The Botanika Project

Abstract:

Botanika is based on the EDEN ISS project, which focuses on ground demonstration of plant cultivation technologies and their application in space, with the aim to develop safe food production systems and procedures for on-board the International Space Station and for future human space exploration vehicles and planetary outposts.

The Botanika project includes a compact plant cultivation unit, which incorporates systems used in the Mobile Test Facility in the EDEN ISS project, with the purpose of showcasing those technologies. The system will be used for public outreach and educational purposes at the Botanika Science Centre in Bremen, Germany.

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The Botanika Science Centre:

The Botanika Science Centre is an interactive botanical garden for children located in Bremen, Germany. Here the Botanika project will have its own display for children to see how plants could be grown in space. Therefore the main aim of the project was to make Botanika interactive and easy to maintain by the staff at the Botanika Centre in Bremen.
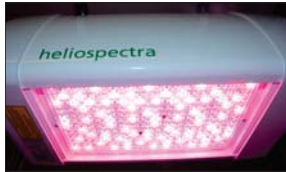

Botanical gardens at Botanika Science Centre.

System Design:
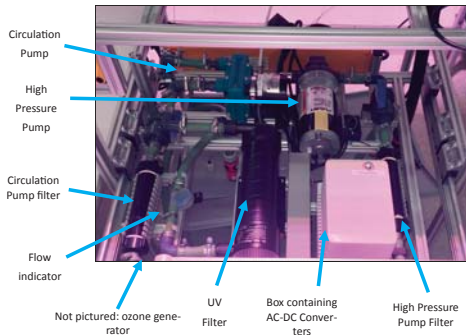
Heliospectra Grow Light:

This is an energy efficient LED light which provides a light source for the plants. The grow light is programmable and can simulate sunrise and sunset. Furthermore it provides the optimum wavelengths and intensities of light to optimise plant growth.


Grow light close-up. (Model: LX-602C)

Nutrient Delivery System:

The required pumps, filters and water lines are placed in this tray. The tray is located between the root zone tank and the water reservoir tank. It can be pulled outwards to enable easy access, cleaning and replacement of critical components. The system control box is also placed at the front of the tray.

Circulation Pump
High Pressure Pump
Circulation Pump filter
Flow indicator
Not pictured: ozone generator
UV Filter
Box containing AC-DC Converters
High Pressure Pump Filter

Water Reservoir:

This tank contains the nutrient and water supply for the plants. This solution is sprayed onto the plant roots at intervals controlled by one of the timers on the control box. The nutrient mixture is continously being recirculated and cleaned using a UV filter and a circulation pump. An ozone generator also bubbles ozone into the tank in order to prevent microbial growth. This enables the system to be as low maintenance as possible. A pH and EC sensor on the side of the tank is used to monitor the nutrient solutions.
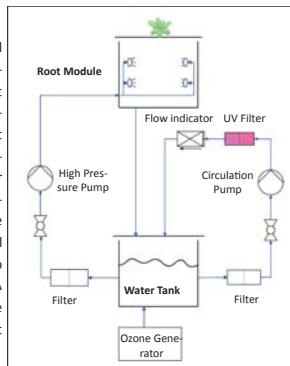
Nutrient system diagram.

Root Module:

This is the top container which is used to grow the plants and has a transparent front in order to allow viewing of the root zone. LED lights are installed inside and can be controlled independently so that visitors can better observe the roots and the aeroponic misting system.

Root Module with strawberry plant roots.
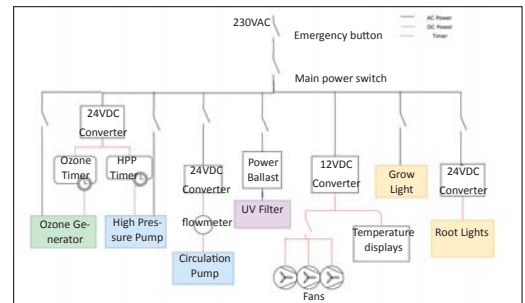
Control Box:

Control Box.

The control box contains all the circuit connections and enables the user to control all of the system components. There are six switches which control the main light, the fans, the ozone generator, the aeroponic pump, the UV filter and the circulation pump. There are also two timers which control the high pressure pump for the misting of the roots and the ozone generator for the water reservoir. Finally, the control box contains three displays connected to temperature sensors to visualize the temperature in different positions in the system.

Full Botanika System.

System circuit diagram.

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