Modeling the UNH Combined Heat and Power Plant 3D model to use for virtual reality tours

Jericho Bien, Thomas Madden, Bonnie Moore
Innovation Scholars, Sustainable Energy and Water Systems Cohort, University of New Hampshire

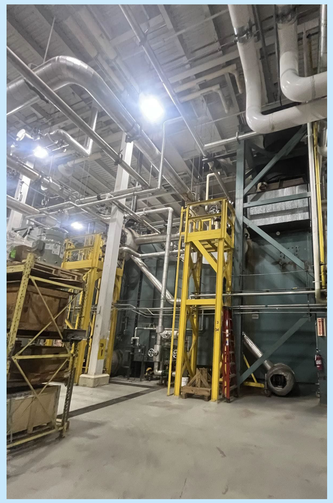
University of New Hampshire

Introduction

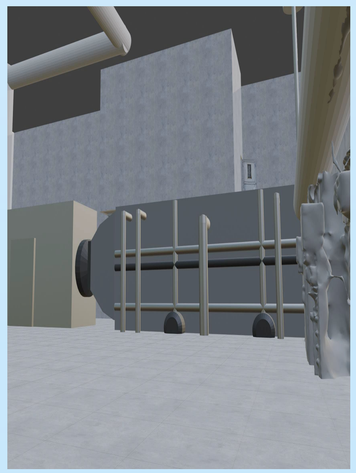
- The Combined Heat and Power (CHP) Plant provides UNH with electricity and heating. It works by combusting landfill gas from a nearby landfill.
- However, seeing the inner workings CHP Plant itself is difficult as it is hard to get a tour and it is quite loud inside
- The goal was to create a 3D environment of the plant to create convenient virtual reality tours

Methods

- Getting the floor plans of the plant to create layout of the plant
- Going inside the CHP plant to get scans with the Kiri Engine app to then use in Blender to build the model of the power plant
- Import model into Unity Engine to create a virtual reality space that allows people to walk through the virtual environment of the CHP plant

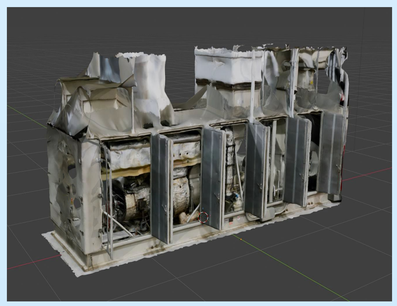


Left: Photo of inside the power plant



Right: Same position in power plant but in model

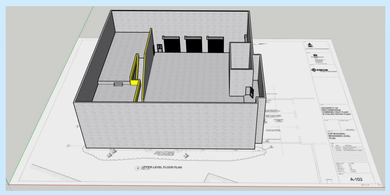
Results



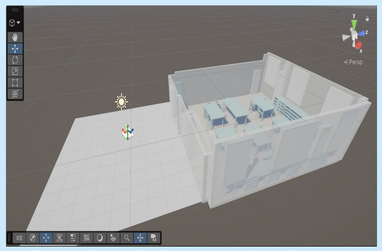
The Solar Turbine model using Kiri Engine scans modified in Blender

Skills Learned

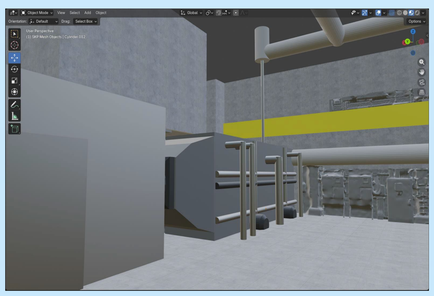
- 3D modeling when using Blender and SketchUp
- Coding/Developing movable 3D environment in the Unity Game Engine
- Using a 3D scanning app, Kiri Engine, to scan in real life figures to convert into 3D models



Using floor plans of the CHP Plant to create layout of the building in SketchUp



Concept of using Kiri Engine scan of room James 240 and adding it into the Unity Engine



CHP Model in its current state in Blender viewport

Future Implementations

- Fully develop all the CHP Plant model in blender with high-definition textures
- Import model into a game engine with physics features
- Uploading the game as a tour for people to use

The Combined Heat and Power Plant

Ecoline Pipeline
Transports pure methane from Turnkey Landfill in Rochester where it will be converted into energy for UNH. It travels through pipes that are 12.7 miles long.

7.9-MW Siemens SGT 300 Gas Turbine The methane from the Ecoline pipeline is burned into electricity. This is done by compressing the air mixed with fuel in a combustor. Igniting this makes high pressure gas which drives turbine blades to powers a generator.

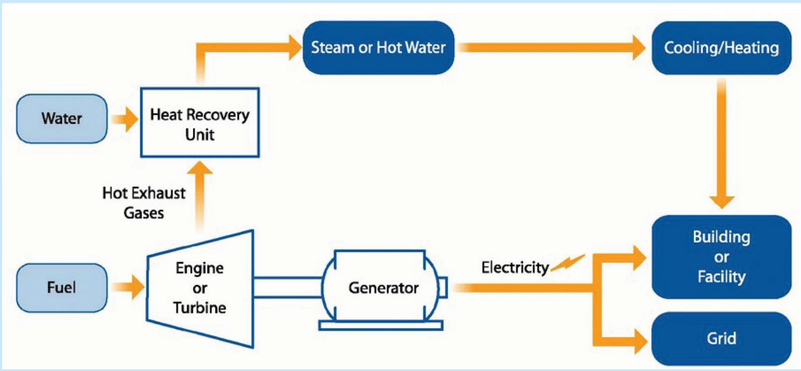
Heat Recovery Steam Generator
Generates 45,000 lb/hr of 150-psi steam from the exhaust of the Siemens Gas Turbine.

Duct Burner
They raise the temperature of the gas turbine exhaust gases. The added heat allows the HRSG to produce an additional 53,000 lb/hr of 150-psi steam.

Backpressure Steam Turbine
High-pressure steam is expanded to drive a rotor which generates electricity. Then the steam is released at a lower, controlled pressure.

Absorption Chillers
Produces chilled water to cool UNH buildings during the warmer months. Done by using steam to drive a refrigeration cycle.

Steam Distribution Network
The plant produces ~85% of UNH's electricity by heating and cooling buildings



Source: US Department of Energy, EERE, Combined Heat and Power Technology Fact Sheet

Contacts

Jericho Bien: Jericho.Bien@unh.edu
Thomas Madden: Thomas.J.Madden@unh.edu
Bonnie Moore: Bonnie.Moore@unh.edu

Software Used

Kiri Engine Blender Unity Engine SketchUp

Acknowledgements

We would like to thank our instructors, Matt Davis, and Cheristy Jones, for supporting us through every step of our project. We would also like to thank David Bowley, the Utility Systems Manager, for providing us with the floor plans and access to the energy plant.