fact that it was their first project and some problems appeared were not anticipated.

The house received big media coverage worldwide, particularly in US. And attracted a lot of partners and agreements for Apis Cor. However, at the moment, they only construction projects they have are in Dubai and not in Europe. The project in the US is also frozen at this point.

Insulation

Insulation system in the printed house was done using innovative materials of TechnoNICOL company. As a heat-insulation layer we applied solid plates on the basis of LOGICPIR hard polystyrene. Due to low thermal conductivity of the material (0.022 w/sq.m), thickness and total weight of the roofing system is much smaller than traditional insulation materials.

Technology

Form freedom

Material extrusion (layered) - An additive manufacturing process in which the added material is selectively dispensed through a nozzle or orifice, creating filaments of material that are deposited horizontally into layers, one on top of the other.

Form freedom

2D freedom – The technology is only able to create shapes within a two dimensional plane. This can be compared to an inkjet printer, which is limited to the two dimensional freedom of the paper it prints on.

Fabrication approach

Semi-direct fabrication (parts are introduced) - The printed object is the definitive construction, by certain parts are added during the printing procedure, to facilitate the process or to overcome some physical obstacles. As an example, lintels can be installed where doors or windows will be, to simplify the printing of layers that need to go over them.

Printer

Movement system

The movement system is similar to mobile robotic vehicle, however, instead of a robotic arm, a mobile crane is used for printing.

The maximum size of the printable area

132 m²

Deposition method

Pressure extrusion

Number of print heads (nozzles/orifices)

Single

Print head (nozzle/orifice) features

Three-axis motion

Material feeding system

Included, fully-automated – There is an autonomous feeding system for the material, which is mounted on top of the printer, and is fully commanded by the printer.

Theoretical printing speed / Actual printing speed

1-10 m/min

Accuracy

0,1 – 0,2 mm

Idling speed X/ Y

20 000 mm / min

Price per printer unit

Not specified.

Material

Material possibilities

Multiple materials - The printer can use different types of materials one at a time, or simultaneously through the use of multiple nozzles.

Material type

Apis Cor is yet to release the details on the materials, but it is a known fact, that there are multiple types of materials to be used. Namely, traditional and alternative concrete.