

Small Scale Plant Model

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Understanding the layout and processes of AguaClara plants can be difficult if one has never seen a plant. This team will design and create a small scale plant that can be used to demonstrate how the plant is laid out, where each process takes place and how it can be taken apart for cleaning. Potential donors and partners, in particular, will benefit from the small scale plant as they will be able to more easily understand the plants.

- Design and construct a small scale plan that can be used to present the AguaClara design.
- The final product should look like a model from the design tool.
- Include labels and features to distinguish between different processes in the plant.
- Be able to take up square footage of a laptop and be easily portable.
- Can be taken apart in the same way as a full scale plant.

Spring 2013

The Spring 2013 team planned construction of a scale model of a 12 L/S AguaClara water treatment plant. The construction of this model was intended to educate and motivate individuals interested in the AguaClara water treatment process. The team edited AutoCAD drawings of the plant using the three-dimensional design software Rhinoceros; plant components were separated into individual planes and laid flat in templates. These pieces were optimized so that they would fit in a 12"x18" laser cutting area and aligned so that multiple pieces could be cut efficiently and at the same time. These finalized Rhinoceros files were then converted back into AutoCAD drawing files in preparation for laser cutting. The Rhinoceros files were also saved as PDFs so that the team could print paper templates to be used in the construction of the mock-up model. The mock-up's pieces were cut from chipboard using an X-ACTO knife and assembled with tape. The team finished certain pieces of the mock-up model this semester, including the main base, flocculator, filter, and filter inlet. The team also began work on other mock-up plant components, including the entrance tank and the staircase. Meanwhile, the Small Scale Plant Model team researched materials for building the final model, considering transparent and opaque Plexiglas, museum board, Plexiglas rod and tubing, and Plexiglu. After deliberation, it was decided that the entire model would be built in Plexiglas, and the team ordered and received 3 sheets of 12"x18" transparent Plexiglas, 6 sheets of 24"x24" white Plexiglas, and 1 sheet of 12"x12" blue Plexiglas. The team will laser cut these Plexiglas pieces through the school of Art, Architecture, and Planning, which offers a laser cutting service that is free to Cornell students.

Summer 2013

The Summer 2013 members plan on using the preliminary designs prepared by the Spring 2013 team in order to construct the final model. Our challenges include re-configuring AutoCAD templates to account for the thickness of the Plexiglas material. We intend on further researching methods to cut this Plexiglas into the necessary plant parts, such as using laser cutting processes or water-jet cutting processes. During assembly of the Plexiglas structure, we are going to create a detailed instruction manual documenting assembly specifics. Once the structure is complete, we can add plumbing components to the model. Towards the end of the summer we intend on evaluating our final structure to determine additional components that could possibly be created to supplement the plant model to increase understanding of the AguaClara project.

Fall 2013

The Fall 2013 team engaged a change of medium for the model: 3D printing. A method was designed to 3D print almost all of the componentry within laser cut plexiglass containers. AguaClara's 3D output model was evaluated in a more robust software Rhinoceros 5 in which students could manipulate the geometry and format it for 3D printing. This included re-formatting the objects to the correct material thickness at model scale and ensuring that components were closed polysurfaces with no naked or non-manifold edges. Structural considerations at model scale were also taken into account for both plexiglass and 3D printed objects. 3D printing was completed using Shapeways.com as well as at the Architecture Art and Planning department. All pieces were completed and cut and assembled; the model is almost completely finished. Considerations for moving forward include how scripting could engage the formatting requirements of 3D printing, how more of the model could be printed at once, and how the model could be simplified for representational purposes.

Fall 2014

The Fall 2014 team worked on repairing the current small scale plant model and began using AutoCAD to 3D print a small scale model of AguaClara plants. The purpose of using AutoCAD to print models of AguaClara plants, rather than using Rhinoceros 5, is to automate as much of the printing process as possible. The team evaluated multiple methods of converting a solid in AutoCAD to a meshed solid. In addition, the team looked into alternative printers that would be more compatible to printing using AutoCAD.

Spring 2015

The Spring 2015 team plans on optimizing the design process of 3D printing by using AutoCAD and Mathcad. Not only is AguaClara already familiar with both AutoCAD and MathCAD, but manually formatting the Rhinoceros 5 drawing file proved to be tedious and time consuming. This transition will involve updating the MathCAD to AutoCAD (MtA) code to include the extra formatting that is necessary for 3D printing. In addition to the change in the design process, the small scale plant model will be scaled down to a travel size. By the end of the semester we will create a small scale plant model that is technical, yet easy to understand.

Members

[Serena Takada](#)

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Email Team

Supplemental Material

References
Documents

	Challenges	Tasks	Symposium	Final Presentation
S p r i n g '15	? Unknown Attachment	? Unknown Attachment	? Unknown Attachment	? Unknown At
F a l '14	? Unknown Attachment	? Unknown Attachment	? Unknown Attachment	? Unknown At
F a l '13	? Unknown Attachment			ModelGraphic.jpg
S u m m e r '13	? Unknown Attachment	? Unknown Attachment		
S p r i n g '13		? Unknown Attachment	? Unknown Attachment	? Unknown At