Implementing The Plant Chicago

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The Opportunity

- Underused urban industrial areas
- Socially/environmentally responsible industry
- Toolkit for Industrial Reuse
The Team

• 21 students, 4 sub-teams, 5 disciplines

Our Mission:
Make The Plant a Reality

• Agricultural systems
• Computer Control
• Digester/Combined Heat & Power (CHP)
• Architecture
The Plant, LLC

- 100,000 sq. ft.
  3 story building
  3 acres
- 50% farming operation
- 50% small food business tenants
Semester Goals

• Bring latest aquaponic system to production
• Implement control system framework
• Design rooftop greenhouse and develop entrance-way design
• Prototype anaerobic digester
Aquaponics

- Light source
- Growing bed
- Fish tank
- Oxygen ($O_2$)
Agricultural Systems

- Germination System
- Breeder System
- Gather water-quality data
Next steps

- Build Systems #2, #3
- Optimize systems for production
- Design vertical hydroponics component
Computer Control

- View/change environment variables
- Minimize maintenance of farm
- Gather operational data
- Integrate with building systems
Previous Work

• IPRO336 Fall 09'
  – Requirements for Ag sys. control

• IPRO336 Spring 10'
  – Prototype aquaponic control system

• Independent Study Fall 10'
  – Design new control framework
Control System Framework

Old System

Network
- Hard Coded Protocol
  - Temp Control
    - thermometer
  - Light Cycle Control
    - heater
  - lights

New System

Network
- Communication Framework
  - Control Logic Modules
  - Transducer Configuration Interface
- Transducer Integration Framework
  - Transducers

Plant
This Semester

• Implement new control system framework
• Integrate temp,pH,ORP,PAR sensors
• Integrate relay and PWM actuators
• Begin deployment to system #1
Next Steps

- Continue development of Ag. Sys. application
- Develop building security application
- Systems composition
Entrance Way

The image that represents the concept behind the plant
Rooftop Green House
Anaerobic Digester

- Use of organic waste to generate power for the Plant.
- Efficient waste management.
- Alternative Benefits
Combined Heat & Power System

The diagram illustrates a combined heat and power (CHP) system, where fuel and water are used as inputs to generate power and heat. The process begins with fuel and water entering the engine or turbine, which produces electricity. Hot exhaust gases are then recovered by the heat recovery unit, which repurposes the heat for cooling or heating purposes. The steam or hot water generated is supplied to buildings or facilities for energy needs. Additionally, the electricity produced is sent to the grid, allowing for distribution to the wider public.
Anaerobic Digester Models

- Materials and Construction
- Model Operation
- Purpose of Models
- Expected Results
Digester Models: Single Stage
Digester Models: Double Stage
Accomplishments

• Commercial-scale aquaponic system
• Implement generalized control system framework
• Presented design proposals for green house and entry-way
• Anaerobic digester prototype
The Next Step

- Finish initial aquaponic systems build-out
- Deploy control system framework across multiple applications
- Practical design of green house and living wall
- Optimize digester feed recipe